Working group	Co-chair	CS Presenter	Keynote Speaker	Expert	Rapporteur	Attendance

Mammals

Alison Rosser	✓					YES
Rodrigo Medellín	✓					YES
Cecilia Lougheed				✓		YES
Carolina Caceres		✓				NO
Domingo Hoces Roque		✓				YES
Dennis Kyabwasi Ikanda		✓				YES
David Fraser		✓				YES
Elmer Topp-Jørgensen		✓				NO
Fernando Ugarte		✓				YES
Gabriela López					✓	YES
Jiang Zhigang		✓				YES
Kathy Traylor-Holzer		✓				YES
Lars Witting		✓				YES
Randall Reeves		✓				YES
Rick Parsons				✓		YES
Urs Max Breitenmoser						NO
Wu Zhongze		✓				YES
Yolan Friedmann		✓				YES

Total Participants : 18

International Expert Workshop on CITES Non-Detriment Findings

Cancun, Mexico, November 2008

Working Group 5

Mammals

Working Group Summary

The main objective of the Mammal Working Group was to identify the most important variables for making Non-Detriment Findings for mammalian species.

In order to achieve this, the group followed NDF Workshop Doc. 2 Output Format and extract, out of every case study, the elements to be considered when making NDFs. This was complemented with Uwe Shippmann´s document (compiling of IUCN Checklist, EU guidelines and ISSC-MAP). Then a scoring exercise was made to assign importance to the different elements.

Working Group discussions were focused on several issues, including the need for defining level of NDF covering (local population, national or regional), harvest *versus* trade-driven harvest, role of the species in the ecosystem, addressing all types of removal when making decisions and the idea of NDF as a matter of judgment.

The working group then developed a decision tree (see full report) where the members agreed on how to address NDFs that involve species at low, high and unknown risk, based on a rapid-assessment *versus* detailed-data-collection approach.

The first step of the above mentioned decision tree is a preliminary assessment looking at the risk level harvest would imply for the species. A series of questions regarding general population characteristics (distribution, abundance, conservation status and harvest likeliness of impact) are considered in this regard (see full report).

Relevant elements identified for making NDF for mammalian species can be found in the full Mammal WG Report. These elements are basically related with population size, structure, trend, and range, segment and proportion of the population taken and extent of monitoring of all these factors through time and space. It was also agreed to include a new section to cover type and magnitude of threats.

Concerning methods to obtain and measure those elements, the group will continue its work to compile relevant sources of information where they can be found and consulted (publications, databases, tools, etc.), although some basic lines can be found on WG full report. Ways to make this information available for Scientific Authorities in the near future will be assessed. Adaptive management was agreed as the main approach to be adopted for future NDF making, as it will allow continuous improvement of Scientific Authorities future work.

With the aim of assessing quantity and quality of information, before making any decision, the group considered peer review, technical assessment and experts opinion as the best paths to achieve it.

Risk assessment, as well as expert assessment and modeling, was considered essential in order to integrate information as per taking the final decision, always considering the precautionary principle beneath CITES functioning and implementation.

Problems when making NDF were pointed out during discussions, and lack of information, accessibility to it, need for capacity and funding were the most recurrent topics in this matter.

Lots of recommendations were made by members of the working group (see full report), although cooperation with other Parties or regions, taking into account all sources of mortality and adopting adaptive management where the main ones.

Future work includes building a glossary of terms, the compilation of helpful references and data sources and a characterization of vulnerability for mammal species (risk level harvest) based on previous exercises already developed.

International Expert Workshop on CITES Non-Detriment Findings

Working Group 5

Mammals
FINAL REPORT

Members (in alphabetical order)

- Susan Fisher
- David Fraser
- Yolan Friedmann
- Jorge Hernández
- Domingo Hoces
- Dennis Ikanda
- Nigel Leader-Williams
- Cecilia Lougheed
- David Morgan
- O´Criodain
- Rick Parsons
- Randall Reeves
- Teresa Telecky
- Kathy Traylor-Holzer
- Fernando Ugarte
- Lars Witting
- Jiang Zhigang
- Wu Zhongze

Co-chairs

- Rodrigo Medellin
- Alison Rosser
- Holly Dublin (not present at the meeting)

Rapporteur

- Gabriela López

Case Studies

Case Studies species	Country	Main characteristics of case studies
Narwhal *Monodon monoceros*	Greenland	Unsustainable subsistence harvest (export of tusks - not driving harvest)
Indo-Pacific Dolphin *Tursiops aduncus*	Solomon Islands	High level of harvest – lack of data
Leopard *Panthera pardus*	South Africa	Trophy hunting (recent CoP approved increase in quota Appendix I species)
Grizzly Bear *Ursus arctos horribilis*	Canada	Trophy hunting (long term harvest)
African Lion *Panthera leo*	Tanzania	Trophy hunting (long term harvest)
Crab-eating macaque *Macaca fascicularis* Rhesus monkey *Macaca mulatta*	China	Captive breeding non-native species (crab-eating macaque) and captive breeding native species (rhesus monkey)
Vicugna *Vicugna vicugna*	Peru	Live shearing

I. INTRODUCTION

To identify the most important variables for making Non-Detriment Findings for mammalian species, the Mammal Working Group reviewed eight case studies and the document *Factors to be considered during a CITES Non-Detrimental Finding* prepared by Uwe Shippmann (that compiled information from the IUCN Checklist, the EU guidelines and the ISSC-MAP). The elements to be considered when making NDFs were extracted from this background information and scored to determine their relative importance.

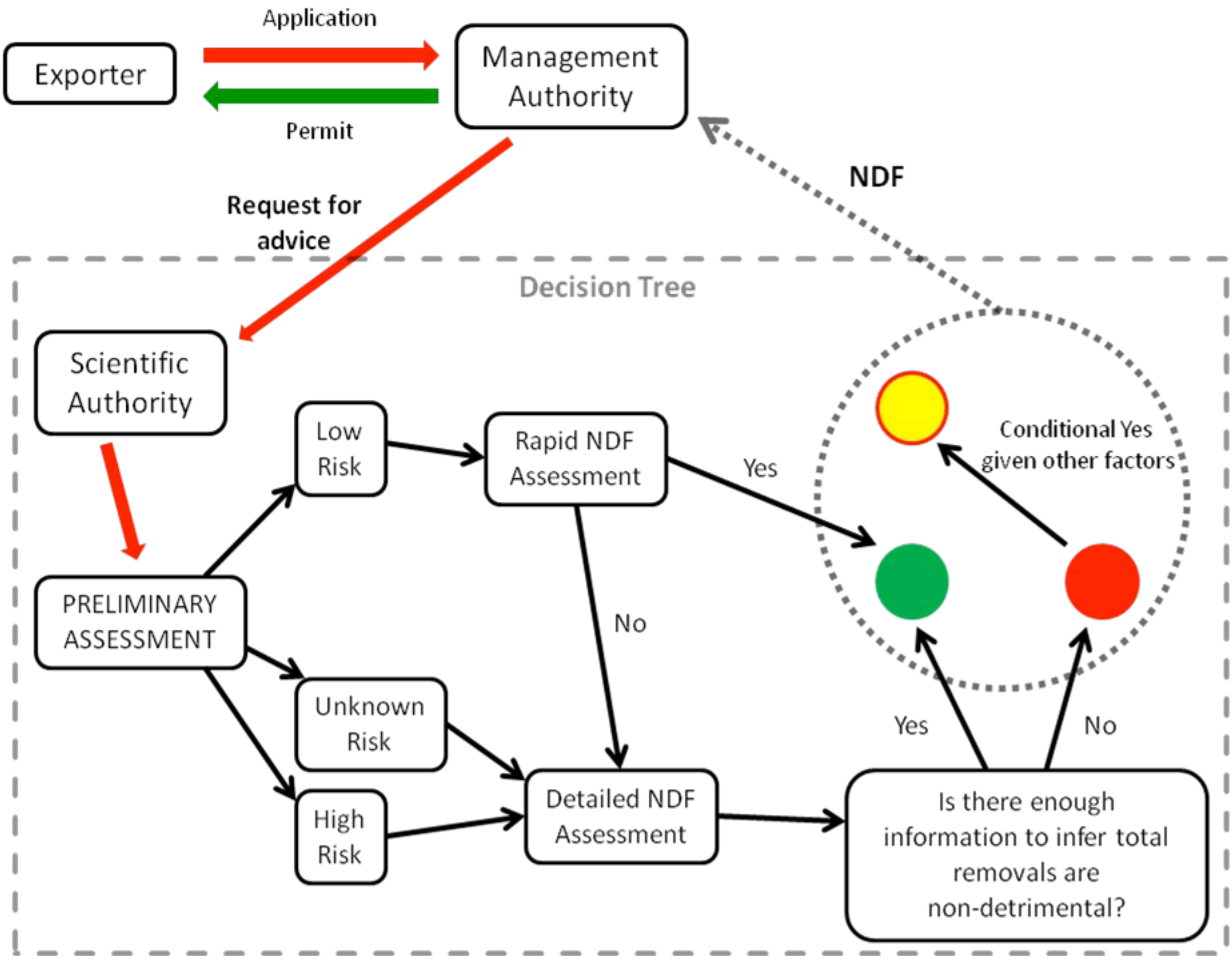
Elements considered to be most important included: population size, structure, trend, and range size, as well as information on the segment and proportion of the population harvested and on the type and magnitude of threats as well as the extent of monitoring of all these factors through time and space.

Additional discussions focused on need for guidance on several issues, including the need to take account of the population for which the NDF is being made, recognizing that whilst the harvest is from a local population, the Scientific Authority (SA) must consider the impact on the national population and, in the case of shared populations, on the regional scale. There was agreement that all types of removal from the population should be considered when assessing the likely sustainability of harvests, and that the making of a NDF is a matter of judgment. But, the group recognized the need for further work on issues such as the role of the species in the ecosystem, and how to deal with the question of allowing trade in unsustainably sourced by-products from meat harvests.

To aid SAs in making a preliminary rapid-assessment, the working group developed a decision tree based on the risk that harvest would imply for the species, taking account of the level of harvest and general population characteristics. For trade likely to be of high or unknown risk to the species, a subsequent detailed-data-collection approach would be required. To assess the quantity and quality of information that is compiled to support a decision, the group recommended the use of peer review, technical assessment and expert opinion. Then, to integrate information in order to take the final NDF decision, methods such as risk assessment, expert assessment, modeling and consideration of the precautionary principle, were considered essential.

Throughout, adaptive management was agreed as the main approach to be adopted for future NDF making, as it will allow continuous improvement of Scientific Authorities work.

II. NDF PROCEDURE (Decision Tree)



III. PRELIMINARY ASSESSMENT

The following questions[1] are thought to be the first approach Scientific Authorities will take when receiving a NDF request from the Management Authority (MA):

1. What population(s) is the NDF process focused on?
2. Is it a shared, national or local population?
3. Does it involve removing animals from the wild population?
4. Is the species population considered widespread and abundant?
5. Is the species considered vulnerable (conservation status, threats)?
6. Is the harvest likely to have negative impact on the population?
7. Is the harvest likely to reduce the range of the species?

[1] Definitions of terms & benchmarks (e.g. Resolution 9.24)

These questions will help the SA to determine the risk that the harvest poses (low, high or unknown risk), so they can decide whether a rapid or a detailed assessment is necessary for the requested species. Additional references and data sources should also be consulted to help characterize the vulnerability of mammal species (see Future Work section below).

IV. OUTPUT FORMAT

When making a detailed assessment when an export is requested for species with a high or uncertain risk of harvest, the following points should be taken into account:

1. Information (elements) to be considered when making NDF for mammalian species

1.1 Biological and species status:

- Demographics (e.g. life history, etc.)
- Population size, trends, proportion of K (depletion level)
- Population range and structure
- Role in ecosystem and impact of harvest on it
- Global conservation status
- National conservation status

1.2 Takes/uses[2]:

- Demographic segment taken
- Number of individuals taken

[2] All types of removal (legal, illegal, unintended, bycatch, etc.) must be taken into account.

1.3 Management, monitoring and conservation:

- Separate population management
- Connectivity among populations
- Extent of time-space monitoring
- Conservation actions (e.g. protected areas, management plans, etc.)
- Harvest monitoring (all forms of removal)
- Tracking population origin of the specimen
- Historical effects of harvest and trade on the species
- Utilization trend
- relationship between international trade and harvest (removal)
- Risk of mortality after harvest / before export

1.4 Threats

- Type
- Magnitude

2. Methods and sources of information

Due to the variety of life forms of mammal species, SA staff should consult references and data sources to determine the optimum methods to study particular groups of mammals (see Future Work section below). However, an Adaptive Management approach is highly recommended and the following are general lines to be considered when compiling information for the concerned species:

2.1 Biological and species status:

- Empirical data
- Modeling

- Experts opinion and assessments (all stakeholders)
- Literature review

2.2 Harvesting and trade data:
- Permit systems
- Monitoring export quotas and total removals
- Experts opinion (all stakeholders)
- Collecting biological data and samples from harvested specimens
- Periodic review of harvest

3. Data integration and analysis

Before taking any decision, the quantity and quality of information must be assessed (see next point). When integrating and analyzing information, the following approaches could be taken into account:

- Risk assessment
- Experts assessment
- Models
- NDF decision tree (see above)

4. Data quantity and quality assessment

- Peer review
- Technical assessment
- Experts opinion
- Different sources of data
- Transparent processes

5. Problems, errors, challenges or difficulties when formulating NDF

- Lack of information and limited access to it (biology, harvest, management, etc.)
- Improve reporting and standardization of units exported (conversion factors-CITES Database)
- Stockpile issues
- Need for capacity (cooperation between Parties, training, data sharing, funding, etc.)
- Lack of standardized process/guideline
- Costs
- Governance

6. Recommendations

- Need for guidance on basic principles (sustainability of harvest/export)
- Include in NDF decision documents a description on methods and sources of information
- Cooperation with other Parties or regions
- Documentation on the basis of NDF for routinely/significantly traded species (e.g. quotas)
- Need for mechanisms to satisfy validity of NDFs

- Need for proactive processes on CITES
- Consider incentives, benefits from harvest for communities
- Promote consumers to ask for NDF document when purchasing specimens
- Periodic data assessment
- Gain access to existing data, publications, etc.
- Evaluate alternatives to address real lack of information
- Precautionary principle when not enough information.
- Adopt adaptive management approach
- Harvest vs trade terms
- Take into account all sources of mortality.
- In case of captive breeding state the kind, extent, and importance of any existing ex-situ in-situ cooperation

7. Useful references and sources of information for future NDF formulation

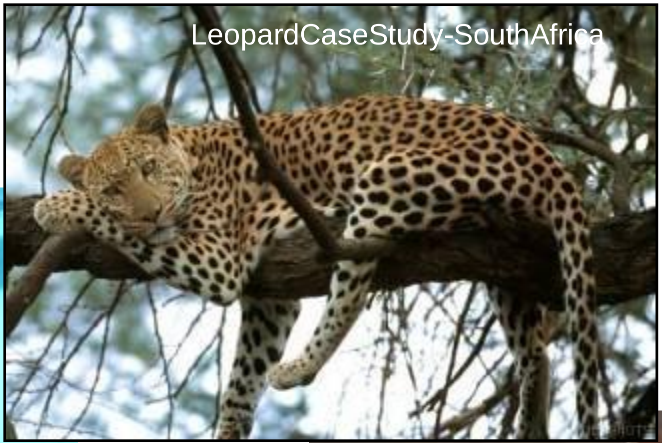
- IUCN Checklist
- Future work to compile additional references (see next point).

V. FUTURE WORK

- Glossary to describe terms
- Compilation of helpful references and data sources
- Characterization of vulnerability for mammal species.


AfricanLionCaseStudy-tanzania


www.cms.int


LeopardCaseStudy-SouthAfrica

Mammal WG


VicugnaCaseStudy-Peru


MacaquesCaseStudy-China


Glenn Williams


D.H.Fraser

Mammals WG5 **Case studies:**

• Narwhal	unsustainable harvest: export of tusks not driving harvest
• Dolphin	high level harvest: lack of data
• Leopard	trophy hunting: recent COP approved increase in quota App I
• Lion	trophy hunting: long term harvest
• Bear	trophy hunting: long term harvest
• Crab-eating macaque	captive bred non-native sp
• Rhesus monkey	captive bred native sp
• Vicuna	live shearing

Process

- **Aim:** to identify most important variables for making a NDF - **for high risk or uncertain risk cases**
- **Methods:** Use of workshop output format Doc 2 & matrix approach
- Circular discussions re rapid assessment vs detailed data collection thus focus on high or uncertain risk cases
- Did not define high or uncertain risk
- Compiled a list of possible key variables for these cases
- Case study authors then **scored** importance of different variables in their study (see next slide)
- Completed workshop output format Doc 2.
- Developed decision tree

Example of scoring for: Biological information

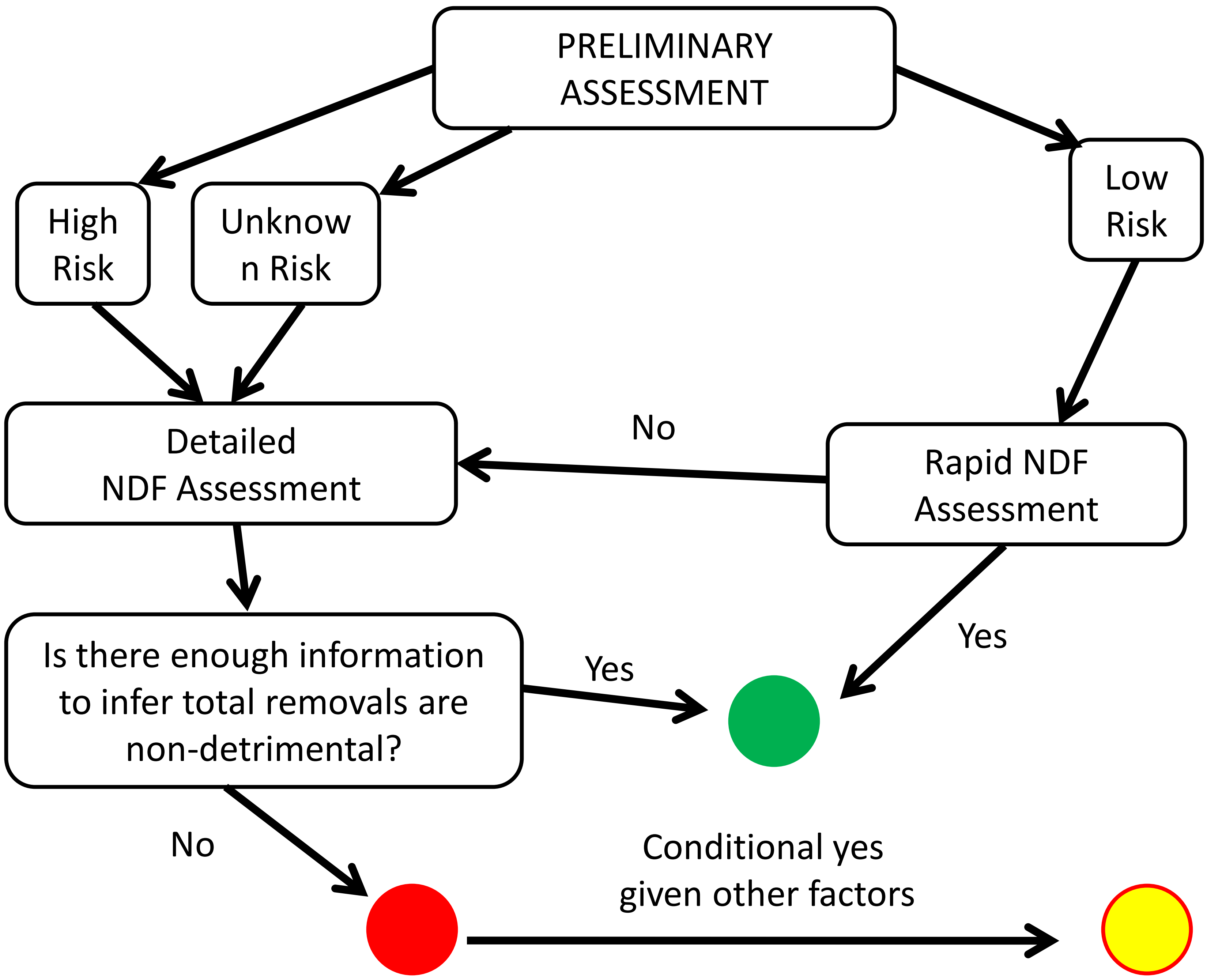
Demographics (e.g. life history, etc.)	**1**	1	1	1	1	1
Population size, trends, proportion of K (Depletion level)	**1**	1	1	1	1	1
Population range and structure	**2**	1	2	2	2	1
Role in ecosystem and impact of harvest on this	**2**	3	3	2	2	2
Global conservation status	**3**	3	3	1	3	2
National conservation status	**1**	3	2	1	1	1
Demographic segment taken	**1**	2	1	1	1	1

Outcomes: Basic points

- What is an NDF? - Need for a written description:

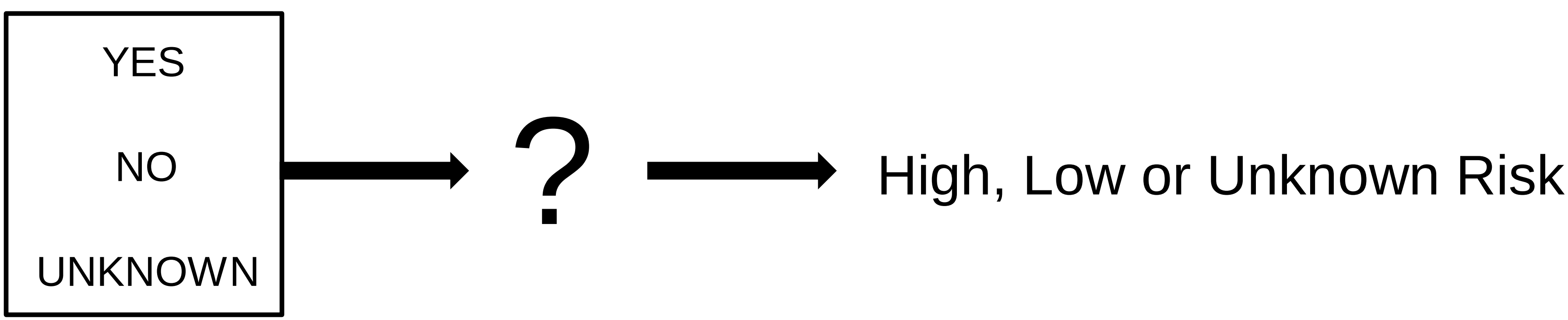
Key considerations:

- Effects of trade on the “species”
- Role of the species throughout its range
- Assess the total removals
- An NDF is a matter of judgement


PRELIMINARY
ASSESSMENT
High
Risk
Unknow
n Risk
Low
Risk
Detailed
NDF Assessment
No
Rapid NDF
Assessment
Is there enough information
to infer total removals are
non-detrimental?
Yes
Yes
No
Conditional yes
given other factors

Preliminary Assessment

1. What population(s) is the NDF process is focused on?
2. Is it a shared, national or local population?
3. Does it involve removing animals from the wild population?
4. Is the species population considered widespread and abundant?
5. Is the species considered vulnerable (conservation status, threats)?
6. Is the harvest likely to have negative impact on the population?
7. Is the harvest likely to reduce the range of the species?
8. (Definitions of terms & benchmarks. e.g. Resolution 9.24)



Detailed assessment & output format

- Excel sheet
- For high/uncertain risk species across all sections of the form

Key data (high risk): Biological & all removals

1.1	Biological, Status	Demographics (e.g. life history, etc.)
		Population size, trends, proportion of K (Depletion level)
		Population range and structure
		Role in ecosystem and impact of harvest on this
		Global conservation status
		National conservation status
1.2	Takes/uses (including all types of removal: legal, illegal, unintended, bycatch)	Demographic segment taken
		Numbers of individuals taken

Key data (high risk): Management, Monitoring, Conservation

1.3	Management, Monitoring, Conservation	Separate population management
		Connectivity among populations
		Extent of monitoring over space and time
		Historical effects of harvest and trade on the species
		Harvest monitoring (all forms of removal)
		Risk of mortality after harvest / before export
		Utilization trend
		Tracking population origin of the specimen
		Relationship between international trade and harvest (removal) Narwhal
		Conservation actions (e.g. protected areas, management plans, etc.)

New section 1.4

Threats: Types and magnitude

2. Methods and data sources: Adaptive management

2.1	Biology and status	• Empirical data, • Modeling, • Experts opinion and assessments (all stakeholders), • Literature review
2.2	Harvest and trade data	• Permit systems, • Monitoring export quotas and total removals, • Experts opinion (all stakeholders), • Collecting biological data and samples from harvested specimens, • Periodic review of harvest data

3 & 4. Integration/ assessment (methods for analysis of information and NDF formulation

3	Integration and Assessment (see 4)
	Assessment of Quantity & Quality of information
	Risk assessment
	Experts assessment
	Models
	NDF decision tree

4	Assess Quantity & Quality of info
	Peer review,technical assessment, experts opinion, agreement between different sources of data, transparent processes

5. Problems, when obtaining and processing information:

5	Problems	(when obtaining and processing information)
		Lack of information and limited access to it (biology, harvest, management, etc.)
		Improve reporting and standarization of units exported (conversion factors-CITES Database)
		Stockpile issues
		Need for capacity (cooperation between Parties, training, data sharing, funding, etc.)
		Lack of standarized process/guideline
		Costs
		Governance

6. Recommendations for the whole process

6	Recommendations (For the whole process)
	Need for guidance on basic principles (sustainability of harvest/export)
	Include in NDF decision documents a description on methods and sources of information
	Cooperation with other Parties or regions
	Documentation on the basis of NDF for routinely/significantly traded species (e.g. quotas)
	Need for mechanisms to satisfy validity of NDFs
	Need for proactive processes on CITES
	Consider: Incentives, benefits from harvest for communities
	Promote consumers to ask for NDF document when purchasing specimens - CITES as a form of certification

6. Recommendations for the whole process

6	Recommendations (For the whole process) cont’d
	Periodic review of data assessment
	Gain access to existing data, publications, etc.; Evaluate alternatives to address real lack of information; Precautionary principle when not enough information
	Adopt an adaptive management approach
	harvest vs trade terms
	Take into account all sources of mortality

7. References

IUCN checklist

etc

Next steps

- Glossary to describe terms
- Compilation of helpful references and data sources
- Characterization of vulnerability for mammal species (Risk Assessment)

Acknowledgements

- Lars Witting
- Fernando Ugarte
- Randall Reeves
- Jiang Zhigang
- Wu Zhongze
- Domingo Hoces
- David Fraser
- Yolan Friedmann
- Kathy Traylor-Holzer
- Dennis Ikanda
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- Susan Fisher
- David Morgan
- Colman O Criodain
- Alison Rosser
- Rodrigo Medellin
- Gabriela López

Special thanks to Holly Dublin for all her help in organizing the Mammal WG

NDF WORKSHOP CASE STUDIES
WG 5 – Mammals
CASE STUDY 1
Panthera leo
Country – **TANZANIA**
Original language – English

NON-DETRIMENT REPORT UNDER CITES REGARDING THE EXPORT OF AFRICAN LIONS *PANTHERA LEO* FROM THE UNITED REPUBLIC OF TANZANIA

AUTHOR:
Dennis K. Ikanda*
*TANZANZANIA WILDLIFE RESEARCH INSTITUTE

I. Background information on the taxa

1. BIOLOGICAL DATA

1.1 Scientific and common names

Scientific; *Panthera leo maasaica* (Neumann, 1900)
Common names: African lion (Eng), Simba (Swahili).

1.2 Distribution

The African lion is the largest of Africa's large carnivores and once one of the most wide spread species. Lions inhabit all the major habitats of the continent where there is stable prey base, water, and minimal human disturbance. They have been recorded throughout the vast savannas, woodlands and bushlands of east and southern Africa and in central and West Africa. Lions are present in 34 range countries today, with a permanent presence in 32 and occasional in 2. Records by Bauer, Chardonnet and Nowell (2005) indicate the disappearance of lions in 6 countries over the recent past. Figure 1 (*ANNEX I*) shows the past and recent lion distribution in Sub-Saharan Africa.

Estimates by Chardonnet (2002) show a current continental lion distribution range of approximately 3 million km^2. Fifty percent of the range is gazetted and with some form of conservation status such as

National Parks and the rest (50%) is just open, ungazetted wildernesses. East Africa holds approximately 40% of the lion range while 35%, 22% and 4% fall within Southern Africa, Central and West Africa respectively.

1.3 Biological Characteristics

1.3.1 *Summary of general biological and life history characteristics*

African lion is the best-studied terrestrial carnivore in Africa today. Lions are gregarious mammals that live in stable social groups or prides that comprise of 2-30 individuals; with a composition of 2-18 adult females, 1-7 adult males and juveniles and cubs born in the pride. Reproduction in lions is non seasonal and occurs approximately once in every two years and generally takes place after individuals in the previous litter reach their second birthdays (Van Orsdol *et al*, 1985). Pride females conceive and give birth in synchrony to litters of 1-4 cubs after a gestation period of 90-110 days. Cub survival rate is 50-75% in the wild (Serengeti NP and Ngorongoro Crater). Maturity is reached at the age of 3 years, but reproductive opportunities are obtained much later in both sexes (Packer *et al*, 1988). Females begin breeding in between their 3-4 birthdays and males do not gain reproductive status until around their fifth birthdays (Packer *et al*, 1988). The difference in males is due to a solitary phase (2-4 yrs) when males undergo nomadic life after dispersal from their natal prides. All the females are born within the pride while males are newcomers that are born in other prides and gain access through successful ‘pride takeovers’. Prides occupy territories of varying sizes (5-400 km^2) that depend upon the availability of food, shelter, and water (Heinsohn and Packer, 1995). Females defend the resources within territories against other female intruders while males do the same against other males.

1.3.2 *Habitat types*

Lions inhabit all the major habitats of the continent where there is stable prey base, water, and minimal human disturbance. They have been recorded mostly throughout the vast savannas plains and woodlands and bushlands of east and southern Africa and in central and West Africa and even extreme environments such as the Kalahari Desert in Namibia and high montane forests of Mt. Kenya in Kenya.

1.3.3 *Role of species in the ecosystem*

Within ecosystems, lions are top predators and keystone species that help regulate and maintain large herbivore populations in balance with nature.

Large volumes of literature on the conservation status, ecology, behaviour and human conflicts exist. For more information on these topics, please refer to Chardonnet (2002), Pusey and Packer (1993), (Heinsohn and Packer, 1995), Packer *et al* (2005) and Ikanda and Packer (2008).

1.4 Population

1.4.1 *Global population size*

Precise global population numbers of African lions are not known due to the difficulty involved in census techniques. Recently Bauer and van der Merwe (2004) and Chardonnet (2002) have attempted to make inventories of lions by country, ecosystem and unprotected/non-gazetted areas, thus giving estimates of total global population size. Their methods involved reviews of local census data (12-30% of inventory) on key well-studied populations through questionnaires and communications with national authorities, scientists and consultants. In areas where such data was not available, Chardonnet (2004) applied educated 'quessestimates on numbers by making extrapolations from similar ecosystems (in terms of natural habitat and human density) (25%) and secondary data (63%). These two studies provide the best available figures on global numbers of lions that put recent estimates in the range of 16,500 – 47,000 (Chardonnet, 2002; Bauer and van der Merwe, 2004).

1.4.2 *Current global population trends*

___increasing   __X__decreasing   ____stable   ____unknown

Fewer lions survive today in the wild and records indicate a continuous decline, primarily due to habitat/range loss (30-50%) in the last 2 decades (Nowell and Jackson, 1996). Continued changes in land-use practices that lead to lion habitat loss and fragmentation (Frank and Woodroffe, 2001; Sunquist and Sunquist, 2001), (Nowell and Jackson, 1996; Bauer and van der Merwe, 2002), sanctioned human persecution (Frank 1998, Packer *et al*, 2005, Ikanda and Packer, 2008) are identified as the principal causes for decline. The remaining lions live mainly inside protected areas in the plains and woodlands of east and southern Africa. Small and isolated populations survive in scattered protected areas of west and central Africa (Bauer and van der Merwe, 2002). A few continue to survive outside protected areas, but at much lower densities and in isolated and fragmented habitats of East Africa (Frank, 1998, Baldus, 2004).

1.5 Conservation status

1.5.1 *Global conservation status*

___Critically endangered	___Near Threatened
___Endangered	___Least concern
_X_Vulnerable	___Data deficient

The African lion is currently listed as *vulnerable* by the IUCN and its trade is regulated pursuant to its listing and its trade is regulated pursuant to its listing under Appendix II of Convention for the International Trade in Endangered Species (CITES) (Nowell and Jackson, 1996).

1.5.3 *National conservation status for Tanzania*

Tanzania is home to a high number of lions, owing to its extensive network of Protected Areas (PAs) and large tracts of relatively undisturbed wild lands that adjoin and extend well beyond PA boundaries (Figure 1). Lions are found *wide spread* in virtually all PAs in Tanzania, whether on temporal and spatial scales, supported by the immense abundance of wild ungulates populations found within. National Parks and Game Reserves form *core lion areas* and are also *common* in Game Controlled Areas, Open Wilderness Areas/Wildlife Management Areas and Forest Reserves that serve as the main buffer zones (semi-PAs status). Country wide 8 known populations have been directly estimated in National Parks and Game Reserves through ecological monitoring and research, giving a figure of approximately 13,000 lions. The primary method of estimation is based on the long-term monitoring of known individuals (lions) that are identifiable individually by their unique and distinct facial markings such as whisker spot patterns, ear notches and scarring (Schaller 1972, Hanby and Bygott, 1979, Packer 1990, Creel & Creel 1997, Ikanda, 2006). Secondly they have been counted using playback calls (Viljoen and TAWIRI *unpubl* and Kiffner (2006)) and lastly using line transects and estimated using DISTANCE in large open terrains such as the Serengeti open grassplains (Durant *et al* 2003). Combining the figures together with other indirect measures using indices done by Chardonnet (2002) for the rest of suitable lion-habitats in Tanzania gives an estimated minimum number of 18,215 lions for entire Tanzania.

Outside PAs lions continue to survive and their interactions with humans are high (Packer *et al* 2005). Little is known of the past abundance, however historical tribal tales and legends suggest fewer lions survive today than did in the past 50 years.

1.5.3 *Main threats within Tanzania*

___No Threats
_X_Habitat Loss/Degradation (human induced)
___Invasive alien species (directly affecting the species)
___Harvesting [hunting/gathering]
___Accidental mortality (e.g. Bycatch)
_X_Persecution (e.g. Pest control)
___Pollution (affecting habitat and/or species)
___Other_______________
___Unknown

Threats to Lion in Tanzania are limited/reversible.

Persecution

There are four types of non-natural mortality of lions in Tanzania on the based on research records, District Problem-Animal files and Wildlife Division Hunting records; Problem-animal control (PAC), ritual hunting, tourist hunting and road kills (e.g. Mikumi highway and TAZARA railways and Mtwara-Lindi highway). Road kills do not occur in significant numbers and can easily be disregarded. Tourism hunting is regulated and affects a demographic segment of the population, thus having minimal impacts. The former two, however, pose significant threats to the survival of lions in Tanzania. Numbers out of the four types of non-natural mortality are not considered when setting quotas, with the exception of tourist hunting records, main reason being that mortalities occur in significantly far distances from harvested populations to have any significant impacts, even though some places may increasingly be forming population sinks.

Problem-animal control

Records from 7 high human-lion conflict districts indicate minimum annual losses of 15 lions due to PAC resulting mainly from attacks on humans (Ikanda and Mduma, *in prep*). Lion PAC resulting from livestock depredation is even more difficult to quantify and measure as it is mostly done by closed pastoralists societies, located in highly remote areas (where events are seldomly reported to wildlife authorities). Studies by Maddox (2003) and Ikanda (2006) for the Ngorongoro Maasai rangelands and Kissui (2008) for the Greater Tarangire-Manyara Maasai rangelands indicate annual offtakes of 30+ (1% of population) and 40+ (10% of population) lions respectively through ritual hunting. District Government records (Unpublished), Wildlife Division Records (Unpublished) and studies by Ikanda and Mduma (in prep) indicate annual losses of 3-7 lions in other pastorilist-dominated landscapes through PAC, especially in central Tanzania. Combining all figures, approximately 73-77 lions are persecuted annually through PAC in high human-lion conflict regions of Tanzania. These figures were gathered through participatory research and matched against estimated local population sizes to determine impacts. Kill data was gathered through reviews of government records and field research (PRA) and figures summed up per district/location. In locations where population abundance is known, figures were then matched up with population size in order to determine impact levels.

Ritual hunting

Ritual hunting is illegal and the single most illegal-form of lion harvest in Tanzania. The practice is done by pastoralist societies inhabiting open rangelands, in often highly remote and extreme environments. Each year young warriors from the *Maasai* (northern Tanzania) and *Barbaig* (central) pastoralist communities kill lions with spears-in display of bravery and courage-as a necessity for their 'right of passage' into manhood. Nevertheless, the practice goes on unabated due to high secrecy behind these communities; and even when detected by authorities, the events may easily be framed and disguise acts of retaliatory (PAC) killings due to livestock theft (depredation).

Habitat loss in Non-Gazetted Areas

Tanzania has a significant number of lions living outside its PAs network, in large expanses of *ungazetted* open wilderness rangelands. Until recently these have served as suitable lion habitats due to low human presence and activity. However, it is within these same habitats today that an increasing rural population (at a rate of 3.5-4% annually) is expanding to with adverse effects on biodiversity, especially pastoralists. Human-lion encounters and conflicts are increasing due to space and resources competition on open rangelands.

2. SPECIES MANAGEMENT WITHIN TANZANIA

2.1 Management measures

Lions are protected throughout the country, and it is the policy of the Government to conserve them both inside and outside protected areas as part of the countries biological heritage (Wildlife Conservation Act, 1974). Lions are managed within the context of the ecological systems in which they occur, on the basis of General Management Plans (GMP), in all National Parks and Game Reserves and in the future also at the GCAs and OA/WMA.

The only exception is in defence of life and property. Lions may be killed at any time where they are deemed a threat to life and, or property (Wildlife Conservation Act, 1974).

2.2 Monitoring system

2.2.1 *Methods used to monitor harvest*

RANKED- QUANTITATIVE

The Wildlife Division monitors harvesting of lions through its quota system. Hunting companies are obliged to show the number of lions they shoot each hunting seasons through hunting returns, these numbers are verified by records from local wildlife officials (Park managers and District Game Officers) who supervise all hunting. Furthermore, harvesting is also monitored through an trophy export permit system; as lions are harvested for trophy by foreign tourists hunters that must export them. This system also enables the monitoring for quality of trophies using several verifiable indicators (e.g. trophy quality, age etc.). Records mainly used by authorities to monitor hunter's adherence and compliance to regulations, especially on sex biased harvesting and set minimal ages of lions harvested.

2.2.2 *Confidence in the use of monitoring*

RANKED-MEDIUM

Each export of lion trophy requires an export permit that enables the Wildlife Division to monitor harvest. As African lions area a CITES listed species, it can be expected that a high level of international scrutiny will be applied to international trade in the species.

Wildlife Division has many years of cumulative experience of setting quotas that relies on several verifiable indicators (population estimates, trophy quality, age, abundance, offtake levels etc.) that can demonstrate little or no significant detrimental impacts on the wildlife populations provides the bench mark that allows for the confidence of setting future hunting quota through an adaptive management approach.

2.3 Legal framework and law enforcement

Harvesting of lions in Tanzania is controlled through the Wildlife Conservation Act (1974) and Hunting Regulations (2002). The Wildlife Conservation Act ensures there is no resident hunting of lions, whether for trophies, medicinal or other forms of trade and ensures the protection of lions outside PAs. It is thus illegal for any body to be found with lion parts. Tanzania's Zonal Anti-poaching Units (APU) enforce the law under the Act.

Harvesting of lions is only allowed in designated tourist hunting areas as stipulated under the Hunting Regulations (2002). Hunting permits to shoot lions are issued by the Director of Wildlife for each hunting company and hunting clients are obliged to be accompanied by a Government Wildlife Officer, who ensures their quotas are not exceeded and compliance of the full extent of the Regulations.

3. UTILIZATION AND TRADE FOR TANZANIA

3.1 Type of use and destination

RANKED-TROPHY HUNTING

In some wildlife PAs categories e.g. Game Reserves, Game controlled Areas, Open Areas/WMAs, lions are utilized consumptively through *tourist hunting*. Here 1.4-12.3% (average 6 %) of the male population (Baldus, 2004) is harvested commercially annually and exported as trophies mainly to the US and EU countries. Proportion of males were determined from 3 well studied populations in the Serengeti, Ngorongoro and Selous GR and were found to have a mean ratio of 18%. This figure was multiplied against each population estimate for each ecosystem to obtain approximate male population sizes. Mean numbers (2000-7) of lions harvested for each ecosystem were then divided by estimated male population numbers in order to obtain harvested proportions per each ecosystem.

Utilization is exclusively (100%) on wild specimens.

3.2 Harvest

3.2.1 *Harvesting regime*

RANKED- EXTRACTIVE, DEMOGRAPHIC SEGMENT ONLY.

Harvesting is *extractively* and strictly administered under a national quota system set and controlled by the Director of Wildlife. Quotas are restricted to adult males (preferably of 6+yrs) only. Approximately 320 lion quotas in total are issued to hunting block concessions in Tanzania annually. The outfitter of the concession than sell the hunting experience and lion trophies to clients based upon quotas issued for their particular hunting blocks. To hunt lions, clients purchase 21-day safari permits, lion trophy fees and export fees for each lion. In the field, outfitters are obliged to make sure clients are accompanied and assisted by professional hunters and government game rangers (mainly for safety and compliance purposes).

3.2.2 *Harvest management*

Lions are harvested in designated hunting areas under Tanzania's PAs categories of Game Reserves, Game Controlled Areas and Open Areas/WMAs. Hunting areas are divided into 158 hunting concessions that are leased by the Wildlife Division to hunting outfitter/operators. Hunting outfitters are issued quotas of 0-5 lions annually and these form the limits to the number lion trophies they can sell to clients. Government game rangers are further assigned to each client in order to make sure quotas are not exceeded. Lastly, harvested trophies are exported out of the country through a permit system. At the end, export permits from departing tourist hunters must reflect the hunting outfitter's identity and his 'baggage size' or quota. Finally, harvesting is time-managed, strictly conducted over a six-month period that effectively commences on July1st to December 31st each year. This period coincides with the dry season in Tanzania when wildlife species are easily visible and less mobile for harvest management. At the end of the season, hunting companies must submit their hunting returns to the Wildlife Division upon which records of annual harvests are made.

Approximately a quota of 320 lions- is issued for harvesting in all hunting blocks annually. Quotas are set (unscientifically) by the MA and were provide to us as figures only-for each hunting block/concession.

Harvest Analysis

Records of issued lion quotas (annual) and corresponding hunting returns (see Harvest management above) were collected for hunting blocks from the Wildlife Division in Dar-es Salaam. Quotas were not calculated; they were set (non scientifically) and provided by the MA. Due to observed gaps in the data and computerization, records were restricted to coverage of 89% (n=158) of hunting blocks and for the period 2000-7. The spatial-temporal data was captured onto a computer database to enhance analysis. Furthermore, as hunting takes place in 6 major populations (mainly the Selous, Maasai steppe, Great Ugalla comprised of Rukwa, Rungwa and Moyowosi areas and the Serengeti surrounds), analyses were conducted separately for each these as ecosystems (*see* Map in Appendix II) in order to better assess and detect local harvest impacts.

Using *Standard linear regression* (Model I Regression) the form and strength of relationship between lion quotas and harvests was analyzed for each of the ecosystems for the period of 2000-2007. The main assumption was that if harvest levels are detrimental to the populations then quotas should show statistically significant *inverse* relationships with offtake levels; on the assumption also that harvest efforts were 100% and hunting companies strictly adhered to their bag limits (quotas). Findings indicate statistically significant, strong positive relationships in the two variables for Selous (r = 0.634, p=0.00), Maasai steppe (r = 0.624, p = 0.003), Great Ugalla-Rungwa complex (r = 0.647, p = 0.007), Moyowosi complex and Serengeti surrounds (r = 0.868, p = 0.05). There was no significant relationship of the two variables for the Rukwa complex part of the Great Ugalla ecosystem, though there is still a positive relationship. Findings suggest non-detrimental effects in lion harvest levels in Tanzania for the period 2000-2007. Visual presentations of the findings are given in *ANNEX III*.

A mean number of 192 lions, under mean quota of 320 were harvested in the period meeting 63.3 % of harvest requirements. From the data (assuming 100% harvest effort-marketing+hunting), it can be discerned that lion quotas were relatively high, even though trends showed positive linear relationships.

3.3 Legal and illegal trade levels

Legal Use Nationally

There is no resident hunting of lions in Tanzania, which includes licenses for traditional lion hunting or to obtain lion products for traditional medicine. Ownership of any item deriving from wildlife including lion must be proven with an ownership certificate that is only provided in the case of legal acquisition.

Illegal Use Nationally/Internationally

Illegal harvest and trade in lion body parts are rare nationally (9 skins impounded between 2000-7), making it difficult to estimate through meaningful quantitative measures. These numbers are not considered when setting quotas, as numbers are regarded low and insignificant. Records from 9 districts show a minimum of 9 lion skins were impounded by authorities between 2000-2007 (Pers observ). Incidents are always difficult to measure, and it does not come as a surprise that the exact number of lions lost due to illegal acts in Tanzania is unknown. The highest losses are attributable to the pastoralists of northern and central Tanzania, e.g. the Maasai and Barbaig.

II. NON-DETRIMENT FINDING PROCEDURE (NDFs)

1. IS THE METHODOLOGY USED BASED ON THE IUCN CHECKLIST FOR NDFs?

__yes __X_no

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED?

The approach used by the Wildlife Division to allocate quotas is to rely on the knowledge of Project Managers and District Game Officers who suggest quotas for the Game Reserves and Game Controlled and Open Areas respectively. Aerial survey data are taken into account (where available) together with past hunting records and recommendations of professional hunters and outfitters. As such, the setting of lion quotas is on the basis of the following parameters:

1. *Population abundance*- Population estimates of lions per Game Reserve or Open areas are not available for the Wildlife Division so review panels rely on the recommendations of Project Managers (Chief wardens of GRs) and District Game Officers (OAs) as well as professional hunters and Hunting outfitters who have best local knowledge on local lion abundance. These recommendations then provide the basis for setting future quotas.
2. *Trophy quality and age*- Trophy quality is assessed by the type (black. Tawny) and length/coverage of the mane. The mane is also used as an indicator of age (as length and quality increases with age). Trophy quality of harvested animals is observed in the field by Project managers and District game officers and recommendations given to review panels for future quota setting. Further evaluation is done by the Wildlife Division prior to trophy export. However, studies by Whitman *et al* (2004) with field data from Tanzania demonstrated through modelling that harvesting only lions of six years and older is not harmful to a normal lion population. Aging in the field is based on nose colouration; from bright pink (young) to freckled-black/ black (adults 6+yrs) Based on their results, the Wildlife Division is considering a system of discouraging the export of lion trophies from animals less than six years old. These records will also be applied in setting of quotas.
3. *Past offtake levels*- Perhaps this is the primary base from which future quotas are gauged and set. The extent to which past quotas have been met (harvest levels) are assessed effectively and the cumulative experiences obtained over past years form criteria of setting future ones.

No proper quantitative data exists within the Wildlife Division for conducting rigorous harvest analyses using criteria 1 and 2. Therefore harvest analyses are based upon criteria 3, and the main assumption is that negative impacts of harvest in a quota-based system should be manifested in the returns (number of hunted lions) against quotas in a linear relationship. Under the current system, all hunting outfitters are obliged to report back to the Wildlife Division the number of lions harvested per given quota. Usually this is done after the end of a hunting season in the form of 'hunting returns' and must be reported before commencement of the next hunting season. Returns reflect the date, location and number of harvests for each hunting outfitter. Both sets of records were collected from the Wildlife Division and compilations of all outfitters' records in a given ecosystem give a record of harvest for that specific region.

3. MAIN SOURCES OF DATA, INCLUDING FIELD EVALUATION OR SAMPLING METHODOLOGIES AND ANALYSIS USED

The main source of data for the NDF is the Wildlife Division hunting records.

Lion population Abundance

No proper quantitative data exists within the Wildlife Division on lion population abundance. This is due to the fact that the primary method of animal census by the Wildlife Division is aerial surveys, which are inconsistent due to costs, are ineffective for species such as lions and are only useful in providing population trends. Few hunting outfitters have attempted to census lions on their concessions, but the figures represent too small sample proportions of ecosystems to provide for any meaningful statistical analysis.

Lion trophy quality

Likewise, no proper quantitative data on trophy quality is available at the moment. As such, this type of data was excluded from the analysis.

Past harvest records/returns

The Wildlife Division sets and distributes all lion quotas to all hunting concessions/outfitters on an annual basis- prior to commencement of hunting season. In return, at the end of every hunting season the hunting companies are obliged to submit their hunting returns to the Wildlife Division. Records are then kept on annual quotas and annual returns for all hunted species annually. We gathered both sets of data for lions on all hunting companies between 2000-7. Standard linear regression analyses were used to determine relationships between, and ‘cause’ and ‘effects’ of present quotas on harvest levels. To better evaluate the impacts, this analysis was scaled down to ecosystem levels where a total of 6 lion populations (in 5 ecosystems) were assessed.

Further analysis was done to estimate proportions of the population offtake per year in order to draw on a broader picture.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

No rigorous evaluation of the data was done. However, a few points are worth noting regarding the data. The data is strictly maintained by the Wildlife Division and is not accessible to the public. Records used reflect lion harvest for up to 89% of hunting concessions. Although such records exist for previous years, computerized data records existed basically from 1995 upwards. More complete records exist for the period of 2000-7, hence restricting analyses to this period.

5. MAIN PROBLEMS, CHALLENGES OR DIFFICULTIES FOUND ON THE ELABORATION OF NDF

The main difficulty in conducting this NDF revolves around accessing properly arranged (computerized) data and other relevant records from management authorities. This exercise could have been made much simpler if records were properly kept and updated with ongoing changes, especially data on license returns. For the case of Tanzania all data needs to be entered into a computer immediately.

It is also worth mentioning that there are needs for more training on the NDF procedures to SA. Much time is spent in trying to determine how the procedure is carried out.

6. RECOMMENDATIONS

NDFs are a powerful tool in conserving species under CITES Appendix II category if applied properly. Proper applications maybe limited due to a) lack of proper recording keeping by MA, and 2) lack of technical knowledge on conducting NDFs. It is herby recommended that CITES Secretariat should explore ways in which there can be training to MA on data keeping and training also to SA on NDF procedures. Special focus should be on species range states.

CONCLUSIONS

An overview of the African lion harvest management system has been prepared using the draft format by the International Workshop on CITES non-Detriment Findings. Populations of P. leo have suffered dramatic declines throughout their global range in recent times. Tanzania holds the largest population that benefit from a widespread network of protected areas (30 % of the country) and from vast tracts of unpopulated and populated lands with relatively undisturbed habitats suitable for lions. Lions play a major role in the hunting industry; it is the major source of revenue that sustains the game reserves and game controlled area network in the country.

The harvest management regime in place insures that no lions are hunted by resident hunters and that only tourist hunters are permitted and in designated areas. The regime also insures that the tourist hunter's harvest is limited (in quantity and quality) by a quota system. Approximately 193 lions were harvested annually from a quota of 320 between 2000-7, meeting 63.3% of harvest requirement. Regression analyses for key lion populations have shown significantly, positive linear relationships between quotas and offtake/harvest. A visual presentation by graphs of relationships between quotas and harvest/offtake are given in *ANNEX II* to show current non-detriment effects in Tanzania. These findings suggest current harvest levels have had no-detriment effects to the lion population in Tanzania.

In conclusion, the requirements for a non-detriment finding are met with the management regime put in place by the Wildlife Division.

REFERENCES

BALDUS, R.D. (2004). Tanzania: Lion conservation and human-lion conflicts. *Indaba 2 (4)*: 2.

BAUER, H., Chardonnet, P. and Nowell, K. (2005). Status and Distribution of the African Lion *P.leo* in East and Southern Africa. Background paper for the East and Southern Africa Lion Conservation Workshop, January 2006, Johannesburg, South Africa.

BAUER, H., and van der Merwe, S., (2002). The African Lion Database. IUCN/Species Survival Commission, African Lion Working Group.http://www.african-lion.org/ALD_2002.pdf.

BAUER, H., van der Merwe, S., (2004). Inventory of free ranging lions *Panthera leo* in Africa. *Oryx*: 26-31.

CHARDONNET, P. (2002). Conservation of the African Lion: contribution to a status survey. International Foundation for the Conservation of Wildlife and Conservation Force.

CREEL, S. and Creel, N.M. (1997) Lion density and population structure in the Selous Game Reserve: Evaluation of hunting quotas and offtake. *Afr. J. Ecol. Vol. 35*: 83-93

DURANT, D., Craft, M. and Hilburn, R. A. (2003). Serengeti Carnivore Survey, Dry season 2003. *Unpublished report*. Tanzania Wildlife Research Institute.

FRANK, Laurence G. (1998). Living with lions: Carnivore Conservation and Livestock in Laikipia District, Kenya. Report published by DAI for USAID. 63 pp.

HANBY, J. P. and Bygott, J. P. (1979). Population changes in Lion and other Predators. *In: Serengeti: Dynamics of an Ecosystem.* A. R. E. Sinclair and M. Norton-Griffith, Eds. Chicago. University of Chicago Press.

HEINSOHN, R. and Packer C. (1995). Complex cooperative strategies in group-territorial African lions. *Science, 269*: 1260-1262.

Ikanda, D. K. (2006). A study of the spatial dynamics and human interactions of African lions (Panthera leo) in the Ngorongoro Conservation Area, Tanzania. MSc Thesis. University of Dar es salaam.

IKANDA, D. and C. Packer (2008). Ritual versus retaliatory killings of African lions in the Ngorongoro Conservation Area, Tanzania. *Endangered Species*.

KIFFNER, C. (2006). The use of playback surveys to estimate African lion (Panthera leo) and Spotted hyaena (Crocuta crocuta) densities: methological aspects and implications for the management of lions. MSc Dissertation Georg-August University, Gottigen.

KISSUI, B.M. (2008). Livestock by lions, leopards and spotted hyaenas, and their vulnerability to retaliatory killings in the Maasai steppe, Tanzania. Animal *Conservation* (2008): 422-432.

NOWELL, K. and Jackson, P.(1996) Status Survey and Conservation Action Plan. Wild Cats. Gland, Switzerland. IUCN-World Conservation Union.

PACKER, C. (1990). Serengeti Lion Survey. Report to TANAPA, SWRI, CAWM and WD. November 15.

PACKER, C., Herbst, L., Pusey, A.E., Bygott. D. J., Hanby, J. P., Cairns, S. J., and Bergerhoff-Mulder, M. (1988). Reproductive Success of Lions. *In: Reproductive Success* (T. H. Clutton-Brock, Ed.). Chicago. University of Chicago Press.

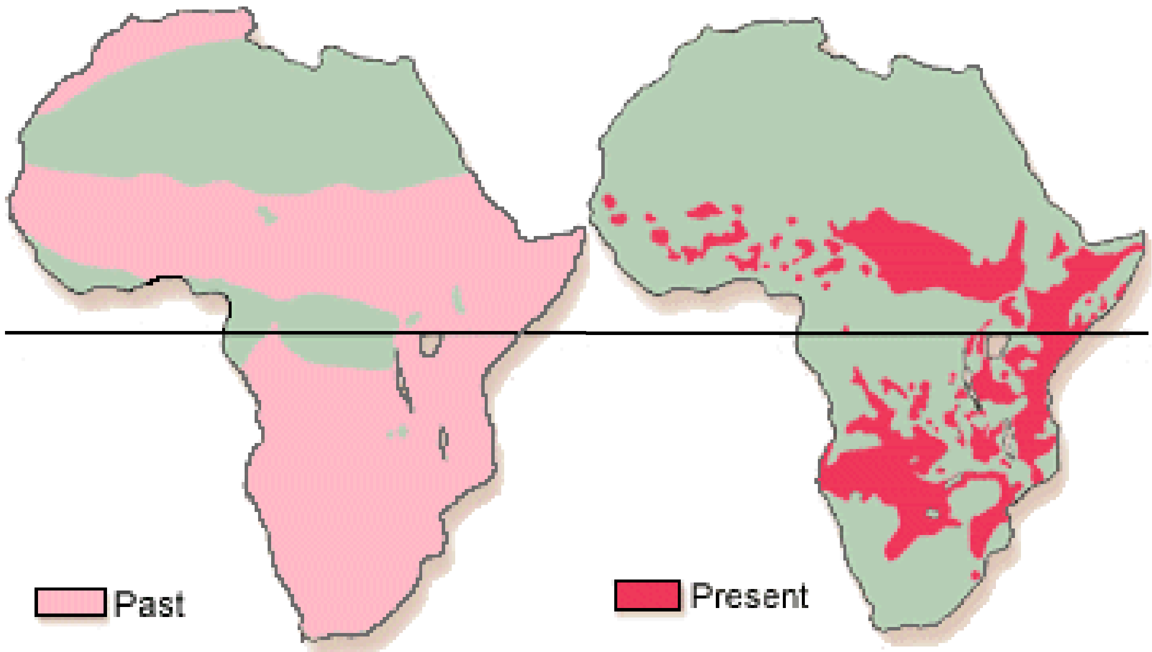
PACKER C., D. Ikanda, B. Kissui, and H. Kushnir (2005). Lion attacks on humans in Tanzania - Understanding the timing and distribution of attacks on rural communities will help to prevent them. *Nature 436*(7053):927-928.

SCHALLER, G. B. (1972). *Serengeti Lion; a Study of Predator-Prey Relations*. Chicago. University of Chicago Press.

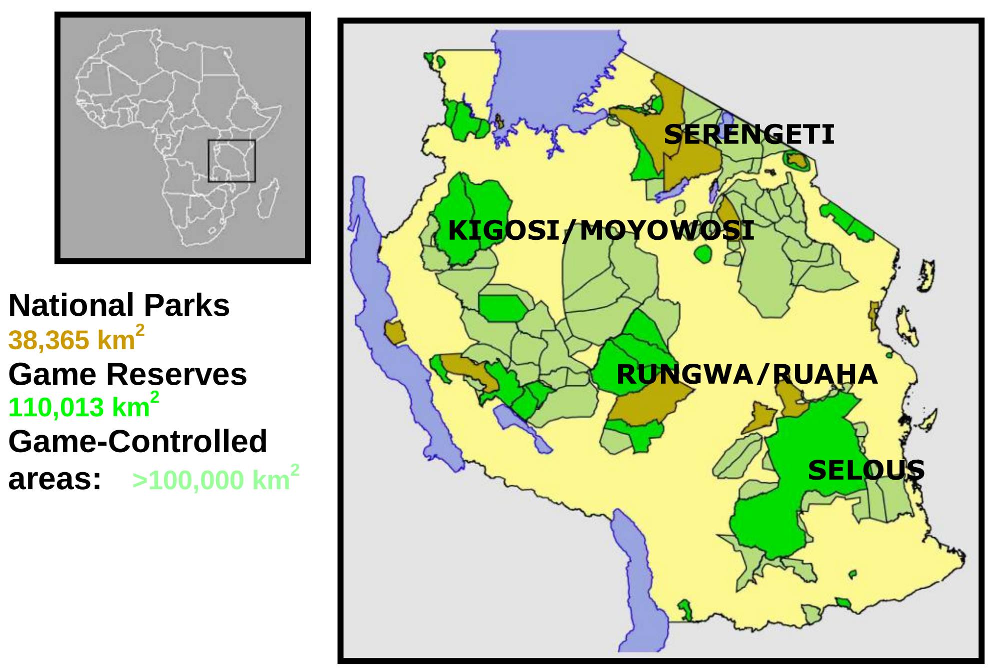
VAN ORSDOL, K.G., Hanby, J.P., and Bygott, J.D. (1985). Ecological correlates of lion (*Panthera leo*) social organization. *Journal of Zoology London. 206*. pp. 97-112.

VELJOEN, P., Kaaya, J., Maliti, H., and Parker, C. (2004). Lion population survey in Moyowosi Game Reserve, Tanzania. *Unpublished report*.

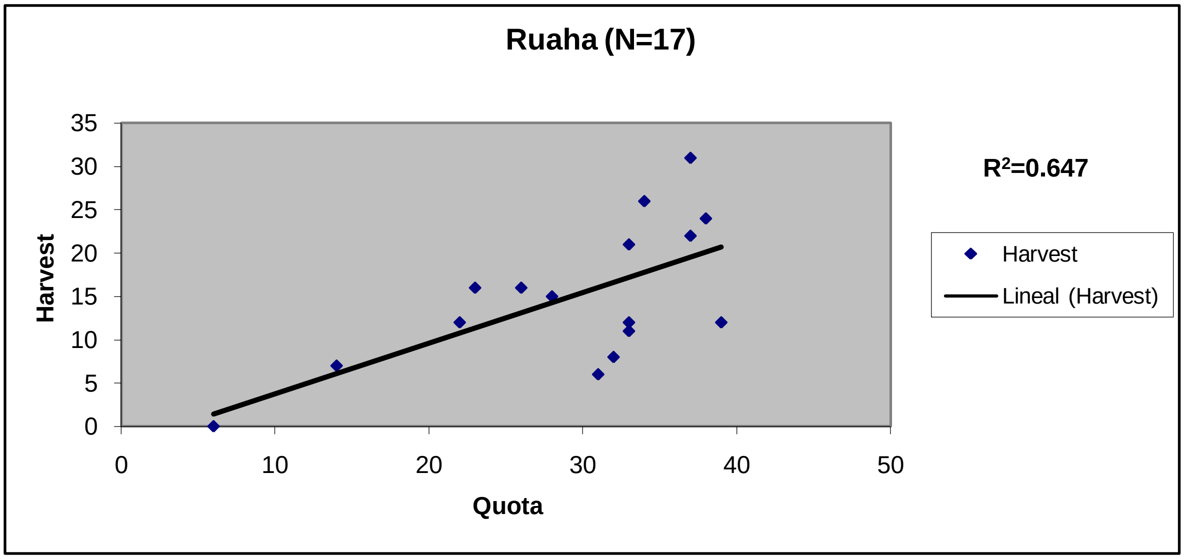
ANNEX I: Past and present distribution of lions across Africa. (Source: www.african-lion.org/ALD_2002.pdf.)

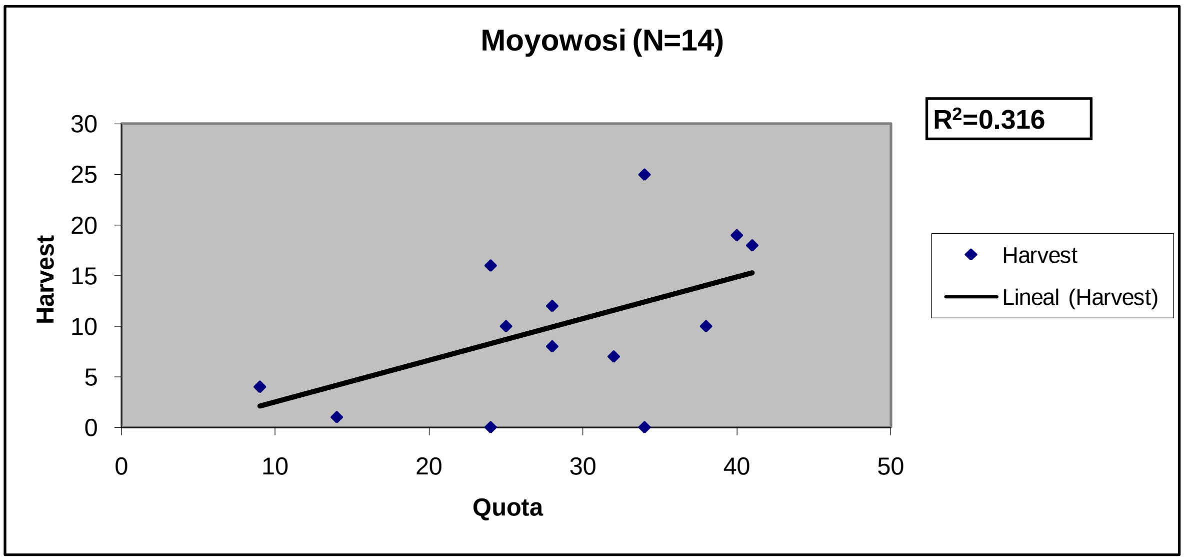


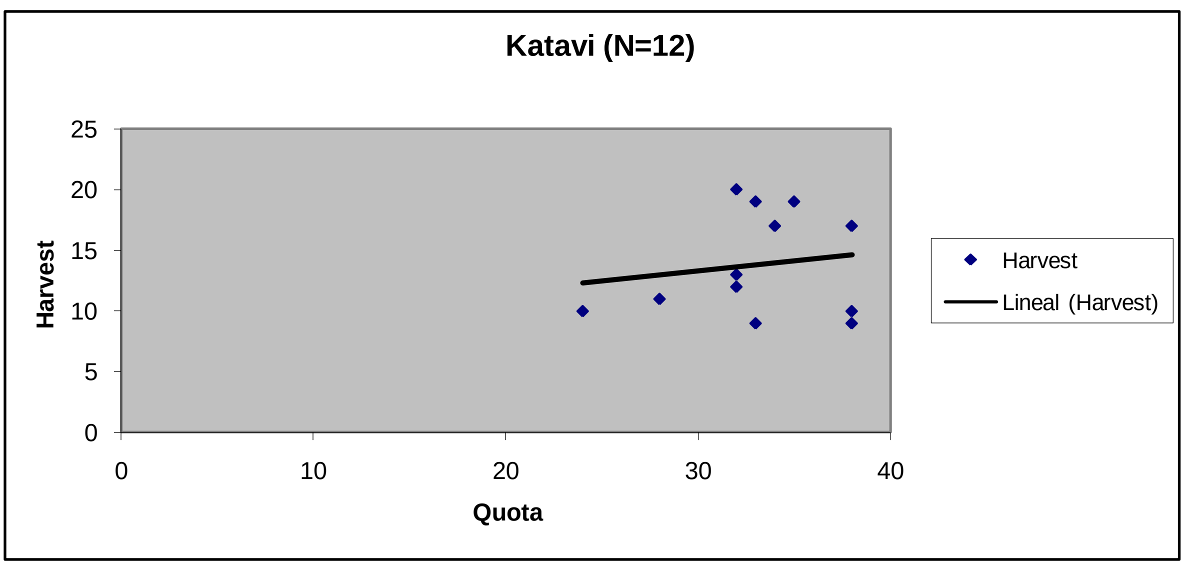
ANNEX II: Key ecosystems supporting large populations of lions in Tanzania. Lions harvested in Game Reserves and Game Controlled Areas.

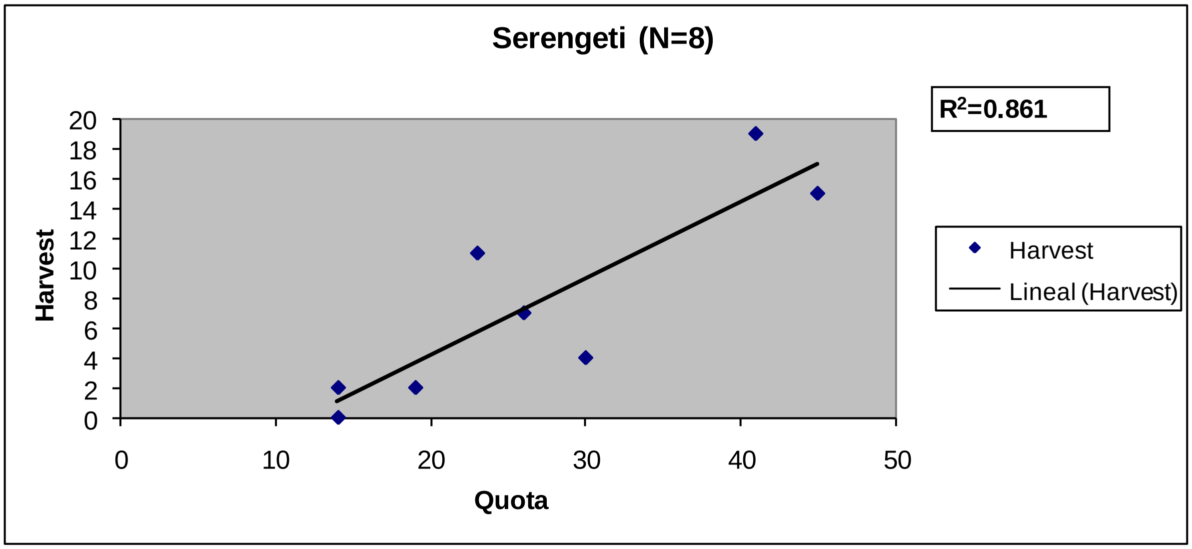


ANNEX III. Regression graphs showing non-detriment impacts of harvest








Serengeti (N=8)
R2=0.861
Harvest
Lineal (Harvest)
Harvest
Quota
0
10
20
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40
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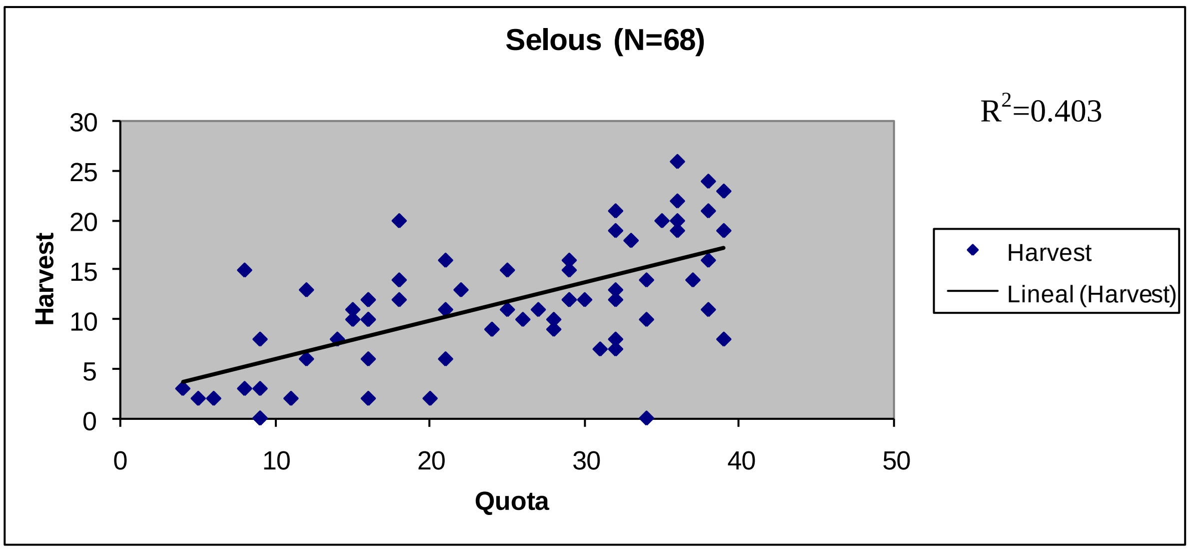
Selous (N=68)
R2=0.403
Harvest
Lineal (Harvest)
Harvest
Quota
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40
50
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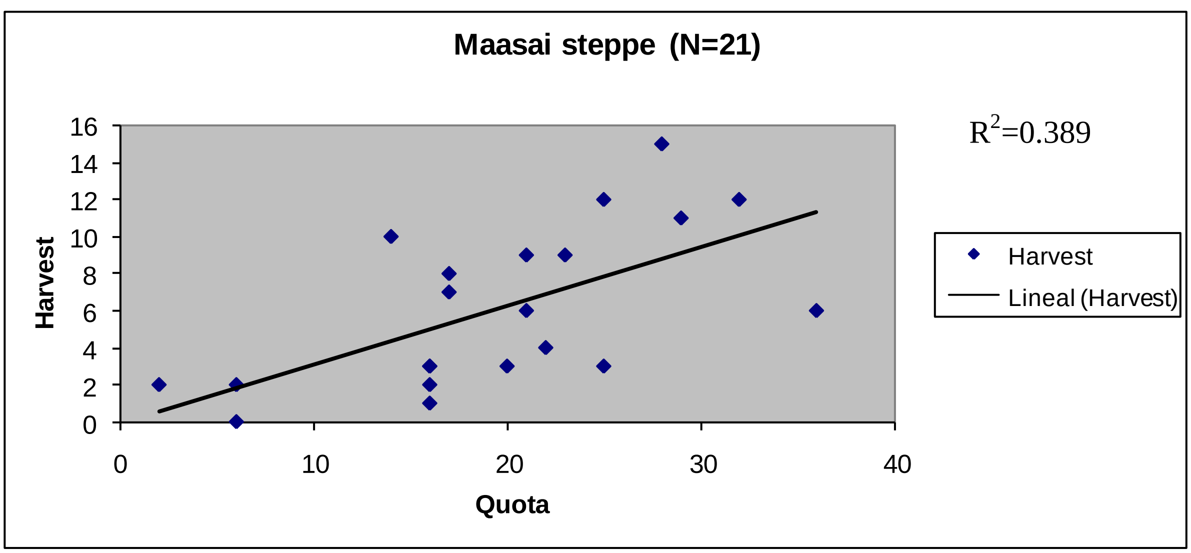
Maasai steppe (N=21)
R2=0.389
Harvest
Lineal (Harvest)
Harvest
Quota
0
10
20
30
40
0
2
4
6
8
10
12
14
16

NON-DETRIMENT REPORT UNDER CITES REGARDING THE EXPORT OF AFRICAN LIONS *PANTHERA LEO* FROM THE UNITED REPUBLIC OF TANZANIA

AUTHOR:
Dennis K. Ikanda

The African lion *Panthera leo* is one of Africa's most wide spread large carnivore species, found in 34 range countries and with a continental range covering approximately 3 million km^2 of gazetted and ungazetted open wild rangelands. East Africa holds approximately 40% of the lion range while 35%, 22% and 4% fall within Southern Africa, Central and West Africa respectively. In these prime habitats, lions live gregariously in stable social groups called "prides" that comprise of 2-30 individuals. Prides occupy territories of varying sizes (5-400 km^2) that are evenly distributed within ecosystems (mostly protected) and with ecological roles as top predators and keystone species that help regulate and maintain large herbivore populations in balance with nature. Precise global population numbers of lions are not known but it is evident that fewer survive today in the wild as records indicate continuous decline due to range contraction (30-50% habitat loss in the last 2 decades). Available figures on global population numbers put recent estimates in the range of 16,500 – 47,000. The African lion is currently listed as *vulnerable* by the IUCN and its trade is regulated pursuant to its listing from trade under Appendix II of Convention for the International Trade in Endangered Species (CITES). Tanzania is home to an estimated minimum number of 18,215 lions, owing to its extensive network of Protected Areas (PAs) and undisturbed wild rangelands. Lions are protected throughout the country, as part of the countries biodiversity. Inside PAs, there are managed within the context of the ecological systems in which they occur under General Management Plans (GMP). However, outside the PA network persecution by humans through PAC and habitat loss presents significant threats to their persistence as a species. In wildlife PAs categories e.g. Game Reserves, Game controlled Areas, Open Areas/WMAs, lions are utilized consumptively through *tourist hunting*. Harvesting is restricted to adult males and records from 2000-7 show approximately 320 lion quotas were issued annually leading to the harvesting of 1.4-12.3% (average 6 %) of the male population. Harvesting is strictly administered under a national quota system set and controlled by the Director of Wildlife. Quotas are not set scientifically, but are rather determined by adaptive management approaches based on cumulative experiences of wildlife managers using several non-detriment verifiable indicators (population abundance estimates, trophy quality, age, offtake levels etc.). The Wildlife Division sets and distributes all lion quotas to all hunting concessions/outfitters on an annual basis- prior to commencement of hunting season. In return, at the end of every hunting season the hunting companies are obliged to submit their hunting returns to the Wildlife Division. Records are than kept on annual quotas and annual returns for all hunted species annually. We gathered both sets of data for lions on all hunting companies between 2000-7. Standard linear regression analyses were conducted to determine positive/negative relationships between present quotas and harvest levels. To better evaluate the impacts, this analysis was scaled down to ecosystem levels where a total of 6 lion populations (in 5 ecosystems) were assessed. These findings suggest current harvest levels have had no-detriment effects to the lion population in Tanzania over the 2000-7 period. In conclusion, the requirements for a non-detriment finding are met with the management regime put in place by the Wildlife Division.

NON-DETRIMENT FINDINGS REPORT ON THE EXPORT OF AFRICAN LIONS FROM TANZANIA

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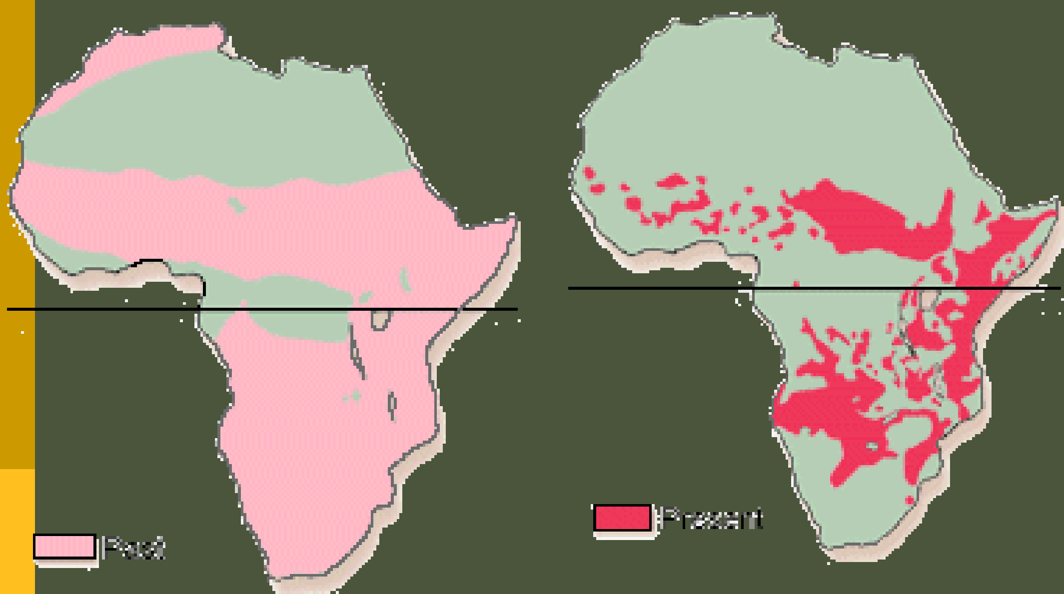
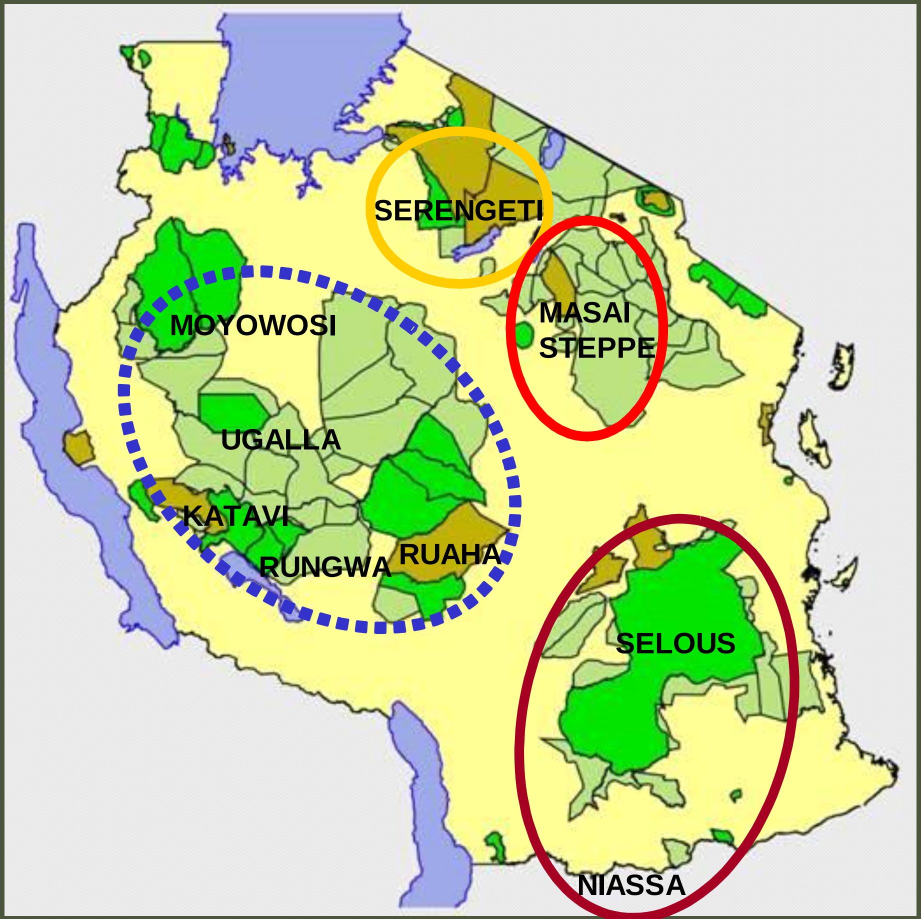
CONSERVATION STATUS: WORLD



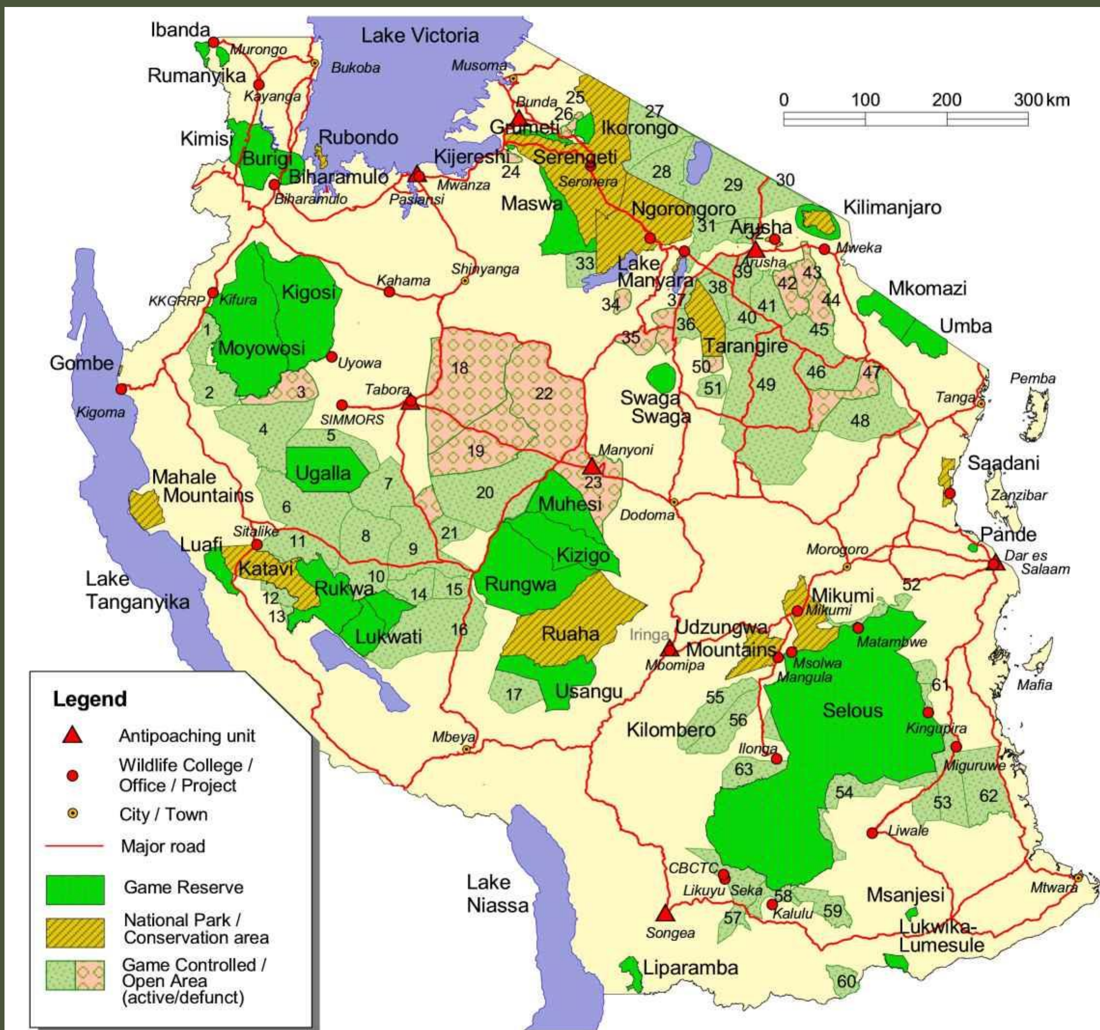
- Precise global population numbers unknown.
- Guess-estimates put figures in the range of 16,500-47,000.
- Population in decline, 30-50% in last 2 decades alone.
- IUCN listed-*vulnerable*.
- CITES listed-Appendix II

CONSERVATION STATUS: TANZANIA



- Home to ½ of global population-Approx 18,215
- Protected as biodiversity unit.
- Found in 4 major populations (1000+ lions).
- Threats-None in PAs
- Threats-PAC/Habitat loss (outside PAs)

HARVESTING: Tourism hunting



- High economic value species.
- Harvested for > 50 yrs.
- Harvested commercially- Approx 192 annually
- Harvested in GRs and GCAs-Approx 158 blocks.
- Harvest quota regulated.

NDF Methods-Data collected

Harvest management

- Fixed quota
- Reviewed annually

Determinants of quotas

- Pop. Abundance
- Trophy quality.
- Past offtake levels.

Source of data

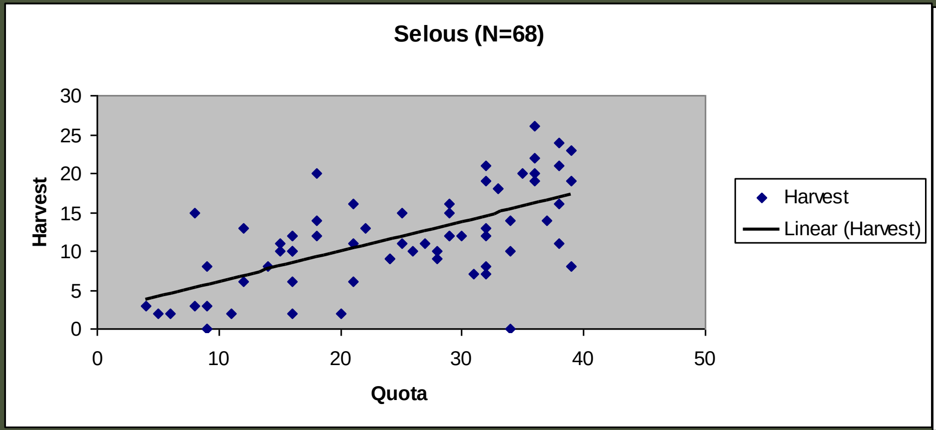
- Wildlife division.

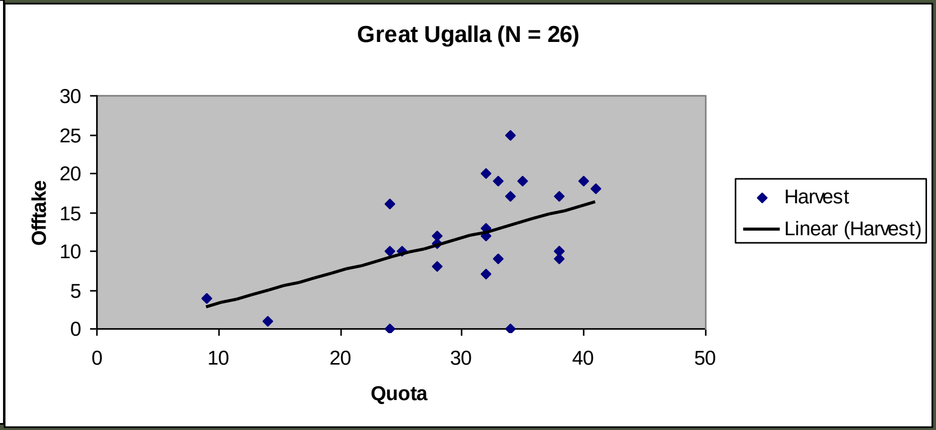
NDF Methods- Analyses

- Analyses based on *offtake* variable
- Regression analyses used to establish relationship between harvest levels and quotas.
- Determine relative proportions of male population harvested to identify detriment effects on populations.

NDF Results: Harvest trends 2000-7

- Off-take against quota relationship analyses (Regression: r=0.634, P<0.001)
- Off-take against quota relationship analyses (Regression: r=0.553, P=0.003)





NDF Results

Harvest trends

- +ve linear relationships found in 6 pop. Significant in 5/6.

Harvest level

- Only 68.3% of quota achieved.
- Mean harvest of 192/yr = 1% of pop.
- 1.4-12.3% Male pop. harvested annually.

NDF-Conclusion

For 6 well harvested pop (89%):

- Population responses to current harvest levels are still positive.
- 68.3% harvest success rate suggests quotas are on the higher side.
- 1 % harvest rate likely to have minimal impacts on the population at large.
- Local impacts maybe greater.

Harvest regime non detriment to lion population in Tanzania.

NDF-Recommendations

Data management

- CITES should work more with local authorities (MA) to identify and manage data-type requirements for listed species in order to improve future NDF processes.

Data analyses

- IUCN checklist for NDFs not well known to SA, efforts for training required.
- Regression analyses useful tool for quota-based harvest assessments.

Acknowledgement:

TAWIRI:

- Tanzania Mammal Atlas Project (TMAP)
- Conservation Information Monitoring Unit (CIMU)

Wildlife Division:

- Wildlife Utilization Department

Conabio-Official sponsorship.

GRACIAS

NON-DETRIMENT FINDING FOR *TURSIOPS ADUNCUS* IN THE SOLOMON ISLANDS

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INTRODUCTORY NOTE ON DEFINITION OF "SPECIES"
In preparing this case study, the authors assumed that the non-detriment finding should apply to the population being exploited and not to the entire global population of the species. This is consistent with the CITES definition of "species", which encompasses "any species, subspecies or geographically separate population thereof." In CITES terminology, a "geographically separate population" includes the concept of "stock" traditionally used in fishery contexts, which applies in this case.

I. BACKGROUND INFORMATION ON THE TAXA

Much of the biological data on the Indo-Pacific bottlenose dolphin was summarized by Hammond *et al*. (2008) for the Global Mammal Assessment and IUCN Red List, by Brownell and Reeves (2008) for a meeting of the CITES Animal Committee in April 2008, and by Wang and Yang (in press) in a species review for the revised *Encyclopedia of Marine Mammals*. Also, relevant information on the species was reviewed and summarized in detail, with a specific focus on the Solomon Islands region, at a technical workshop organized by the IUCN/SSC Cetacean Specialist Group in Apia, Samoa, in August 2008 (report in preparation = Samoa workshop).

1. BIOLOGICAL DATA

1.1 Scientific and common names

Tursiops aduncus (Ehrenberg, 1832), Indo-Pacific bottlenose dolphin

1.2 DISTRIBUTION

Discontinuous in coastal warm temperate to tropical marine waters of the Indo-Pacific region, from the southern tip of Africa in the west, along the northern rim of the Indian Ocean (including the Red Sea, Arabian Gulf and Indo-Malay Archipelago to as far east as the Solomon Islands and New Caledonia) and western side of the Pacific to the southern half of Japan and the southern coast of Australia (Kemper 2004). Within that range, these dolphins occur in coastal waters along continental coastlines as well as around some oceanic islands. Overall distribution appears naturally fragmented, according to the CITES meaning of the term, i.e. the case where most individuals within a taxon are found in small and relatively isolated sub-populations, which increases the probability that these small sub-populations will become extirpated and the opportunities for re-establishment are limited.

The range countries, according to Hammond et al. (2008), are: Australia, Bangladesh, Brunei Darussalam, Cambodia, China, Djibouti, Egypt, Eritrea, India, Indonesia, Iran (Islamic Republic of), Japan, Kenya, Kuwait?, Madagascar, Malaysia, Mozambique, Myanmar, New Caledonia(?), Oman, Pakistan, Papua New Guinea, Philippines, Qatar(?), Saudi Arabia, Singapore, Solomon Islands, Somalia, South Africa, Sri Lanka, Sudan(?), Taiwan, Tanzania, Timor, United Republic of Tanzania, Thailand, Timor-Leste, United Arab Emirates, United States (Guam and Northern Marianas) (?), Viet Nam and Yemen. In addition, the species is known from Israel, Jordan, and Saudi Arabia (Gulf of Aqaba). It is also assumed to occur is Iraq and Bahrain in the Persian Gulf (Arabian Gulf). Occurrence in New Caledonia was recently confirmed.

Distribution within Solomon Islands

Two survey programmes have provided information on the distribution of *T. aduncus* in the Solomon Islands. The first of these was a large-scale, interdisciplinary marine assessment in the western provinces in 2004 that covered >2400 nmi and included a dedicated marine mammal component (Kahn 2006). Visual and acoustic survey effort for cetaceans spanned 36 days and involved 160 active survey hours of passage between site-based activities (Benjamin Kahn, pers. comm. to R.R. Reeves, 2 October 2008). A total of 1228 nmi was covered by dedicated visual effort and 49 listening stations with dual hydrophones were deployed. A substantial part of the survey effort (~67 hours) was in the "coastal habitat zone" considered to be the principal habitat for *T. aduncus*. Despite this considerable effort, the only confirmed visual sighting of *T. aduncus* during the 2004 survey programme was of a group of 11 individuals off the north-western coast of New Georgia Island (Kahn 2006; Benjamin Kahn, pers. comm. to R.R. Reeves, 2 October 2008).

A second, separate survey programme in the Solomon Islands dedicated specifically to *T. aduncus*, led by R.H. Defran, began in 2005. This programme has focused on coastal waters along the northern shore of Guadalcanal Island, and less intensively covered the northern and southern portions of the Florida Islands and the near-shore waters of Savo Island (R.H. Defran, presentation to Samoa workshop). Nearly all sightings from this programme have been very near shore (within a kilometre) in waters <50 m deep.

A major difficulty in establishing the actual distribution is that both the common bottlenose dolphin (*T. truncatus*) and the Indo-Pacific bottlenose dolphin are known to occur in the South Pacific and the two species can be distinguished at sea only by experienced observers, and then only if viewing conditions are favourable. T. truncatus have not been confirmed to occur in near-shore waters in the Solomon Islands so it is uncertain whether the distribution of the two species actually overlaps in this region.

1.3 Biological characteristics

1.3.1 *Life history*

Most of what is known about the life history of *T. aduncus* comes from studies of photo-identified dolphins at sites in Australia and Japan. Estimates for most parameters have fallen within the ranges reported for the better-studied and more widely distributed *T. truncatus* (Wells and Scott 1999, 2002). The one parameter that appears to differ notably is age at sexual maturation of females. Female *T. aduncus* in Shark Bay, Western Australia, give birth for the first time at 12-15 years of age (Connor *et al*. 2000). The implications of this comparatively late onset of maturity for potential population growth are difficult to evaluate in the absence of information on female reproductive lifespan and age-specific fecundity. Also, some variability in this parameter between populations of a species is to be expected.

Other life history parameters of *T. aduncus* based on studies in Australia and Japan are mean annual birth rate 0.065-0.071, mean fecundity rate 0.239, mean recruitment rate 0.068, first-year mortality rate 0.133-0.300, calf mortality rate 0.44-0.46, male age at sexual maturity 10-15 years, interbirth interval 3-6 years and maximum age 40+ years in the Australian animals (Samoa workshop report).

These dolphins are social and live in groups of perhaps 5-10 individuals. Such groups are parts of wider "fission-fusion" societies, "a continuous mosaic of overlapping home ranges for both males and females" (Connor *et al*. 2000). Social groups may include kin but are not based on familial relationships, except for the mother-calf association which can extend well beyond nutritional weaning and last as long as 3-6 years. The exception to this rule is the prolonged period (3-6 years) of mother-calf association, which extends past nutritional weaning and involves an extended period of learning by calves. These dolphins exhibit complex feeding patterns that appear to be transmitted from mother to young and in some cases throughout societies by observational learning.

1.3.2 *Habitat types*

Indo-Pacific bottlenose dolphins are found primarily in continental shelf waters (<200 m deep) near shore and in areas with rocky or coral reefs, sandy or soft bottoms, or seagrass beds. Although they may be concentrated in areas where there is estuarine influence, they do not seem to enter far into the muddy, turbid waters of estuaries. Small populations also occur in the inshore waters of some small oceanic islands. The species distribution is centred in tropical to warm temperate waters of the Indian and western Pacific oceans, but populations also exist in cooler waters in Japan, northern China and southern Australia. Sea surface temperatures where *T. aduncus* have been observed varied from 12°C (possibly less) to more than 30°C.

1.3.3 *Role of the species in its ecosystem*

Little is known about predation on *T. aduncus* but sharks are likely to be a major cause of mortality for some populations.

1.4 Population

There is no estimate of the size of the population of *T. aduncus* around the Solomon Islands.

1.4.1 *Global Population size*

There is no estimate of the global population size as the species has not been studied in most of its range. However, there are estimates for a few specific areas and these were summarised by Wang and Yang (in press) and at the Samoa workshop. For example, in Japanese waters, there is an estimate of 218 dolphins in the Amakusa-Shimoshima population and at least 160 have been photo-identified in the Mikura Island population. In Australian waters, there are local estimates for the populations of Shark Bay (>600); Point Lookout, off Queensland (700-1000); and Moreton Bay (334). In eastern Africa, a resident population in a small area near Zanzibar (Tanzania) was estimated to consist of 136-179 dolphins.

1.4.2 *Current global population trends*
___increasing ____decreasing ___stable _X_unknown

1.5 Conservation status

1.5.1 *Global conservation status (according to IUCN Red List)*
___Critically endangered ___Near Threatened
___Endangered ___Vulnerable
___Least concern ___Data deficient

1.5.2 *National conservation status for the case study country*
None.

1.5.3 *Main threats within the case study country*
___No Threats
___Habitat Loss/Degradation (human induced)
___Invasive alien species (directly affecting the species)
_X_Removals [hunting/gathering]
_X_Accidental mortality (e.g. Bycatch)
___Persecution (e.g. Pest control)
___Pollution (affecting habitat and/or species)
___Other_______________
___Unknown

2 SPECIES MANAGEMENT WITHIN THE COUNTRY FOR WHICH CASE STUDY IS BEING PRESENTED

2.1 Management measures
None.

2.1.1 *Management history*
None.

2.1.2 *Purpose of the management plan in place*
No management plan is in place.

2.1.3 *General elements of the management plan*
Not applicable.

2.1.4 *Restoration or alleviation measures*
Not applicable.

2.2 Monitoring system
None.

2.2.1 *Methods used to monitor harvest*
There is no monitoring of the "harvest".

2.2.2 *Confidence in the use of monitoring*
Not applicable.

2.3 Legal framework and law enforcement
There is no national or international legislation related specifically to the conservation of *T. aduncus*. CITES provides a framework for the regulation of international trade.

3 UTILIZATION AND TRADE FOR RANGE STATE FOR WHICH CASE STUDY IS BEING PRESENTED

3.1 Type of use (origin) **and destinations** (purposes) (e.g. commercial, medicinal, subsistence hunting, sport hunting, trophies, pet, food).
The dolphins in trade and being considered in this case study are taken from the wild in the Solomon Islands and are used mainly for commercial purposes. Thus far, exported dolphins have been purchased and imported by resort hotels or aquatic parks for display and/or interactive (swim-with-the-dolphins) programmes.

3.2 Harvest

3.2.1 *Harvesting regime*
Direct or incidental catches of *T. aduncus* in the Solomon Islands are known from at least 1990 (Akimichi 1992; Kurihara and Oda 2007; R. L. Brownell, Jr. pers. comm. to R.R. Reeves 4 October 2008). These are in addition to the live-capture removals reported since 2003. A traditional drive hunt for small cetaceans occurs in some villages on the island of Malaita but there are no published accounts of *T. aduncus* being taken in this hunt.

3.2.2 *Harvest management/ control* (quotas, seasons, permits, etc.)

It was reported in early 2008 that the Government of the Solomon Islands had issued a permit for the export of up to 80 *T. aduncus* per year (CITES Secretariat document AC 23 Doc. 8.5). The Samoa workshop was advised by John Leqata of the Ministry of Fisheries that 100 live dolphins (regardless of species) were currently permitted (August 2008) to be exported annually from the Solomon Islands. This number is consistent with the report by Anita (2007) that stated: "The Government has established an annual export quota of one hundred (100) animals per year."

Anita (2007) reported: "Harvesting and Export Permits can only be held by persons or tribes of dolphin harvesting communities. There is no restriction on traditional harvesting and utilization of this resource [cetaceans] but communities are encouraged to maximize income by engaging in this export quota." He also reported the commercial value of *Tursiops aduncus* in 2007 to be $(US)25,000-30,000. Anita (2007) did not consistently recognise the distinction between the live-capture fishery for Indo-Pacific bottlenose dolphins and the traditional drive hunt targeting a variety of other small cetaceans.

3.3 Legal and illegal trade levels

Two events of legal export of live dolphins from the Solomon Islands are on record: one in 2003 (28 animals to Mexico) and one in 2007 (28 animals) to the United Arab Emirates.

II. NON-DETRIMENT FINDING PROCEDURE (NDFS)

Provide detailed information on the procedure used to make the non-detriment finding for the species evaluated.

1. IS THE METHODOLOGY USED BASED ON THE IUCN CHECKLIST FOR NDFS?

___yes √_X_no

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED

The IUCN/SSC Cetacean Specialist Group (CSG) established the following standard (Reeves *et al*. 2003) which has been widely cited and is regarded here as a reasonable basis for determining "non-detriment":

> As a general principle, dolphins should not be captured or removed from a wild population unless that specific population has

> been assessed and it has been determined that a certain amount of culling [offtake] can be allowed without reducing the population's long-term viability or compromising its role in the ecosystem. Such an assessment, including delineation of stock boundaries, abundance, reproductive potential, mortality, and status (trend) cannot be achieved quickly or inexpensively, and the results should be reviewed by an independent group of scientists before any captures are made.

Based on that standard, the Samoa workshop developed a more explicit set of necessary elements for a NDF for the Solomon Islands dolphin live-capture fishery (summarized in point 6, below).

It may not be necessary to obtain all of the required data empirically for the population being assessed. For example, default or inferred values may be used to estimate reproductive potential and natural mortality rates. Also, multiple approaches may be considered for assessing population structure and abundance (see point 6). However, at least one credible estimate of abundance for the population from which removals are being contemplated is essential, a credible analysis of population structure must be carried out, and other known or likely anthropogenic factors besides live-capture need to be critically examined even though past catch records may be difficult to collect or reconstruct.

3. MAIN SOURCES OF DATA, INCLUDING FIELD EVALUATION OR SAMPLING METHODOLOGIES AND ANALYSIS USED

A workshop was organized and conducted under the auspices of the CSG in Samoa in August 2008 to address explicitly the scientific and technical issues relating to the conservation of populations of small cetaceans, especially Indo-Pacific bottlenose dolphins. Participants included representatives of both relevant ministries in the Solomon Islands (Environment, Conservation and Meteorology; Fisheries and Marine Resources); the lead scientist in the ongoing cetacean survey programme in the Solomon Islands; and scientists with particular expertise, including the biology, ecology and behaviour of both species of bottlenose dolphins, genetic analysis of population structure, and population estimation from line-transect and mark-recapture survey data. The workshop considered all of the results of small cetacean survey work in the Solomon Islands to date and drew comparisons with studies on Indo-Pacific bottlenose dolphins in Japan, Australia, China, Taiwan and New Caledonia.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

The data currently available from the Solomon Islands are inadequate for a rigorous NDF assessment (see below).

5. MAIN PROBLEMS, CHALLENGES OR DIFFICULTIES FOUND ON THE ELABORATION OF NDF

Little is known about the distribution, population structure, past catches and numbers of Indo-Pacific bottlenose dolphins in the Solomon Islands. The limited data available from the two survey programmes undertaken to date suggest that the species is patchily distributed in near-shore waters and not abundant. To date, only about 113 individuals have been photo-identified along most of the northern coastline of Guadalcanal Island in the ongoing survey programme led by R.H. Defran (presentation to Samoa workshop). The coastal distribution and apparently low numbers are consistent with observations in other locations where the species has been more closely studied.

6. RECOMMENDATIONS

The following outline was developed by the Samoa workshop as a template for assessment of island-associated populations of small cetaceans, including Indo-Pacific bottlenose dolphins in the Solomon Islands [information in brackets refers to current situation in Solomon Islands]:

I. Definition and geographic boundaries of the population (unit to conserve)

a. Ecological and oceanographic considerations
b. Gaps in distribution or low-density areas
c. Movement or site fidelity (and inferred demographic isolation) using photo-identification, genetics, radio-tracking, and/or data and information on habitat use.

[To date, some preliminary data have been obtained on movements by individual dolphins based on photo-identification.]

II. Current estimate of abundance, with associated uncertainty

Obtained from either a line-transect survey or a mark-recapture analysis. The latter requires at least two appropriately designed sampling episodes.

[To date, some photo-identification data are available that could be used for a minimum abundance estimate for a portion of the Solomon Islands. The Samoa workshop provided a rationale for using photographic mark-recapture in preference to a line-transect approach, and also developed a work plan and schedule for carrying out an appropriate mark-recapture study in the Solomon Islands.]

III. Selection of a value for maximum potential population growth (or replacement) rate

Often using appropriate default values derived from similar species and populations (0.04 for odontocete populations; observed rates of population growth have all been under 0.03 – killer whales, common bottlenose dolphins)

[No direct information on this parameter is likely to be available from the Solomon Islands for some time. Therefore, a default value will be needed.]

IV. Understanding human-caused mortality

a. Determine whether there has been, or is, non-deliberate mortality (e.g. bycatch, vessel strikes) and if so, estimate levels of such mortality
b. Review and incorporate consideration of recent "historical" or ongoing deliberate removals (e.g. by hunting, live-capture)

[There is no evidence of deliberate removals of Indo-Pacific bottlenose dolphins in the Solomon Islands drive hunts although this does not mean the possibility can be ruled out. Captures, apparently in purse seines, have been documented within the last 20 years; it is unclear whether these were incidental or deliberate. It is unlikely that it will be possible to quantify removals in a meaningful way because there has been no catch monitoring.]

V. Integrated assessment of potential impact on population from human-caused mortality

VI. Analysis of the data and information listed above using one or a combination of the following techniques

a. Rule-of-thumb approach (e.g. 1% of best abundance estimate)
b. Potential Biological Removal or equivalent (e.g. 1.1 to 1.8% of best abundance estimate)
c. Population Viability Analysis

[Cetacean conservation schemes developed by various countries and intergovernmental bodies use values between about 1% and 2% of abundance as removal thresholds for sustainability (Samoa workshop report). This may be used as a guide in determining non-detriment for live-capture removals in the Solomon Islands, but on the understanding that total removals, and not just deliberate live-captures, need to be taken into account.]

VII. Follow-up monitoring and periodic reassessment to track population trajectory

Much more and better-quality information than presently available will be needed on the distribution, population structure, removals (bycatch, hunted, live-captured) and numbers of Indo-Pacific bottlenose dolphins in the capture region before a credible NDF can be made and additional collections for export, or exports of animals already collected, are authorized. External technical assistance will be needed to ensure that study designs, data collection procedures and analyses are sufficiently rigorous. Substantial financial investments, either by the companies involved in the trade, by government agencies, or by both, will also be necessary. As indicated by Reeves *et al*. (2003; see above), considerable time will be needed to collect sufficient data, complete the analyses, and carry out the population assessment. The Samoa workshop in August 2008 (report in preparation) proposed that a minimum of four field seasons over two years would be needed to generate a robust abundance estimate for Indo-Pacific bottlenose dolphins in the Solomon Islands, which could then be used as part of an informed determination of whether a given level of live-captures for export would or would not cause detriment to the survival of the species (i.e. population). The Samoa workshop report will contain more details on the elements of assessment mentioned above.

REFERENCES

AKIMICHI, T. 1992. The surviving whale-tooth culture significances of whale products in Oceania. Bulletin of the National Museum of Ethnology 17(1):121-142.

ANITA, B.A. 2007. The role of cetaceans as a sustainable and renewable resource in the Solomon Islands. 4th Pan Commonwealth Veterinary Conference, 4-8 November 2007, Barbados, West Indies, pp. 241-245.

BROWNELL, R.L., Jr. and Reeves, R.R. 2008. Biological background on bottlenose dolphins (*Tursiops* spp.) in the 'live-capture' trade and specifically on the Indo-Pacific bottlenose dolphin, *T. aduncus*. CITES Animals Committee, 23rd Meeting, Geneva, 19-24 April 2008, Document AC23 Inf. 5, 10 pp.

CONNOR, R.C., R.S. Wells, J. Mann and A.J. Read. 2000. The bottlenose dolphin, *Tursiops* spp: Social relationships in a fission-fusion society. Pp. 91-126 *In*: J. Mann, R.C. Connor, P.L. Tyack and H. Whitehead, eds., Cetacean Societies: Field Studies of Dolphins and Whales. University of Chicago Press. 433 pp.

HAMMOND, P., Bearzi, G., Bjørge, A., Forney, K., Karczmarski, L., Kasuya, T., Perrin, W., Scott, M., Wang, J., Wells, R. and Wilson, B. (assessors). 2008. *Tursiops aduncus* (Ehrenberg, 1832) Indo-Pacific bottlenose dolphin. Red List Assessment, IUCN.

KAHN, B. 2006. Oceanic Cetaceans and Associated Habitats in the Western Solomon Islands. In: Green, A., P. Lokani, W. Atu, P. Ramohia, P. Thomas and J. Almany (eds.) 2006. Solomon Islands Marine Assessment: Technical Report of Marine Survey-May 13 to June 17, 2004. The Nature Conservancy - Pacific Island Countries Report No. 1/06. pp 445-515. http://conserveonline.org/workspaces/pacific.island.countries.publications/SIMAReport

KEMPER, C. M. 2004. Ostelogical variation and taxonomic affinities of bottlenose dolphins, Tursiops spp., from South Australia. Australian Journal of Zoology 52:29-48.

KURIHARA, N. and S. Oda. 2007. Cranial variation in bottlenose dolphins *Tursiops* spp. from the Indian and western Pacific Oceans: additional evidence for two species. Acta Theriologica 52(4):403-418.

REEVES, R.R., B.D. Smith, E.A. Crespo and G. Notarbartolo di Sciara (compilers). 2003. Dolphins, Whales and Porpoises: 2002-2010 Conservation Action Plan for the World's Cetaceans. IUCN/SSC Cetacean Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.139 pp.

ROSS, G., F. Gulland, N. Gales, R. Brownell and R. Reeves. 2003. Report of a fact-finding visit to the Solomon Islands, 9-12 September 2003. Unpubl. report, 10 pp. typescript.

WANG, J.Y. and S-C. Yang. In press. Indo-Pacific bottlenose dolphin, *Tursiops aduncus*. *In*: W.F. Perrin, B. Würsig, and J.G.M. Thewissen, eds., Encyclopedia of Marine Mammals. Second Edition. Elsevier, Inc., San Diego, CA.

WELLS, R.S. and M.D. Scott. 1999. Bottlenose dolphin *Tursiops truncatus* (Montagu, 1821). Pp. 137-182 *In*: S.H. Ridgway and R. Harrison (eds.), Handbook of Marine Mammals, Vol. 6, The Second Book of Dolphins and the Porpoises. Academic Press, San Diego, CA. 486 pp.

WELLS, R.S. and M.D. Scott. 2002. Bottlenose dolphins (*Tursiops truncatus* and *T. aduncus*). Pp. 122-128 In: W.F. Perrin, B. Würsig, and J.G.M. Thewissen, eds., Encyclopedia of Marine Mammals. Academic Press, San Diego, CA.

NON-DETRIMENT FINDING FOR *TURSIOPS ADUNCUS* IN THE SOLOMON ISLANDS

AUTHORS:
Randall R. Reeves and Joe Horokou

The Indo-Pacific bottlenose dolphin, *Tursiops aduncus*, has a discontinuous distribution in coastal warm temperate to tropical marine waters of the Indo-Pacific region. It occurs in coastal waters along continental coastlines as well as around some oceanic islands. Overall distribution appears naturally fragmented, with most individuals found in small, relatively isolated sub-populations. Most of what is known about life history comes from studies in Australia and Japan, which suggest that the mean annual birth rate is 0.065-0.071, mean fecundity rate 0.239, female age at first reproduction 12-15 years, male age at sexual maturity 10-15 years, first-year mortality rate 0.133-0.300, calf mortality rate 0.44-0.46, interbirth interval 3-6 years and maximum age 40+ years. There is no estimate of global population size, and global trends in abundance are uncertain. IUCN lists the species as "data deficient."

The distribution and abundance of Indo-Pacific bottlenose dolphins are poorly known in the Solomon Islands region, where they have recently been live-captured for export: coastal surveys of cetaceans in this region have been sporadic and of limited geographical extent. A small group of animals was observed off the north-western coast of New Georgia Island in a 2004 survey, and more recent photo-identification surveys found them in modest numbers (113 unique individuals photo-documented through August 2008) within a kilometre of shore (<50 m depth), primarily along the northern coast of Guadalcanal Island. Bottlenose dolphins apparently are not primary targets of the traditional drive hunt for small cetaceans in the Solomon Islands. There is, however, some historical (1990) evidence that *T. aduncus* are captured in purse seines either deliberately or as bycatch. Also, two recent export shipments of live *T. aduncus* are known – one to Mexico (28 animals in 2003) and one to the United Arab Emirates (28 in 2007). Additional animals have been captured and held in sea pens, but there is no information on how many have died or escaped, have been released, or remain in captivity. The Solomon Islands government currently permits 100 live dolphins to be exported annually.

A credible non-detriment finding to justify further exports will require much more and better-quality data than are presently available. The principal categories of needed data include population structure, current abundance, population growth rate, and recent or ongoing human-caused removals (both deliberate and non-deliberate captures). External technical assistance and substantial financial investments will be necessary to ensure rigorous study designs, data collection procedures, and analyses. Collecting sufficient data, completing analyses, and carrying out population assessment will take several years. For example, a minimum of four field seasons over two years will be needed to generate a robust mark-recapture estimate of abundance for Indo-Pacific bottlenose dolphins in the Solomon Islands.

SOLOMON ISLANDS BOTTLENOSE DOLPHINS NDF CASE STUDY

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and

Joe Horokou

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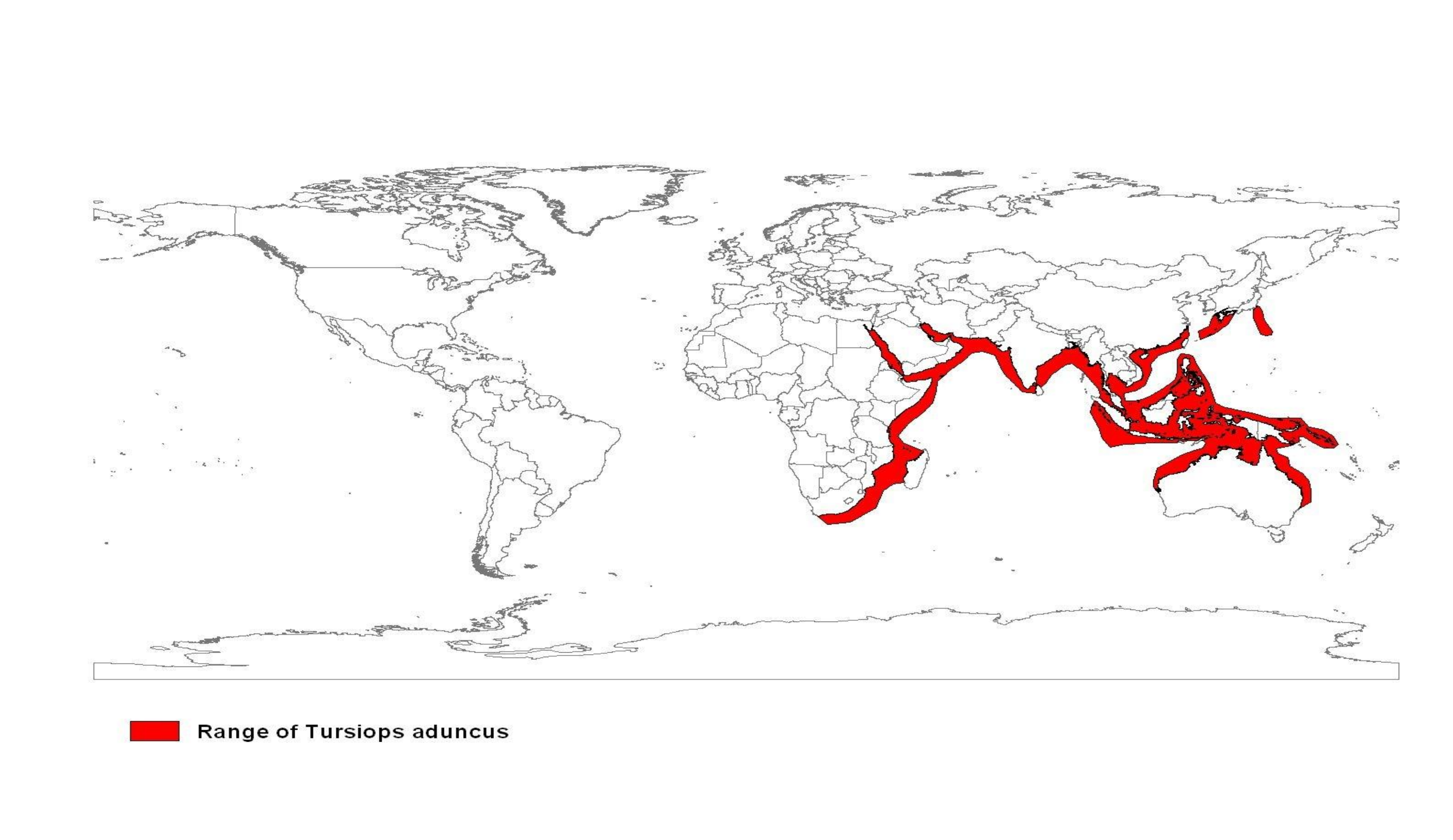
Global Distribution



Background

- 2003 large shipment to Mexico
- Strong NGO response, internal controversy in Mexico
- IUCN Cetacean and Veterinary SG fact-finding trip
- Report and comment letter critical of NDF
- 2007 large shipment to UAE
- More controversy and criticism
- More shipments rumoured and some animals still in pens

More recent background

- Document for Animals Committee from Cetacean SG (Brownell and Reeves)
- Planning/fundraising for technical workshop
- Samoa workshop August 2008
- Preparation of the case study

Case Study Elements

- Define ‘unit to conserve’
- Count or estimate of current abundance
- Population growth or replacement rate
- Human-caused mortality
- Integrated assessment/analysis of sustainability
- Ongoing monitoring and reassessment

Unit to Conserve

- Many types of information and data of potential value
- Default proposed by CITES Secretariat: national population of the country involved
- In Solomons, there is great uncertainty about where the species occurs within the archipelago (difficulty telling the two *Tursiops* species apart, as well as distinguishing from pantropical spotted dolphin)

Abundance

- No estimate has yet been attempted. Is that ok? Some of the suggestions of ‘adaptive management’ make it seem so.
- A credible estimate of ‘minimum’ abundance is necessary (who defines credible?).
- Need for external help but who should pay for it?

Potential Rate of Increase

- Toothed cetaceans (odontocetes) generally, a default of 4% is used.
- Modelled rates up to about 8% but these are generally viewed as overly optimistic.
- Realized (observed) rates of up to about 5% for belugas, 3% for killer whales, 2-3% for common bottlenose dolphins

Anthropogenic Mortality

- Long-standing traditional drive hunt of dolphins but no evidence of *T. aduncus* being taken; mostly or entirely on Malaita and not on Guadalcanal.
- Documented catches in purse seine(s) in 1990 but uncertain if deliberate or incidental, opportunistic (one-off) or regular.
- Fishing in region implies (ensures?) some level of cetacean bycatch but there is no monitoring.

Integrated Assessment/Analysis

- US Potential Biological Removal method is one option (used mainly to manage incidental mortality)
- Various adaptations of PBR including an initial approach in Japan to manage Dall's porpoise hunt
- Rule of thumb used by IWC and CMS agreements re: harbour porpoise (*Phocoena phocoena*) bycatch: if bycatch is 1/2 or more of maximum growth rate, it is cause for concern

Integrated Assessment/Analysis (continued)

- Lacy and Wells PVA for Samoa workshop: “Population size for a dolphin population with demographics typical of those seen for Sarasota Bay *T. truncatus* would need to be about 60 to 65 times larger than the harvested number to assure that the harvests don’t cause any population crashes.”
- Generally, removal rates in the range of 1-2% are considered potentially sustainable for dolphins

Monitoring and Reassessment

- Essential for “adaptive management”
- In Solomons, need to know numbers caught and exported by age and sex class, locations of removals, numbers that die or are seriously injured during capture attempts, numbers released back into wild and circumstances (e.g. do they readapt and survive?).
- How to monitor wild population through time?

MEXICO 2008

NDF WORKSHOP CASE STUDIES
WG 5 – Mammals
CASE STUDY 3
Ursus arctos horribilis
Country – **CANADA**
Original language – English

THE NDF PROCESS FOR *URSUS ARCTOS HORRIBILIS* (GRIZZLY BEAR) IN CANADA

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I. Background information on the taxa

1. BIOLOGICAL DATA

1.1. Scientific and common names

Ursus arctos horribilis (Grizzly Bear, Brown Bear) is a sub-species of grizzly bear which is found exclusively in Canada and the United States of America (USA). Two other sub-species of *U. arctos* also exist: *Ursus arctos middendorffii* (Kodiak Bear) is found on the Kodiak Islands off the coast of Alaska, USA and Ursus arctos arctos (Eurasian Brown Bear) is found only in the Eurasian portion of the species' range.

1.2. Distribution

Historically grizzly bears were found across much of North America (including northern Mexico), Europe, Asia, the Middle East, and North Africa. Presently, grizzly bears occupy approximately 5,000,000 km^2 of the north-western portion of North America, 800,000 km^2 of Europe (excluding Russia), and much of northern Asia (IUCN, 2008).

Globally the grizzly bear has lost approximately 50% of its range and abundance since the mid-1800s (Servheen, 1990) and many populations in Eurasia, and several of the southern portions of the North American range, are insular, small, and endangered (Servheen *et al*, 1999; Swenson *et al*, 2000).

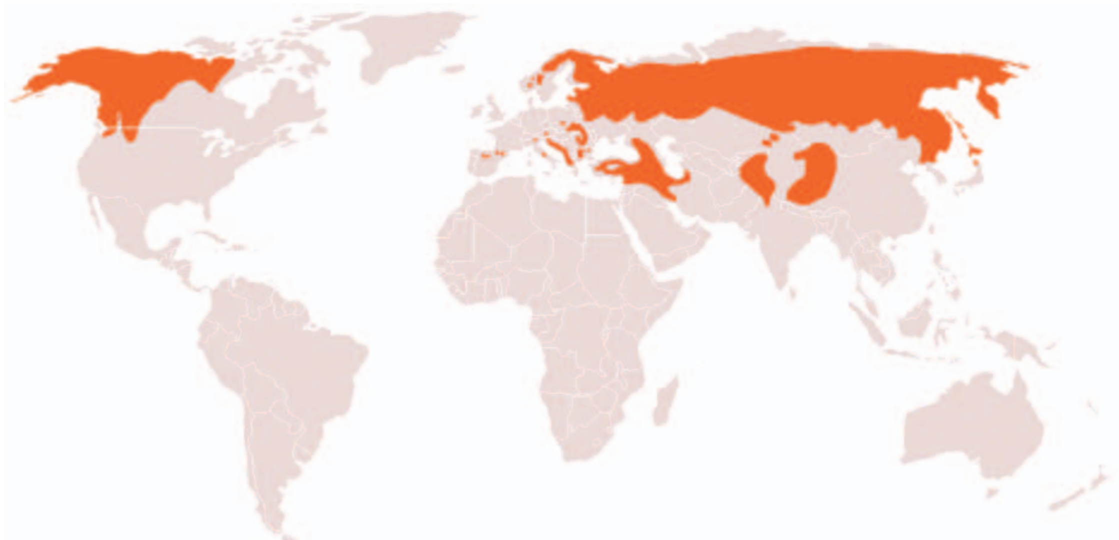

Figure 1. Current global distribution of *Ursus arctos* (International Association for Bear Research and Management, 2005).

The grizzly bear is currently distributed across approximately 26% of Canada's total land mass (~ 2.6 million km^2). The Prairie population of grizzly bear in Canada has been extirpated since the 1880s in the grassland portions of the provinces of Saskatchewan, Manitoba, and

Figure 2. Current and historic North American range of *Ursus arctos horribilis* (Grizzly bear). Adapted from Servheen (1990).

Alberta (COSEWIC, 2002). With the exception of a few isolated populations in the southern portion of British Columbia, the grizzly bear's current range in Canada is best described as one continuous metapopulation across the provinces and territories of the Yukon Territory, the Northwest Territories, Nunavut, Alberta and British Columbia.

1.3. Biological characteristics

1.3.1. *Provide a summary of general biological and life history characteristics of the species* (e.g. reproduction, recruitment, survival rate, migration, sex ratio, regeneration or reproductive strategies, tolerance toward humans).

Grizzly bears share the typical ursid body form and are thus large, muscular, and robust. They have a prominent shoulder hump, concave facial profile and long front claws. Fur colour ranges from blonde through shades of brown and nearly black. Typical body mass for an adult female can range from 100 kg for individuals of interior populations, to 200 kg or more for those of coastal populations (COSEWIC, 2002). Males are on average nearly twice as heavy as females.

Grizzly bears are slow-growing, long-lived, and have a low reproductive output (Jonkel, 1987). Their lifespan is usually 20-25 years, although individuals as old as 34 have been recorded. The survival rate of adult females in Canada is typically higher (> 90%) than adult males (~ 80%), including in hunted populations, in part due to protection for females with cubs and hunter preference for larger specimens (COSEWIC, 2002).

Typically, females have their first litter between five and seven years of age, and have litters of one to three cubs, which are born inside dens in January or February (Schwartz *et al*, 2003). Cubs generally remain with their mother for two to four years, and as a result females have litters approximately every three years. Lack of food and harsh weather compel most grizzly bears to hibernate during the winter and individuals may spend up to seven months inside their dens. Pregnant females generally enter dens first and emerge last with their cubs in tow. However, duration of denning is also related to latitude, with both male and females at higher latitudes entering earlier and emerging later compared to individuals at lower latitudes (Schwartz *et al*, 2003).

Grizzly bears require constant and substantial amounts of food to meet their nutritional needs, especially when establishing large fat reserves in preparation for hibernation. Although grizzly bears have the feeding and digestive anatomy of a carnivore, they are omnivorous and food habits and movements depend largely on season and the availability of various food sources (COSEWIC, 2002). Often plants and berries comprise the majority of a grizzly bear's diet, although they can be very effective predators of moose, caribou and salmon. Grizzly bears are opportunistic and will also feed on insects, small mammals, dead animals and garbage.

In their search for food, the home range of grizzly bears is heavily dependent on the quality of their habitat. Bears with access to predictably abundant, high-quality food and long growing seasons tend to have smaller ranges (McLoughlin & Ferguson, 2000). Home ranges for males are typically several times larger than those of females, likely due to breeding activity and/or the increased energy demands of larger body size (McLoughlin *et al*, 1999).

1.3.2 *Habitat types: Specify the types of habitats occupied by the species and, when relevant, the degree of habitat specificity.*

At the broad scale, Grizzly bears are habitat generalists, and can be found from sea level to high-elevation alpine environments. Within their home ranges they select specific habitats for specific resources (food, cover) in different (phonological) seasons. Their large home ranges may give the impression that Grizzly bears are very adaptable and can occupy poor quality habitat because of the wide variety of foods and habitats they use. However, their large body sizes, high nutritional requirements, limited ability to digest coarse vegetation and omnivorous diet are responsible. In order to obtain the very specific resources they require, they move to very specific habitats in different seasons, some of which can be regarded as "critical habitat". In Canada, they occupy habitats as diverse as temperate coastal rain forests and semi-desert Arctic tundra, and historically roamed the Great Plains (COSEWIC, 2002). Suitable grizzly habitat must provide an adequate food supply, appropriate denning sites, and isolation from human disturbance. As the diet of most grizzly bears is dominated by vegetation, their habitat associations are strongly seasonal and reflect local plant development. However, in systems where salmon are present they may form an important component of the grizzly bear diet. In mountainous regions, dietary vegetation dependency may result in seasonal migrations across elevational gradients.

1.3.3. *Role of the species in its ecosystem*

Grizzly bears are umbrella, keystone and indicator species. Grizzly bears are of paramount importance to the functioning of the ecosystems in which they inhabit. Ecosystems that are healthy enough to support grizzly bear populations are *ipso facto* adequate to maintain populations of many other species with requirements of large land tracts (Peek *et al*, 2003).

Through their feces, grizzly bears transport and disperse the seeds and berries of plants on which they have been feeding. Grizzly bears promote vegetation diversity and regeneration by providing fertile ground via their digging for edible roots and tubers, as well as fossorial rodents (Tardiff & Stanford, 1998). Grizzly bears also play an important role in maintaining forest health by transporting and depositing nutrients from salmon (through urine and feces, as well as the carcass itself) considerable distances from salmon streams (Hilderbrand et al, 1999). Scavengers may also benefit from incompletely consumed carcasses, especially salmon, abandoned by grizzly bears.

Grizzly bears are often regarded as indicators of ecosystem health because of their sensitivity to human intrusion into occupied wilderness areas. There are few other species as commonly viewed as icons of the Canadian wilderness.

1.4. Population

1.4.1. *Global Population size: (Population size may be estimated by reference to population density, having due regard to habitat type and other methodological considerations, or simply inferred from anecdotic data)*

Grizzly bears have been extirpated from North Africa and the range of the grizzly bear has contracted in North America, Europe and Asia (IUCN, 2008). Nonetheless, this species remains widespread across three continents and is still considered to be a widely distributed terrestrial mammal. The global population of grizzly bears is estimated to be more than 200,000 (IUCN, 2008). Reliable population estimates are available for several areas in North America and Europe but few areas in Asia (IUCN, 2008 and references therein).

Canadian grizzly bear populations are stable and total approximately 29,900 individuals (based primarily on expert opinion models and a combination of capture, telemetry, and observation data) with an estimated range of about 27,000 to 34,200 individuals (COSEWIC, 2002). The breeding-age number of grizzly bears in Canada is estimated to be between 6900 and 16,000 individuals (COSEWIC, 2002).

Within Canada, the province of British Columbia has about half of the country's grizzly bears with at least 17,000 individuals (Hamilton et al, 2004). There are estimated to be approximately 6000-7000 grizzly bears in the Yukon Territory, about 500 in the province of Alberta, and 5100 in the Northwest Territories (COSEWIC, 2002). The number of grizzly bears in the territory of Nunavut is unknown but is estimated to be 800 to 2000 individuals (Dumond, 2005).

1.4.2. *Current global population trends:*

___increasing ____decreasing __X__ stable ____unknown

According to IUCN (2008), the global grizzly bear number remains large and is not significantly declining. Although Canadian grizzly bear populations have been greatly reduced compared to historic levels numbers are currently stable (COSEWIC, 2002).

1.5. Conservation status

1.5.1. *Global conservation status* (according to IUCN Red List):

___Critically endangered	___Near Threatened
___Endangered	_X_Least concern
___Vulnerable	___Data deficient

The grizzly bear was assessed as 'Least Concern' according to the IUCN Red List in 1996 and in 2008, as the global number large and widely distributed across three continents. Although there are some small, isolated populations that are in jeopardy of extirpation, others that are under more protection are expanding.

1.5.2. *National conservation status for Canada*

The prairie populations of grizzly bear are considered *'Extirpated'* by the national Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The species disappeared from the prairie provinces of Saskatchewan, Manitoba, and some parts of Alberta in the 1880s.

The northwestern populations of grizzly bears are collectively considered as a *'Species of Special Concern'* by COSEWIC (2002). This national-level designation includes grizzly bears in the provinces and territories of Yukon Territory, Northwest Territories, Nunavut, British Columbia, and Alberta. A species is considered to be of 'Special Concern' by COSEWIC if it possesses characteristics that make it particularly sensitive to human activities or natural events. Although grizzly bears are not currently at risk of extirpation nationally, special attention is required to ensure they do not become at risk. Recovery efforts are required in 9 Grizzly Bear populations in British Columbia and throughout Alberta to prevent localized extirpation.

According to the Canadian Endangered Species Conservation Council (2006), in British Columbia, Yukon Territory, the Northwest Territories, and in Nunavut, grizzly bears have been assigned the status of *'Sensitive'*. In Alberta, the grizzly bear is provincially considered a species that *'May be at Risk'*.

1.5.3. *Main threats within Canada*

___No Threats
X__Habitat Loss/Degradation (human induced)
___Invasive alien species (directly affecting the species)
X__Harvesting [illegal hunting for parts and trophies]
X__Accidental mortality (e.g. collisions with vehicles and trains)
X__Persecution (e.g. defence of life and/or property kills)
X__Pollution (affecting habitat and/or species)
___Other_______________
___Unknown

Habitat loss and degradation (due to urban encroachment, agricultural development commercial timber harvests, oil/gas development and exploration, and mining) are the primary threats to grizzly bears in Canada (COSEWIC, 2002). Additional threats include illegal harvesting for the trafficking of parts (e.g. bile, gall, paws) and trophies, kills as a result of a perceived threat to life or property, and collisions with automobiles and trains (COSEWIC, 2002). Note that the legal harvest of grizzly bears in jurisdictions where permitted is sustainably managed and therefore does not constitute a threat to the long-term viability of Canadian grizzly bear populations.

2. SPECIES MANAGEMENT WITHIN CANADA

2.1. Management measures

2.1.1. *Management history*

Grizzly bears have historically been one of the most important icons for Canadian Aboriginal Peoples and the symbolic and spiritual significance of this species continues today (Shepard, 1986; Rockwell, 1991). Grizzly bears have been hunted throughout history as a source of food, pelts, and ornamental specimens (Black, 1998)

In Canada, grizzly bears have been managed as a game species in the provincial and territorial jurisdictions under Wildlife Acts, Wildlife Management Boards, and Land Claims Agreements with Aboriginal Peoples for many decades. Grizzly bears are also under federal legislation via the *Canada Wildlife Act* (1985) and the *Canada National Parks* Act (2000).

Brown bears, including grizzly bears were listed in Appendix I of CITES in 1990. However in 1992, all populations were down-listed to Appendix II except those in Bhutan, China, Mongolia, and Mexico (which remain in Appendix I). The grizzly bear population in Canada is not considered at risk, but is regulated by CITES as it is a look-alike to those populations in Appendix I (including other species of ursids).

2.1.2. *Purpose of the management plan*

The management of grizzly bears in Canada promotes its sustainable use and benefit as a valued wildlife species. The primary goals are to ensure a viable population at present-day levels, to maintain the current distribution, to protect and maintain suitable grizzly bear habitat, and to minimize conflicts with humans. Provincial management plans also include opportunities, where sustainable, for a carefully managed sport harvest and for recreational and commercial Grizzly bear viewing.

2.1.3. *General elements of the management plan*

The management of grizzly bear in Canada is the responsibility of the provincial and territorial jurisdictions in which it occurs in consultation with Wildlife Management Boards. Wildlife Management Boards are established under Land Claims Agreements and are co-management agreements that guarantee Aboriginal Peoples meaningful involvement and participation in decisions relating to the preservation of wildlife and the future development of lands. The management and research of grizzly bear is coordinated nationally and reviewed annually through federal/provincial/territorial consultations. Wildlife Acts in each of the jurisdictions outline the legal context for the management of grizzly bears.

Grizzly bear harvests in Canada are monitored by species experts and wildlife managers in the provincial and territorial jurisdictions. Estimates of grizzly bear population size are determined using a combination of field techniques, models, Mark-Recapture census using hair-snagging and subsequent DNA analysis, and Traditional Ecological Knowledge (TEK). Population estimates and allowable harvests are maintained at conservative levels to account for uncertainties.

Based on population estimates and model predictions, sustainable harvest levels are determined. All hunting is conducted under a license system and licenses are awarded to resident hunters only, in some cases exclusively to Aboriginal Peoples. In some provinces, outfitters possessing a valid license may allocate their tag to a non-resident if the grizzly bear is to be harvested under their supervision during a guided hunt. In British Columbia, Guide Outfitters are assigned strict 5-year allocations to legally guide non-resident hunters (a quota of a specific number of bears they can take).

2.1.4. *Restoration or alleviation measures*

Most current populations of grizzly bears in Canada are not considered to be at risk of extinction or extirpation. However, to ensure the species does not become at risk in the future, the species is managed sustainably and various levels of protection to habitat are provided through a series of provincial/territorial and national parks and protected areas. In total, approximately 215,000 km^2 (~ 8%) of the current grizzly bear range in Canada is within protected areas where the mandate includes the preservation of grizzly bear habitat (COSEWIC, 2002). Resource extraction (e.g. mining, commercial timber) is prohibited in protected areas. However, depending on which provincial or territorial jurisdiction the protected area is located, hunting for sport and/or subsistence by Aboriginal Peoples may be permitted and recreation activities or urban development may also occur nearby thereby affecting habitat quality. Protected areas most likely serve as a core refuge to grizzly bears, but are dependent on adjacent, unprotected areas to sustain and link viable populations. Important habitats outside of protected areas may also be protected. In British Columbia, much critical Grizzly bear habitat (stand level) is protected as Wildlife Habitat Areas under the Forest and Range Practices Act.

In British Columbia, all bear hunting licenses include a surcharge for the Habitat Conservation Fund, which helps provide financial support for grizzly bear research and management throughout the province. The isolated populations at the southern edge of the range in British Columbia are managed separately for recovery and various recovery actions are proposed or underway, including motorized access management, habitat restoration, mortality risk reduction around communities, and enhanced protection of critical habitats. Population augmentation has been proposed for one population, the North Cascades.

2.2. Monitoring system

2.2.1. *Methods used to monitor harvest*

Harvest of grizzly bear is closely monitored in Canada through the issuance of licences, tags, and quotas. Grizzly bears killed as a result of road or train accidents, illegal harvest, and in Defence of Life or Property are documented and considered when determining sustainable harvest levels. In the province of British Columbia, an inspection of the carcass is compulsory and includes the collection of tooth, hair, and tissue samples for age determination and genetic relatedness testing. These same samples have also been used to determine stable isotope signatures, and those, in addition to stable isotope data from other samples collected during inventories and research, are used as a component of the revised British Columbia population estimate process.

Grizzly bear harvest in Canada for the purpose of international trade is also monitored via the issuance of CITES Export permits.

Population estimates and modelling are used to predict the effects of harvest on grizzly bear in Canada and sustainable harvest levels are set based on the best available information. Managers account for uncertainty in population estimates when setting deliberately conservative harvest levels.

2.2.2. *Confidence in the use of monitoring*

The legal harvest of grizzly bears in Canada is strictly monitored by the provincial and territorial jurisdictions. Compliance and the quality of reporting are high because jurisdictions have a shared interest to ensure a long-term, sustainable harvest as well as a legal mandate under federal and provincial or territorial legislation related to wildlife management.

2.3. Legal framework and law enforcement: Provide details of national and international legislation relating to the conservation of the species.

Management of grizzly bears in Canada is conducted through a variety of provincial and territorial legislation and agreements such as Wildlife Acts, Wildlife Management Boards, and Land Claims Agreements with Aboriginal Peoples. The grizzly bear is also managed under federal legislation via the *Canada Wildlife Act* and the *Canada National Parks Act* which affords protection to individuals found in national parks and historic sites.

Provincial and territorial legislation in the form of Wildlife Acts provide the legal context for the management of grizzly bear in Canada and substantial penalties exist for those found illegally harvesting grizzly bears. Protection is afforded to cubs (up to and including 2 years of age) and bears with cubs, and well as those in dens. Baiting is prohibited although hunting with dogs is permitted in some jurisdictions. All kills (hunting or otherwise) must be reported and in the province of British Columbia are subject to a compulsory inspection by a Wildlife Officer. Defence of Life or Property kills are allowed.

The Canadian population of grizzly bear is listed on Appendix II of CITES which is administered in Canada using the *Wild Animal and Plant Protection and Regulation of International and Interprovincial Trade Act*.

3. UTILIZATION AND TRADE FOR RANGE STATE FOR WHICH CASE STUDY IS BEING PRESENTED.

3.1. Type of use (origin) **and destinations** (purposes) (e.g. commercial, medicinal, subsistence hunting, sport hunting, trophies, pet, food). **Specify the types and extent of all known uses of the species. Indicate the extent to which utilization is from captive-bred, artificially propagated, or wild specimens.**

Grizzly bears are highly prized as hunting trophies. In Canada, trophy harvest is sustainably managed by the provincial and territorial jurisdictions in which grizzly bears occur. All specimens are from the wild.

Some Asian medicine has relied on bear parts for thousands of years. Bear bile and galls are valuable and documented retail prices can reach US$500/g for bile and US$2000 for whole gall bladders (Servheen *et al*, 1999). Although bile and gall bladders are the most widely sought after parts, a market also exists for other body parts, especially paws (COSEWIC, 2002). Recent cases show an increase in the illegal demand for full trophies (hides and mounts) for use as decorative elements in large country "estates" in the American west. The harvest of grizzly bears for trade in such parts is prohibited in Canada. However, harvest of grizzly bears as hunting trophies is legal with a valid hunting license. Harvest for skins and/pelts is also permitted as long as the specimens are accompanied by valid tags and any necessary interprovincial trade permits.

3.2. Harvest:

3.2.1. *Harvesting regime* (extractive versus non extractive harvesting, demographic segment harvested, harvesting effort, harvesting method, harvest season)

Harvest of grizzly bears in Canada is primarily for hunting trophies and harvest limits have been set at 1-6% of the population depending on the jurisdiction. The majority of harvest is of adult male grizzly bears as they are usually larger and thus generally preferred by hunters as trophy specimens over females. Cubs under the age of two are not hunted.

3.2.2. *Harvest management/ control* (quotas, seasons, permits, etc).

Harvest of grizzly bears in Canada is highly managed. All hunting is conducted under license system and all harvests must be by a licensed hunter with valid tags. In some provinces, non-resident hunters may hunt grizzly bears only if accompanied by a licensed Canadian outfitter or guide who has allocated this valid tag to the hunter. In British

Columbia, non-residents must also be accompanied by a guide, but rather than allocating a tag, the Guide Outfitter operates under a limited quota system. Hunting seasons are either in the spring or the spring and fall depending on the provincial/territorial jurisdiction. Any export or trade in grizzly bear from Canada requires a valid CITES Export permit, and may also require a provincial export permit.

3.3. Legal and illegal trade levels: To the extent possible, quantify the level of legal and illegal use nationally and export and describe its nature.

Of the approximately 500 grizzly bear mortalities each year in Canada, about 84% are the result of legal harvest (including harvest by Aboriginal Peoples); Defence of Life or Property kills account for another 13% (COSEWIC, 2002). Based on population estimates, human-caused mortality of grizzly bears in Canada accounts for approximately 2% of the total number of individuals.

Between 2002 and 2005, Canada issued approximately 250 CITES export permits annually for grizzly bear hunting trophies. Sport hunting is a lucrative industry in Canada as grizzly bear trophies are highly prized. An annual average of about $2.8 million is spent on grizzly bear hunting in the province of British Columbia alone (Province of British Columbia, 1995).

Although it is difficult to evaluate due to the underground nature of illegal activity, harvest of grizzly bears in Canada for the purpose of trade in parts for medicinal purposes still occurs to some extent despite it being prohibited. The high value of trophies also results in some degree of poaching and trafficking as indicated by reports of seizures and prosecutions (BCMOE, 2001; COSEWIC, 2002).

II. Non-detriment finding procedure (NDFs)

For grizzly bear in Canada there is currently a positive NDF (i.e. harvest of grizzly bear is considered non-detrimental to the species in the wild).

1. IS THE METHODOLOGY USED BASED ON THE IUCN CHECKLIST FOR NDFS?

_X_yes ___no

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED

In Canada, the IUCN Checklist for non-detriment findings is followed closely when making an NDF. All elements of tables 1 and 2 of the Checklist are considered by wildlife managers and species experts in the jurisdictions. This information is provided to the CITES Scientific Authority for consideration. When the Scientific Authority reviews and finalises the Checklist, consideration is given to the primary experience of managers and experts in the management and research of wild populations, as well as to any additional sources of information that are available (e.g. scientific journal articles, technical reports, and consultations with additional experts, wildlife management boards, species-specific committees and associations, etc).

3. MAIN SOURCES OF DATA, INCLUDING FIELD EVALUATION OR SAMPLING METHODOLOGIES AND ANALYSIS USED

Wildlife managers in the provincial and territorial jurisdictions, in collaboration with species experts, are responsible for the management of wild grizzly bear populations. The Canadian CITES Scientific Authority relies on these managers and experts to provide it with up-to-date information on the status of grizzly bears in Canada, primarily in the form of the IUCN Checklist, but also through consultations, when making an NDF.

Standard field techniques include telemetry, mark/re-capture, and den/aerial surveys. Historically, the Fuhr-Demarchi habitat-based model (Fuhr and Demarchi, 1990) was used to estimate historic, potential, and current habitat capability based on biogeoclimatic mapping in British Columbia. Progressive step-downs accounted for habitat loss, alteration, displacement, and fragmentation, as well as historic levels of human-caused grizzly bear mortalities. Habitat capability ratings were generally revised every three years. Population-Viability Analysis (PVA) models (Herrero *et al*, 2000) were also utilised to predict population status and trends, as well as the extinction risk for populations. Input variables were region-specific and population characteristics and habitat conditions had to be known and foreseeable.

British Columbia's current population estimate (Hamiton *et al*. 2004) is based on two methods: a multiple regression for the majority of the province and an expert-based model for the coast. A relationship between Grizzly bear density and ultimate measures of ecosystem productivity and mortality was established for known-density areas then extrapolated to areas where no Mark-Recapture estimates were available. Grizzly bear density in non-coastal environments was related to mean annual rainfall and temperature, human caused mortality, human density and the presence of salmon. Densities on the coast were heavily influenced by the abundance and distribution of Pacific salmon.

The Canadian CITES Scientific Authority itself does not participate in field evaluations or surveys of grizzly bear populations. All field evaluations and statistical analyses to estimate populations and determine harvest levels are conducted by the wildlife managers and species experts in the provincial jurisdictions.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

Given that all jurisdictions have mandates to protect wildlife, and have the scientific and management information and expertise that contribute to the making of an NDF, the data and information provided to the Scientific Authority is assured to be of a high standard. It should be noted that the conservation and management of wild species is multi-jurisdictional in Canada, falling under the authority of various provincial, territorial, and federal acts and legislation related to wildlife management.

The details provided by the experts in the range jurisdictions are reviewed by the Scientific Authority to ensure that all the necessary information is complete. Whether trade will be detrimental to the species in the wild is determined based on the information provided by the wildlife managers/species experts in the jurisdictions.

5. MAIN PROBLEMS, CHALLENGES OR DIFFICULTIES FOUND ON THE ELABORATION OF NDF

As management of wildlife in Canada is multi-jurisdictional, coordinating the numerous people involved in the NDF process can be challenging. Budget and time constraints are factors affecting the Scientific Authority and the wildlife managers in regards to making NDFs.

Due to the large geographical area in which grizzly bears reside it can be difficult to determine their exact population size and demographics. A variety of methods must be utilised to gather accurate information and data analyses are complex. Undocumented mortalities may contribute to uncertainty when determining population estimates and sustainable harvest levels.

6. RECOMMENDATIONS

The Canadian CITES Scientific Authority has had great success in using the IUCN Checklist, either formally or via consultations, as a method to gather the information that is required to make an NDF. The IUCN Checklist covers a wide scope of the parameters that may be considered when developing an NDF and the format is useful in terms of focusing the approach for gathering information, recognizing gaps in information or management, and identifying the vulnerabilities for the species in question. Collectively it ensures a thorough analysis of the status and management practices currently in place for a species, regardless of taxa, and ensures consistency when making a NDF. It is recommended that Parties consider the IUCN Checklist when developing NDFs.

REFERENCES

BCMOE (British Columbia Ministry of Environment, Land, & Parks). 2001. Moricetown residents convicted of grizzly bear trafficking. Press Release 330-30:ELP2001-702. March 2, 2001.

BLACK, L.T. 1998. Bear in human imagination and ritual. *Ursus* 10:343-347.

CANADIAN ENDANGERED SPECIES CONSERVATION COUNCIL (CESCC). 2006. Wild Species 2005: The General Status of Species in Canada. Available: http://www.wildspecies.ca

COSEWIC. 2002. Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assessment and updated status report on the Grizzly Bear (*Ursus arctos*) in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. vii + 91pp.

DUMON, M. 2005. Nunavut grizzly bear management plan – 2005. Nunavut Department of the Environment, Kugluktuk.

FUHR, B.L. and D.A. Demarchi. 1990. A methodology for grizzly bear habitat assessment in British Columbia. Wildlife Bulletin B-67. Wildlife Branch, Ministry of Environment, Victoria. 28 pp.

HAMILTON, A.N., M.A. Austin, and D.C. Heard. 2004. British Columbia grizzly bear population estimate – 2004. B.C. Ministry of Water, Land, and Air Protection, Biodiversity Branch, Victoria.

HERRERO, S., P.S. Miller, and U.S. Seal. 2000. Population and habitat viability assessment for the grizzly bear of the Central Rockies Ecosystem. Eastern Slopes Grizzly Bear Project, University of Calgary, Alberta, Canada and Conservation Breeding Specialist Group, Apple Valley, USA. 92pp.

HILDERBRAND, G.V., T.A. Hanley, C.T. Robbins, and C.C. Schwartz. 1999. Role of brown bears (*Ursus arctos*) in the flow of marine nitrogen into a terrestrial ecosystem. *Oecologia* 121:546-550.

INTERNATIONAL ASSOCIATION FOR BEAR RESEARCH AND MANAGEMENT. 2005. Distribution of *Ursus arctos*. Available: http:www.bearbiology.com/bearstat/html#brownbear Bear Biology

IUCN Bear Specialist Group. 2008. *Ursus arctos*. 2008 IUCN Red List of Threatened Species (in press). Available: http://www.iucnredlist.org

JONKEL, C.J. 1987. Brown bear. In: Wild furbearer management and conservation in North America. Ontario Trappers Association, North Bay. p.457-473

McLOUGHLIN, P.D., R.L. Case, R.J. Gau, S.H. Ferguson, and F. Messier. 1999. Annual and seasonal movement patterns of barren-ground grizzly bears in the central Northwest Territories. *Ursus* 11:79-86.

McLOUGHLIN, P.D. and S.H. Ferguson. 2000. A hierarchical pattern of limiting factors helps to explain the variation in home range size. *Ecoscience* 7:123-130.

PEEK, J., J. Beecham, D. Garshelis, F. Messier, S. Miller, D. Strickland. 2003. Management of grizzly bears in British Columbia: a review by an independent scientific panel. Submitted to the Minister of Water, Land, and Air Protection, British Columbia. 90 pp.

PROVINCE OF BRITISH COLUMBIA. 1995. Conservation of grizzly bears in British Columbia: background report. BC Ministry of Environment, Lands, and Parks. British Columbia. 70 pp.

ROCKWELL, D. 1991. Giving voice to bear: North American Indian rituals, myths, and images of the bear. Roberts Reinhart Publications. Niwot, Colorado, USA. 224 pp.

SCHWARTZ, C.C., S.D. Miller, and M.A. Haroldson. 2003. Grizzly Bear (*Ursus arctos*). In: Wild Mammals of North America. John Hopkins University Press, Baltimore. pp. 556-586

SERVHEEN, C. 1990. The status and conservation of bears of the world. International Conference on Bear Research and Management, Monograph Series No. 2. 32 pp.

SERVHEEN, C., S. Herrero, and B. Peyton (compilers). 1999. Bears. Status survey and conservation action plan. IUCN/SSC Bear and Polar Bear Specialist Groups. IUCN, Gland, Switzerland and Cambridge, UK.

SHEPARD, P. and B. Sanders. 1986. The sacred paw: the bear in nature, myth and literature. Viking Penguin Press, Inc. New York, New York, USA. 244pp.

SWENSON, J., N. Gerstl, B. Dahle, and A. Zedrosser. 2000. Action plan for the conservation of brown bear in Europe (*Ursus arctos*). Council of Europe, Strasbourg, France.

TARDIFF, S.E. and J.A. Stanford. 1998. Grizzly bear digging: effects on subalpine meadow plants in relation to mineral nitrogen availability. *Ecology* 79:2219-2228.

NDF WORKSHOP
WG 5 – Mammals
CASE STUDY 3 SUMMARY
Ursus arctos horribilis
Country – **Canada**
Original language – English

THE NDF PROCESS FOR *URSUS ARCTOS HORRIBILIS* (GRIZZLY BEAR) IN CANADA

AUTHORS:
Carolina Caceres and David Fraser

Grizzly bears are a slow-growing, long-lived species (lifespan generally 20-25 years) with a low reproductive output. This species depends on a variety of food sources to meet their nutritional needs including vegetation, seeds and berries, salmon, moose, caribou, small mammals, and insects. Grizzly bears are habitat generalists and can be found from sea level to high elevation alpine environments. Suitable grizzly habitat must provide an adequate food supply, appropriate denning sites, and isolation from human disturbance.

Although their range has been reduced, *Ursus arctos* is widespread across North America, Europe, and Asia. The global population, although reduced compared to historic levels, is estimated to be more than 200,000 individuals and the IUCN Red List has determined the grizzly bear to be of 'Least Concern'. In Canada, the grizzly bear population is stable with approximately 29,900 individuals and the species is not considered threatened or endangered by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC).

Habitat loss and degradation (due to urban encroachment, agricultural development, commercial timber harvests, oil/gas exploration and development, and mining) are the primary threats to grizzly bears in Canada. Additional threats include bear-human conflicts (e.g. defence of life or property, collisions with automobiles or trains) and illegal harvest.
The legal harvest of grizzly bears in Canada is sustainably managed and therefore does not constitute a threat to the long-term viability of the species. The harvest of grizzly bears in Canada is strictly monitored through the issuance of licenses, tags, and quotas. Sustainable harvest levels are based on conservative population estimates determined using a combination of field techniques, expert-opinion models, DNA analysis, harvest data, and Traditional Ecological Knowledge (TEK).

Wildlife managers, in collaboration with species experts in the provincial and territorial jurisdictions, are responsible for the management of grizzly bears in Canada. The Scientific Authority relies on these managers and species experts to provide up-to-date information on grizzly bear populations primarily in the form of the IUCN Checklist for Non-Detriment Findings, but also via consultations, when making an NDF.

CASE STUDY: GRIZZLY BEAR NDF FOR CANADA

David F. Fraser, SA for British Columbia,
Carolina Cacerces ,SA for Canada

BRITISH COLUMBIA
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Environment Canada
Environnement Canada

International Expert Workshop on CITES Non-Detriment Findings.
Cancun, Mexico, 17-22 November, 2008

DF.Fraser photo

CITES Responsibilities in Canada

Canadian responsibilities for wildlife management are divided between Federal and Provincial/Territorial governments as per constitutional delegation of power

Federal Government Departments:

- overall implementation of CITES, international, borders, wildlife management/enforcement within federal jurisdiction

Provincial/Territorial Governments:

- Wildlife management (including enforcement) of indigenous species within P/T boundaries

Aboriginal constitutional rights:

- Rights to participation in land, water, wildlife and environmental management and guaranteed wildlife harvesting rights within various land claim acts

J. Hobbs photo

Canadian Non-Detrimental Findings

- NDFs are made for individual exports based on knowledge of P/T management systems in place
- Standing national NDF reports are being developed for frequently traded indigenous species
  - Based on IUCN Checklist
  - National document summarizing management practices of all range jurisdictions for a species
  - Collaborative approach
    - Federal leadership/coordination
    - Provincial/Territorial participation
    - Species experts (management and
    - conservation)

DF.Fraser photo

Making an NDF in Canada

- Role of Canadian Scientific Authorities is to evaluate the information that goes into an NDF such as:
  - Management plan or practices exist at P/T level (as is the case for all vertebrates under P/T wildlife acts)
  - Plan and/or practices are established and based on regular appropriate assessment of species populations
  - Some evidence that plan/ practices are responsive to changes in species trends and status

Grizzly Bear (*Ursus arctos horribilis*)

- Sub-species exclusive to North America
- Distribution across 26% of Canada's land mass
  - Interconnecting populations distributed in the Yukon Territory, the Northwest Territories, Nunavut, British Columbia and Alberta
  - Isolated populations in southern British Columbia
  - Approximately 50% of Canadian population is in British Columbia

DF.Fraser photo

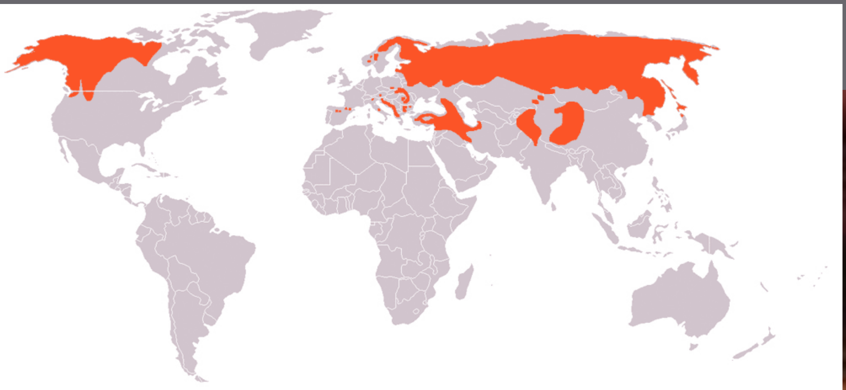


Figure 2. Current and historic North American range of *Ursus arctos horribilis* (Grizzly bear). Adapted from Servheen (1990).

Global	**IUCN**	Critically Endangered. / Endangered	Vulnerable	Near Threatened	Least Concern ✓
National	**COSEWIC**	Endangered	Threatened	Special Concern ✓	Not at risk
National	**General Status**	At risk	May be at Risk	Sensitive ✓	Secure
Provincial	**BC status**	Red	Red	Blue (S3) ✓	Yellow

Increased extinction risk

Grizzly Bear Canadian Populations

- Canadian populations listed under Appendix II for look-alike reasons

A. Teucher photo

Role in the Ecosystem

- Top level predator
- Symbol of wilderness and often used as an umbrella spp for management purposes.
- Key role in distribution of nutrients from salmon to terrestrial ecosystems.

C.W. Melton photo

Grizzly Bear Management in British Columbia

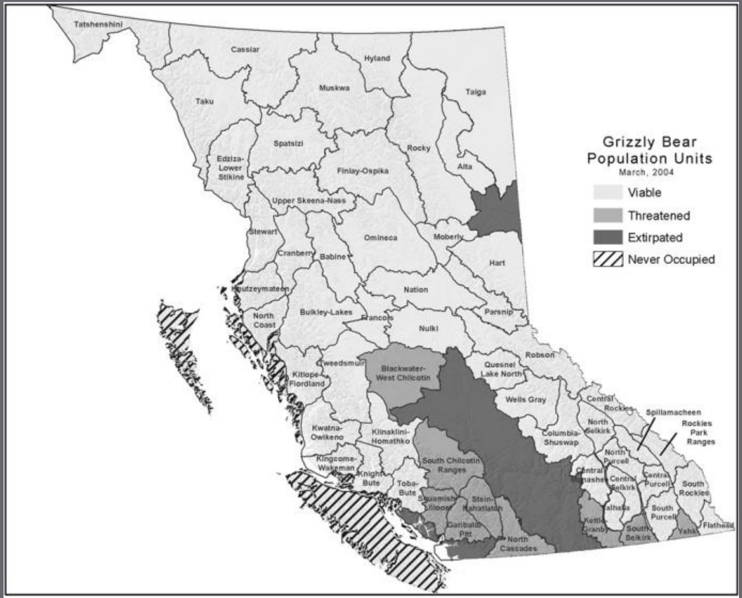
- Listed as wildlife under the *Wildife Act*
- Classified as a game animal
- Also managed for wildlife viewing
- Some populations managed for recovery.

- 57 population units
- 9 are considered "threatened"*
- 4 have extirpated populations
- Threatened and extirpated units are closed to hunting

Threatened Populations are Managed

Recovery actions proposed or underway:

- motorized access management,
- habitat restoration,
- mortality risk reduction around communities,
- enhanced protection of critical habitats.

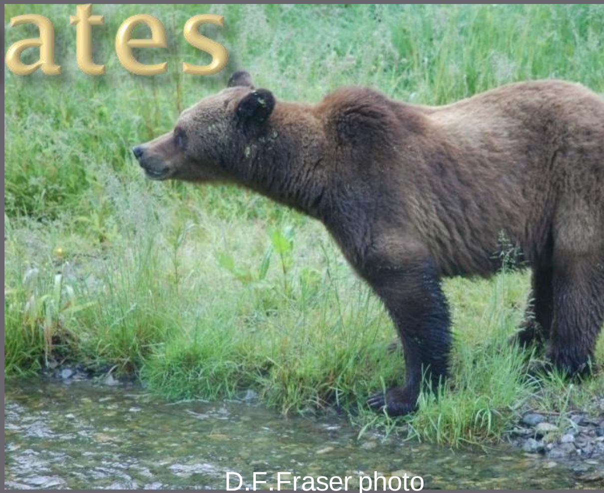


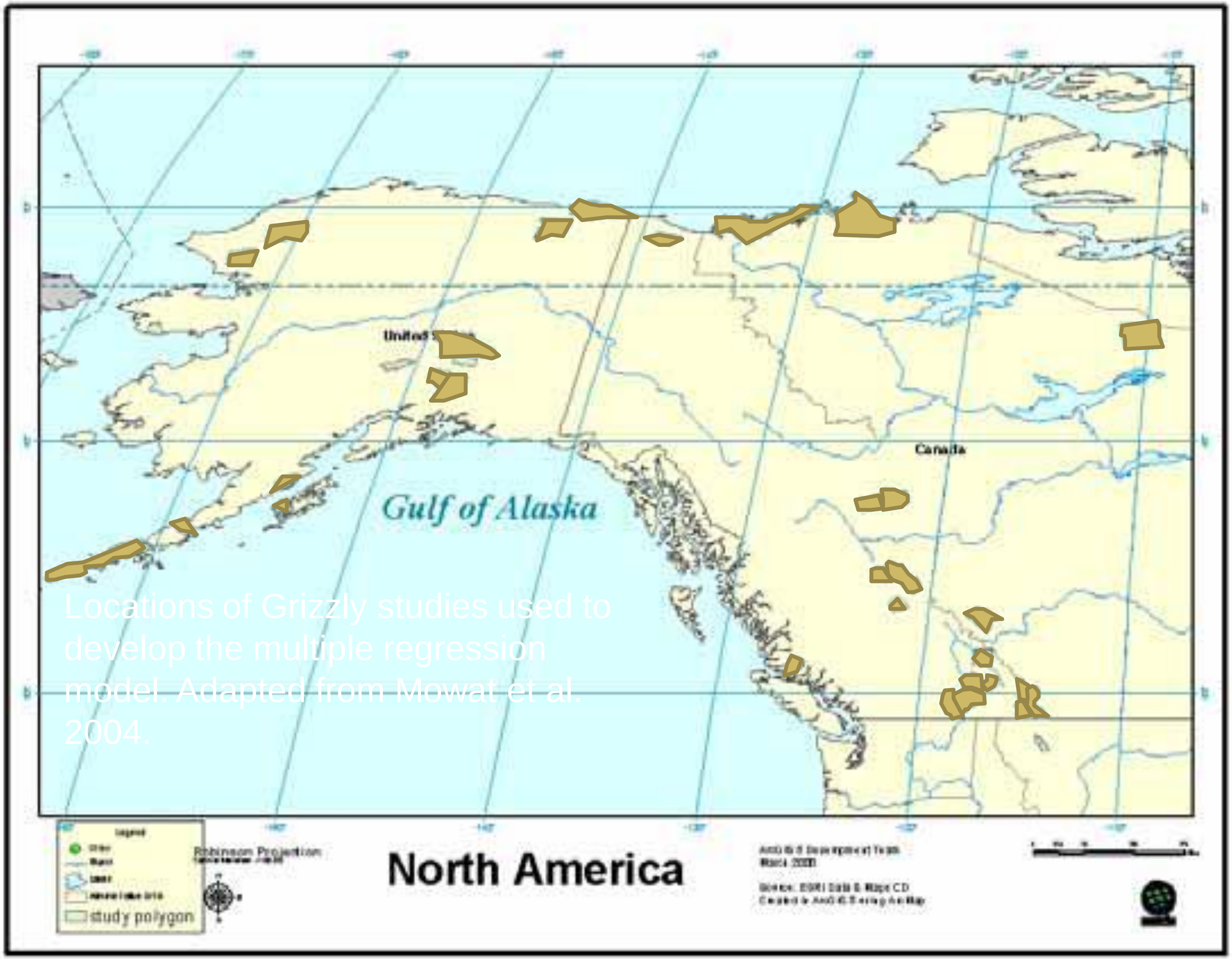
- About 2000 bears occur in areas with no hunting
- About 120,000 square miles of habitat are protected in parks and nearly 1 million ha have been protected from logging because of high grizzly bear habitat values

J Hobbs photo

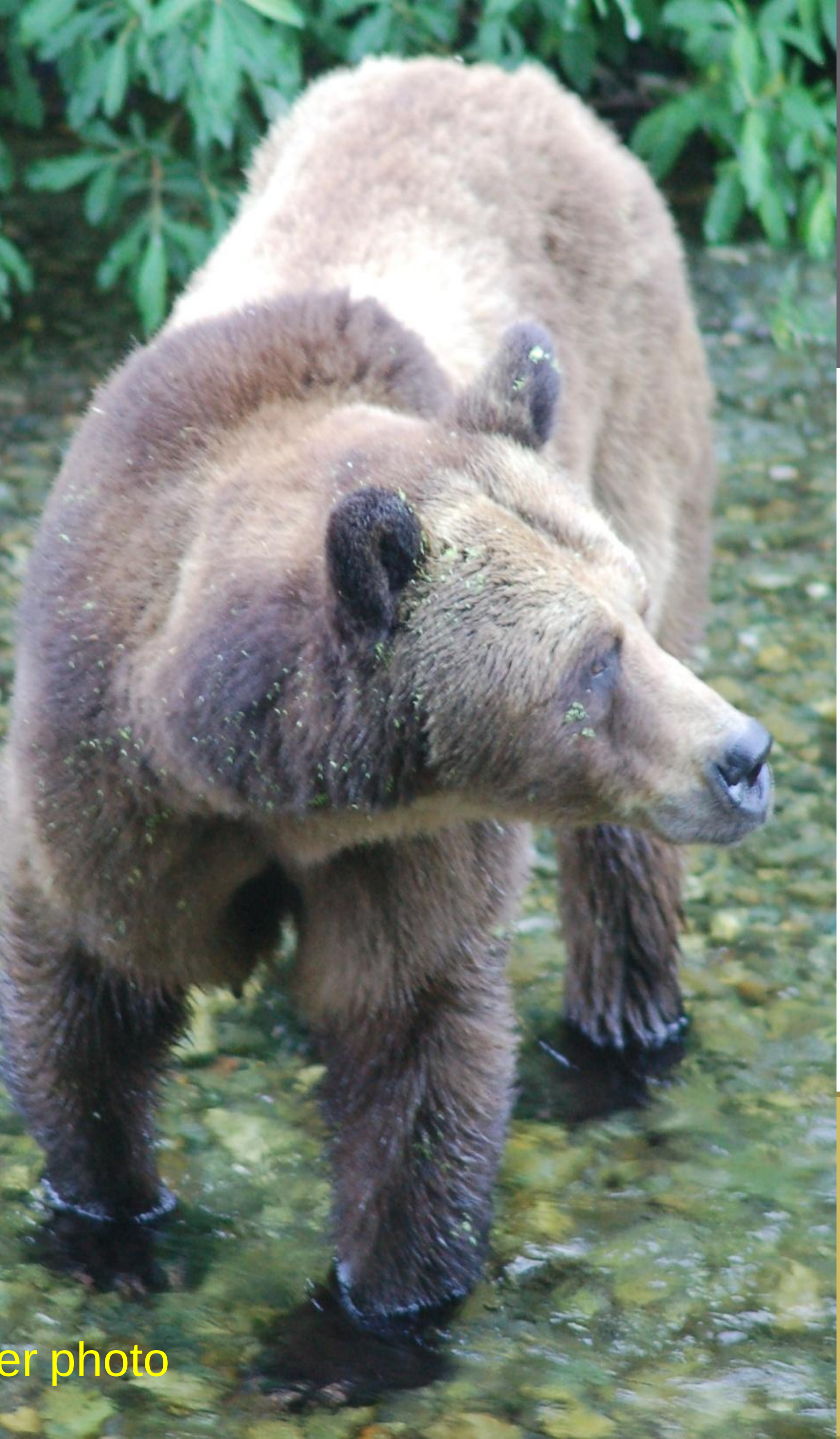
Population estimates

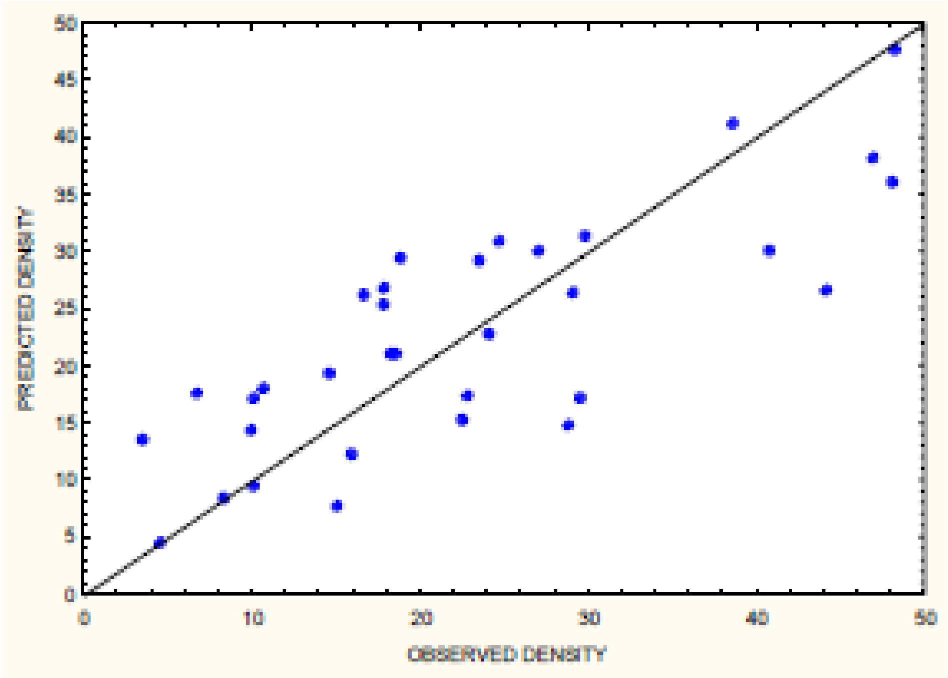
- Current estimate is 17,000 bears in British Columbia
- Estimate based on a habitat based model, an expert opinion model and modified by DNA analysis mark-recapture based studies
- For most of the province population estimates are based on direct inventory and extrapolation to similar areas based using a multiple regression model.





Locations of Grizzly studies used to develop the multiple regression model. Adapted from Mowat et al. 2004.





Observed vs predicted Grizzly Bear densities in the 33 study areas using the multiple linear regression model. Line indicates a perfect relationship between observed and predicted densities. From Mowat et al 2004.

Population estimates cont.

- Stable isotope analysis of hair samples measuring salmon consumption have been used to modify some population estimates
- Methods have been peer-reviewed by experts recommended by the Int. Bear Association

Population estimates (cont.)

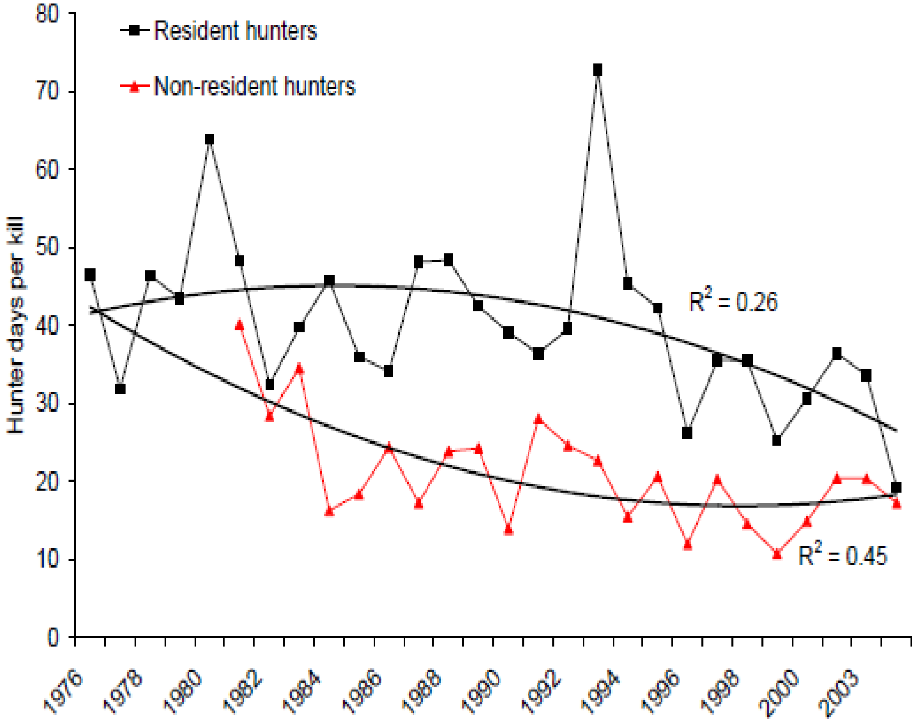


Fig. G7. Catch per effort (days per kill) by resident and non-resident hunters for grizzly bears in the Kootenay Region, 1976-2004. Lines are second-order polynomials fitted to these points.

Population estimates (cont.)

- $ 4M ($3.2M US) has been spent since 1979 on Grizzly Bear inventory in British Columbia.

Andy Teucher photo

Harvest Management.

- Harvest is by Limited Entry Hunts(LEH)which is a lottery system for residents of BC and by guide quotas for non resident hunters. Nonresidents must hunt with a guide..
- Total number of LEH and guide quotas are set annually, based on an allocation policy.

A. Teucher photo

Harvest Management cont.

- Maximum allowable mortality from all human caused sources ranges from 4-6% depending on the GBPU
- No more than 30% of this may be from the loss of female bears to ensure that reproductive capacity is maintained.

Havest Management cont.

- All harvested bears must undergo an inspection
- Sex, location, date is recorded, and a tooth is extracted for ageing.

J Hobbs photo

Harvest Management cont.

- Hunters may only take a single bear a year.
- it is illegal to kill a bear <2 years old or any bear in its company (usually its mother)

Harvest Management cont.

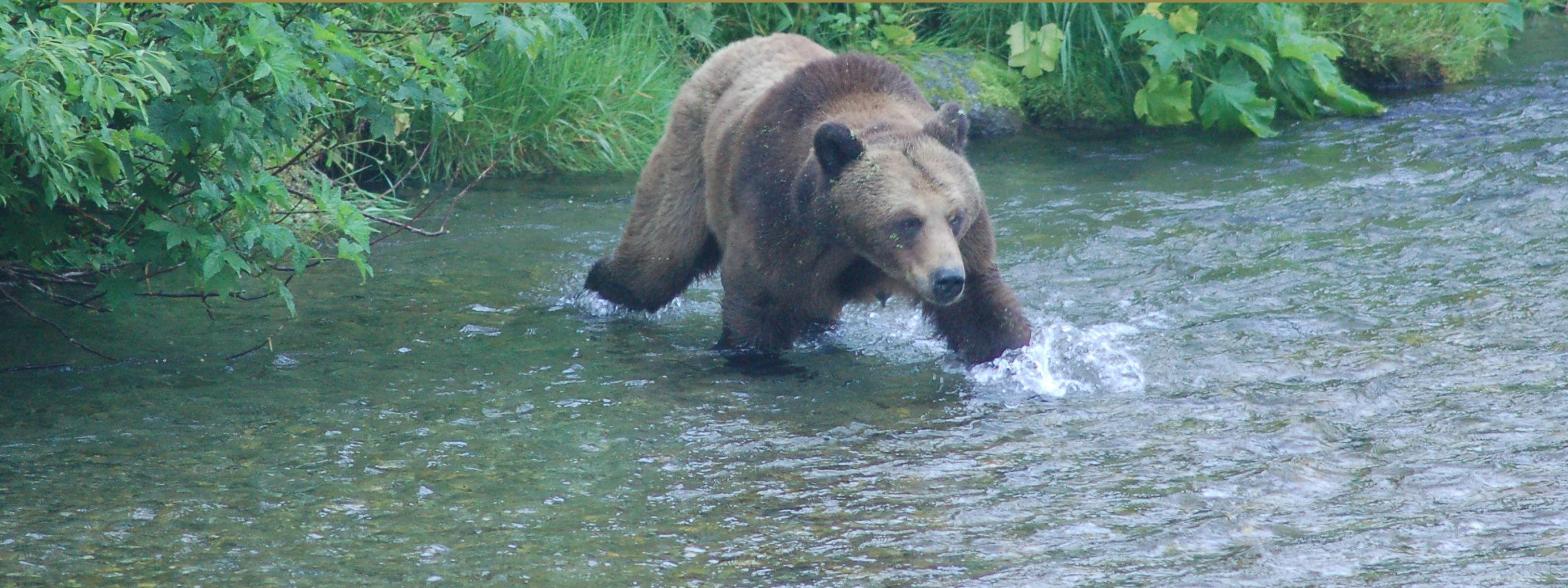
- Allocation procedure takes into account bears that are killed by humans (conflict), traffic, first nations harvest, poaching, and any other adjustments needed to meet population objectives.

Harvest Management cont

Average harvest of grizzly bears is about 300 animals annually, plus an estimated 50 bears are killed each year in human conflict kills and other human caused mortality (e.g. road and rail kills)

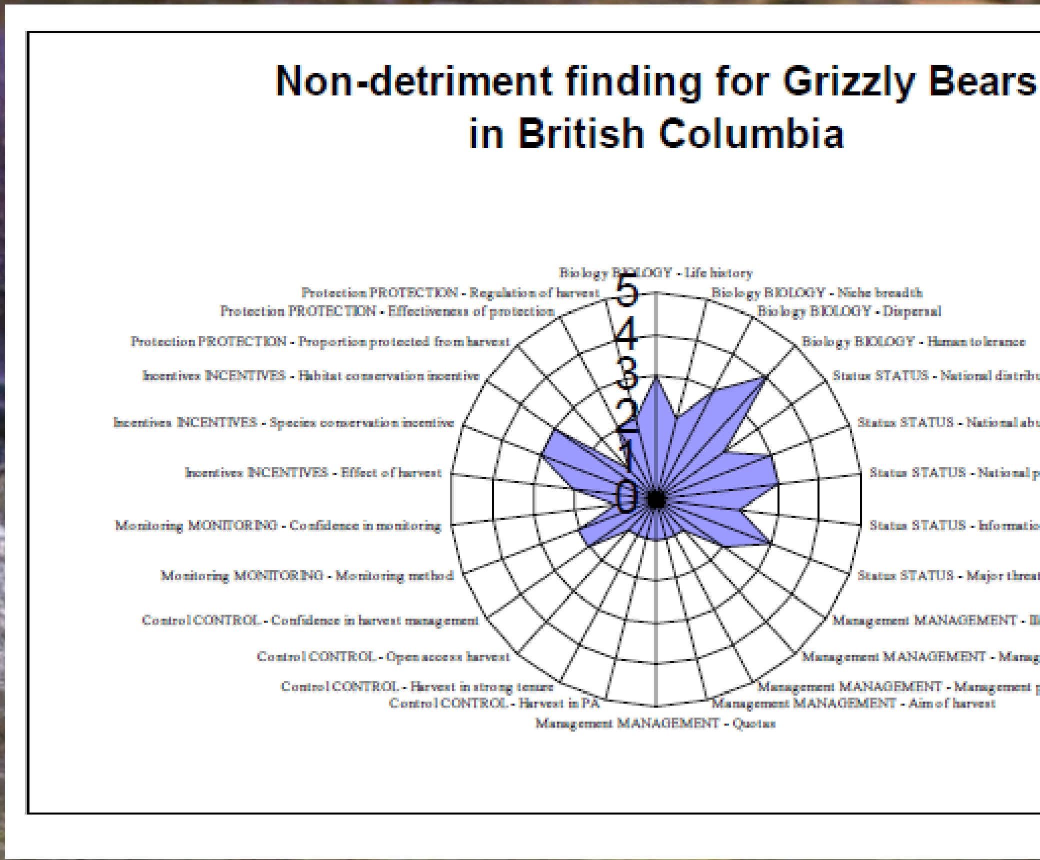
Harvest Management cont

- A five year running average of hunter success rates are used to adjust the number of LEH permits that are issued each year to ensure that resident hunter kills do not exceed allocation.



British Columbia NDF

- Made extensive use of the IUCN checklist



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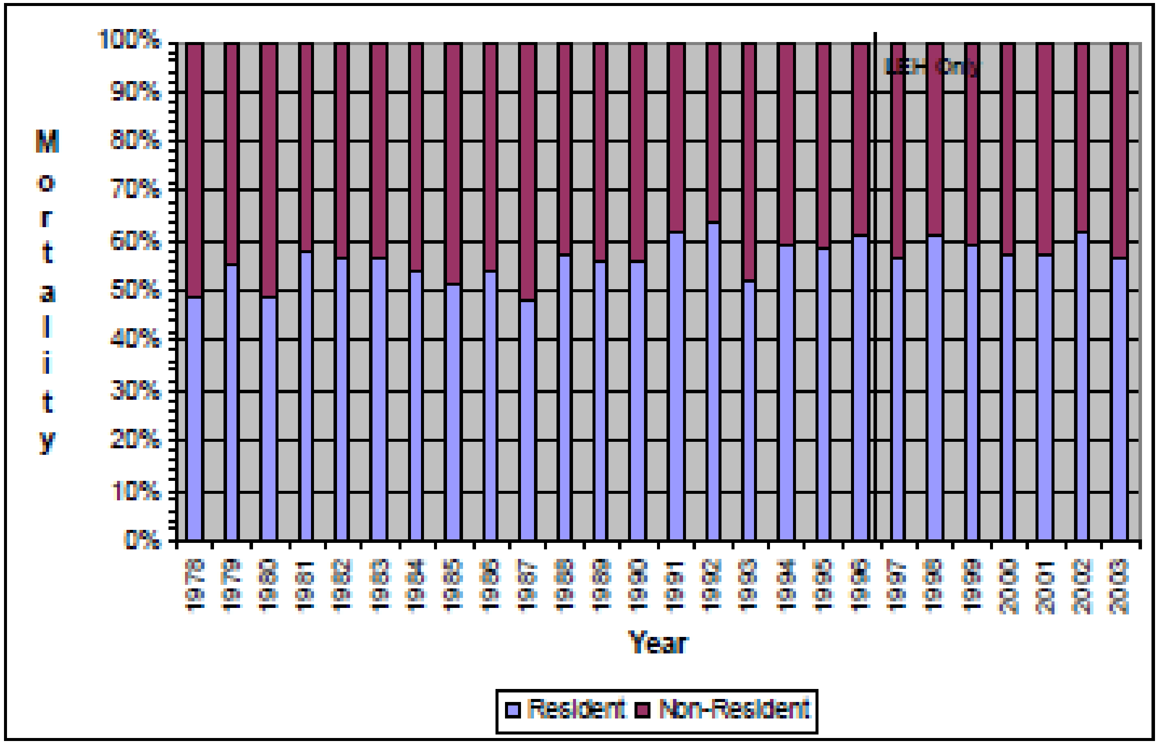
British Columbia NDF

- A little under 50% of Grizzly Bears in BC are taken by nonresident hunters.



NDF in British Columbia

- All human caused mortalities are monitored and adjustments are made to the management regime when necessary.
- Populations deemed to be at risk are not harvested, but managed for recovery.

NDF in British Columbia cont

- Trade in legally harvested bears is not a detriment to the population
- Over the area that is legally harvested GB fulfill their role in the ecosystem
- NDF posted on the web:
- http://www.env.gov.bc.ca/wld/grzz/#nondetriment

NDF WORKSHOP CASE STUDIES
WG 5 – Mammals
CASE STUDY 4
Panthera pardus
Country – **SOUTH AFRICA**
Original language – English

LEOPARD (*PANTHERA PARDUS*) CASE STUDY

AUTHOR:
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* Endangered Wildlife Trust, South Africa.
** IUCN/SSC Conservation Breeding Specialist Group.

I. Background information on the taxa

1. BIOLOGICAL DATA

1.1 Scientific and common names: Leopard (*Panthera pardus*)

CLASS: Mammalia
ORDER: Carnivora
FAMILY: Felidae
GENERA: *Panthera*
SPECIES: *pardus* (Linnaeus, 1758)
SUB SPECIES: *pardus*

While the question of subspecies is controversial, it is generally accepted that there are seven subspecies of Leopard which are separated on variations in coat colour and spot size (Hes, 1991).

I. Amur Leopard (*P. p. orientalis*): Siberia, Korea and north-eastern China. *Endangered*.
II. Barbary Leopard (*P. p. panthera*): Atlas mountains of Morocco and Algeria in North Africa. *Endangered*.
III. Sinai Leopard (*P. p. jarvis*): found on the Sinai peninsula and in Israel. *Endangered*.
IV. South Arabian Leopard (*P.p. nimr*): mountainous regions along the Saudi Arabian Red Sea coast and the coasts of South Yemen and Oman. *Endangered*.
V. Zanzibar Leopard (*P. p. adersi*): Island of Zanzibar off the East African coast, this subspecies is now thought to be *extinct*.
VI. North African Leopard (*P. p. pardus*): widespread over nearly all of Africa south of the Sahara and over the greater part of southern Asia including the Malayan pensinsula and Java. *Not threatened*.
VII. Anatolian Leopard (*P. p. tulliana*): the Caucasus and in Turkey. *Endangered*. (Hes ,1991).

1.2 Distribution

The Leopard has the greatest geographic distribution of any felid, occurring from the southern parts of the African continent through the Middle East to the far East, north-wards to Siberia and south to Sri Lanka and Malaysia.

Countries to which the Leopard is native include: Afghanistan; Algeria; Angola; Armenia; Azerbaijan; Bangladesh; Benin; Bhutan; Botswana; Burkina Faso; Burundi; Cambodia; Cameroon; Central African Republic; Chad; China; Congo; Congo, The Democratic Republic of the; Côte d'Ivoire; Djibouti; Equatorial Guinea; Eritrea; Ethiopia; Gabon; Gambia; Georgia; Ghana; Guinea; Guinea-Bissau; India; Indonesia (Jawa); Iran, Islamic Republic of; Iraq; Israel; Jordan; Kenya; Korea, Democratic People's Republic of; Lao People's Democratic Republic; Lesotho; Liberia; Malawi; Malaysia; Mali; Mozambique; Myanmar; Namibia; Nepal; Niger; Nigeria; Oman; Pakistan; Russian Federation; Rwanda; Saudi Arabia; Senegal; Sierra Leone; Somalia; South Africa; Sri Lanka; Sudan; Tajikistan; Tanzania, United Republic of; Thailand; Togo; Turkey; Turkmenistan; Uganda; Uzbekistan; Viet Nam; Yemen; Zambia; Zimbabwe

Regionally extinct: Hong Kong; Kuwait; Libyan Arab Jamahiriya; Singapore; Syrian Arab Republic; Tunisia

Possibly extinct regionally: Egypt; Korea, Republic of; Lebanon; Morocco; United Arab Emirates

Uncertain presence and origin: Mauritania; Swaziland
(Cat Specialist Group 2002. Panthera pardus. In: IUCN 2007. 2007 IUCN Red List of Threatened Species.)

In the PHVA workshop, only the South African population of Leopards was assessed. The distribution of Leopards in South Africa is widespread across a variety of geographic locations, habitats and management units. Leopard distribution information was provided by Gus Mills at the PHVA based upon the Red Data Book of the Mammals of South Africa (Friedmann and Daly, 2004) (Figure 1). Subsequent group discussion among the participants identified ten core areas, which were modelled as separate populations with varying levels of connectivity among these populations and with Leopard populations in adjacent countries (Figure 2). In South Africa, the Leopard range has been substantially reduced by agricultural development, hunting and human population encroachment in the interior, and today it is found only in the remote mountainous regions of the Western Cape, the bushveld wildlife areas of the North West Province, Limpopo Province, Mpumalanga and KwaZulu-Natal, and the semi-desert areas of the Northern Cape bordering on Botswana. There are possibly still small, isolated populations of Leopard in the KwaZulu-Natal Drakensberg and the forest of the Eastern Cape (Mills and Hes, 1997). The Leopard population size in South Africa is unknown, but it has however, become apparent that Leopard populations are smaller and more fragmented than previously appreciated.

Figura 1: Distribution of the Leopard in South Africa. From Friedmann, Y. and Daly, B. (eds) 2004. Red Data Book of the Mammals of South Africa.

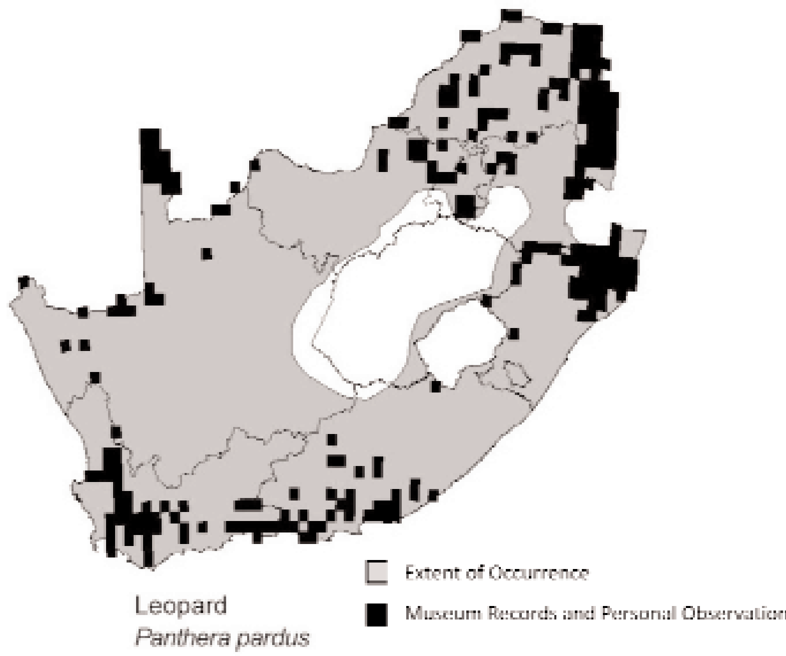
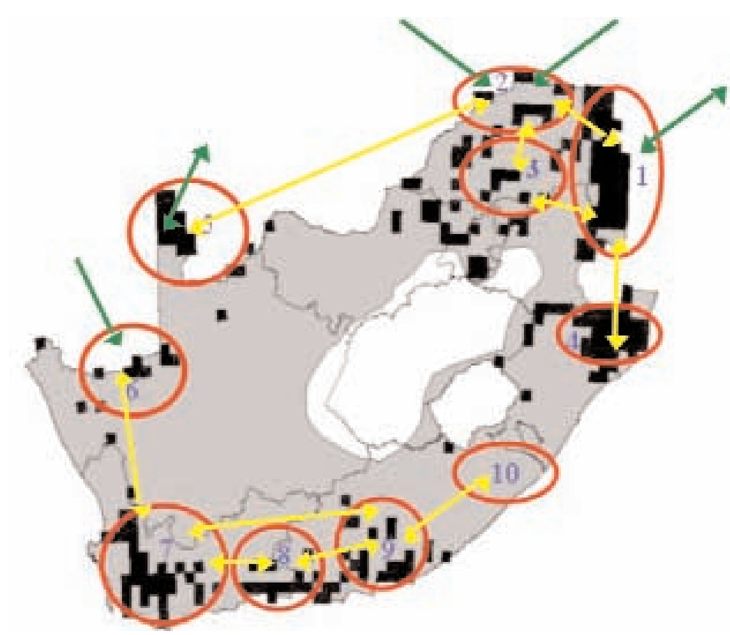


Figura 2: Ten Leopard populations in South Africa that were used in the PHVA Vortex model. Arrows indicate dispersal pathways incorporated in the baseline model (yellow = dispersal within South Africa; green = movement across international boundaries).



1. *Great Kruger Area*: Kruger Park and surrounding private reserves, Lowveld of the Limpopo and Mpumalanga provinces.
2. *Northern Limpopo Area*: Includes the north-western regions of the Limpopo valley in the Limpopo province.
3. *Waterberg and Mpumalanga Area*: Includes widespread central areas of the Limpopo province, eastern regions of the North West Province (such as Pilanesberg and Magaliesberg) and the Mpumalanga Escarpment up to the Lydenburg area. Soutpansberg is in the northern extremity of this defined area.
4. *Northern KwaZulu-Natal*: Includes Hluhluwe-Imfolozi Park, Greater St Lucia, Mkuzi, Phinda, Ndumu, and Itala and numerous other private reserves.
5. *Kalahari Area*: Kgalagadi Transfrontier Park, Molopo, and the North West Province (this population may be a sink for the neighbouring Botswana population).
6. *Orange River*: Includes the northern area of the Northern Cape, within the riverine vegetation of that river system e.g. Orange River.
7. *Western Cape*: Population widely distributed within the Cape Fold Mountains in the Western Cape.
8. *Eastern Cape Mountain*: Includes the cluster in the mountains and forest areas in the Eastern Cape.
9. *Eastern Cape Valley*: The valley Bushveld areas of the Eastern Cape appear to contain another population.
10. *Wild Coast*: Northern part of the Eastern Cape including the Transkei area.

1.3 Biological characteristics

1.3.1 *Provide a summary of general biological and life history characteristics of the species.*

The information provided below outlines the primary biological input parameters used in the Leopard Vortex model. These input values were developed based on consensus by the workshop participants using all available published biological information for Leopards as well as expert opinion. These values result in a deterministic annual growth rate of about 10% (potential growth in the absence of demographic and environmental variation, inbreeding depression, migration, and harvest (both legal and illegal), a generation time of about 7 years (7.2 for males, 6.7 for females), and an adult sex ratio of 1.6 females per adult male. These population characteristics were accepted by workshop participants as realistic and a reasonable representation of wild Leopard populations.

A baseline model was developed to project the best possible estimate of Leopard population viability in South Africa. Model input values were then modified to explore: 1) the sensitivity of the model to demographic rates, population estimates, and population structure; 2) the effect of alternative futures and management options; and 3) the impact of various harvest rates and strategies on Leopard population viability. All model scenarios were run with 500 iterations for 100 years (about 14 Leopard generations). Model output included the probability of extinction, mean stochastic growth rate, and mean population size over time.

Age of first reproduction for each sex:
Female Leopards become sexually mature at 2.5 to 3 years old (Bailey 1993, Nowell and Jackson 1996, Hunter and Balme 2004), and males at about two and a half to four years old (Skinner and Smithers 1990, Bathma and Walker 1999). Leopards are non-seasonal breeders and likely breed soon after reaching sexual maturity; young are born at any time of the year after a gestation of 100 days (Mills and Hes 1997). The input values of 3 years (for females) and 4 years (for males) were used as the average age of first reproduction in the Vortex model.

Litter Size:
Born in lairs among rocks, in brush piles and in termite mound holes, leopards give birth to 1 to 4 cubs per litter. Mean litter size was calculated as 1.92 (SD = 0.38), taken as an average across estimates by Hemmer (1976) as cited by Nowell and Jackson (1996), Martin and de Meulenaer (1988), Skinner (1989), and Mills and Hes (1997). Sex ratio at birth was assumed to be 50:50.

Breeding Success:
Mating usually takes place over a period of two to three days (Mills & Hes 1997). If the female has not mated, oestrus occurs again every 20 to 50 days (Bothma & Walker 1999). In the Kruger National Park the mating success rate appears to be low, and in one study only two of 13 suspected matings (15%) resulted in the birth of cubs. This low success rate is much like that of the lions (20%) in the same park.

Cub development:
Cubs are fully weaned at four months, and from the age of eight months start making their own kills. When cubs are about 12 months old, the mother Leopard becomes less and less tolerant of her offspring, striking out at them aggressively when they approach. She comes into oestrus at this time and sets off on patrols of her territory. Female cubs are more likely to settle on the borders of their mother's territory while males disperse well away from their natal area (Mills & Hes 1997). They attain independence at about 12.5 months, with siblings remaining together for a further 2-3 months (Skinner & Smithers 1990).

Adult sex ratio:
A sex ratio of 1 male: 1.8 females for resident adults (Nowell & Jackson 1996).

Mortality rates and longevity:
First-year mortality was estimated to be 41% by Martin and de Meulenaer (1988) and to be at least 50% by Bailey (1993). Bothma and Walker (1999) estimate that in Kruger National Park only 50% of all cubs survive to become adults. Bailey (1993) observed high annual sub-adult mortality (32%) in Kruger and a mean annual adult mortality of 19%. Mortality rates were observed to be higher in males than in females and higher in older individuals vs. prime age adults. These data were based on relatively small sample sizes and appear to be high as compared with other large cats; when combined with reproductive values used in the model, these mortality rates resulted in a negative deterministic growth rate. After much consultation and discussion among workshop participants, the mortality rates in *Table 1* were selected for the leopard Vortex model. Maximum age was set at 12 years in the baseline model.

Table 1: Mean annual mortality rates for male and female leopards by age class. EV = SD in mean due to annual environmental variation.

	Females			Males		
Life stage	**Age class**	**Mean annual mortality**	**EV**	**Age class**	**Mean annual mortality**	**EV**
Juvenile	0 – 1	40%	8%	0 – 1	40%	8%
Sub-adult	1 – 3	10%	2%	1 – 4	14%	3%
Adult	3 – 10	5%	1%	4 – 10	7%	1.5%
Geriatric	10+	15%	1%	10+	20%	1.5%

Social structure with regards to breeding:
Solitary and territorial, males and females associate only briefly to mate. Males hold large territories encompassing the territories of 2 or 3 females. Females defend their territories against other females, males against other males (Mills & Hes 1997). Male territories encompass up to 4 or 5 females in the Cederberg, Western Cape. Reproduction was modeled as short-term polgyny (promiscuous breeding system with no pair bonds).

The size of a male Leopard range is determined mainly by the number of females present, but a female's range depends mainly on suitable available prey. Therefore the size of a Leopard's range varies extensively between regions. In the Kruger National Park the ranges of adult male Leopards vary from 16.4 to 96.1 km^2, and those of adult females from 5.6 to 29.9 km^2. In the Sabie-Sand Game Reserve the range of one female Leopard studied was 23 km^2 (Bothma & Walker 1999). There are few reliable observations of infanticide in Leopards (see: Ilani, 1986; 1990; Scott & Scott, 2003) but new males entering the population are likely to kill existing cubs (Balme & Hunter 2004). Balm and Hunter 2004 studies in Phinda showed that few cubs were produced during the study may be a further consequence of high male turnover. Rapid turnover of male Leopard might drive females into a reproductive dead-end in which cubs are killed at high rates and subsequent conception is delayed.

Proportion of adult females breeding:
Of eleven adult females captured during the Bailey (1993) study, ten (91%) apparently had young prior to or gave birth during the study. During some years no females gave birth to cubs in the study areas, during others up to one-half of the females produced young. The average proportion of adult females producing young each year was 27.7%. In Wilpattu National Park five females produced seven litters in two years (Muckenhirn & Eisenberg 1973). In Serengeti National Park two of four females had young one year, and two years later both females had young again (Schaller 1972).

The known interval between successive litters in the same female varies from 16 to 17 months in the South African bushveld savanna where it is less than the interval of 24 – 25 months recorded in Serengeti (Bothma & Walker 1999). Interbirth interval averages at 15 months (Martin & de Meulenaer 1988; these data include some shorter periods after litters did not survive) to over 2 years (Schaller 1972, Bailey 1993) (Nowell & Jackson 1996). The percent of adult females breeding each year was modeled as 50% (interbirth interval = 2 years), with an environmental variation SD = 10%. Reproduction was assumed to be independent of population density.

1.3.2 *Habitat types*

Leopards are found in all habitats with annual rainfall above 50mm (Monod 1965), and can penetrate areas with less than this amount of rainfall along river courses: e.g. Leopards are found along the Orange River in the Richtersveld National Park, which lies at the southernmost extension of the Namib Desert (Stuart and Stuart 1989) (Nowell & Jackson 1996).

Leopards occur in all habitats except the most arid desert interior and reaches highest densities in the woodland savannah (Hunter & Balme). Limitations in food, cover and water are usually the major factors affecting an animal's distribution, but for a Leopard the definition of these basic requisites is extremely board. Food can be anything from beetles to ungulates the size of eland and sambar. Cover can be as rudimentary as a few scattered shrubs and trees or as dense as moist tropical evergreen forests. In the Kalahari Desert Leopards have been known to drink only once in ten days (Sunquist & Sunquist 2002). Leopards are commonly associated with 1-Forest; 1.5.-Subtropical/Tropical Dry; 1.6.-Subtropical/Tropical Moist; 2-Savanna; 2.1.-All Latitudes; 3-Shrubland; 3.5.-Subtropical/Tropical Dry; 4-Grassland; 4.5.-Subtropical/Tropical Dry; 8-Desert; 8.1.-Hot (Friedmann et al. 2004).

Leopards are tolerant of a wide range of habitats and climatic conditions, including mountains, rocks, bushveld, woodlands, desert and semi-desert, forest, from sea-level to 2000m above sea-level, in areas of less than 100mm of rain to areas receiving above 1200mm of rain. Usually requires some form of cover in the form of rocks or patches of thick bush. They also occur in the Namib Desert where vegetation on banks of watercourses provides cover (Mills & Hes 1997). The two major factors that appear to limit the distribution of this tough and versatile generalist are the presence of competitors and the presence of humans (Sunquist & Sunquist 2002). Leopards appear to be very successful at adapting to altered natural habitat and settled environments in the absence of intense persecution (Nowell & Jackson 1996).

1.3.3 *Role of the species in its ecosystem*

The Leopard is a large predator in the ecosystem and fills the role of managing smaller predators and managing prey populations. Leopards are a sign of a healthy, functioning ecosystem as they require large territories and are sensitive to human induced disturbance, habit loss or fragmentation and a reduced prey-base. They are easily blamed for stock losses and many people harbour an irrational fear of Leopards, thus further exposing them to intolerance by humans and unnecessary persecution.

They therefore also indicate the attitude of human beings and the extent of persecution practices such as trapping, poisoning and illegal hunting which usually has spill-over or secondary impacts for other, less visible animals.

1.4 Population

1.4.1 *Global Population size*
Unknown

National Population Size: See below (as per PHVA report, 2005)

Population Size
There is generally poor information on Leopard population because of censusing difficulties. As a solitary and nocturnal animal Leopards are not easily seen. The more successful methods of determining Leopard numbers are spoor counts and camera traps. The spoor count technique is used to determine presence/absence as well as the assessment of numbers using indices. This technique is only effective with high "detectability" of tracks e.g. sandy environments and special tracking skills are needed. Camera traps are also used to determine presence/absence data and monitoring trends.

Given the lack of accurate estimates of Leopard population size in South Africa, workshop participants were asked to give their expert opinion, and consensus on estimates was reached via facilitated group discussion. Maximum, minimum and best guess estimates for current Leopard population numbers were developed as baseline values for the Vortex model using a stable age distribution (Table 2). This process resulted in an estimate of 2185 to 6780 Leopards in South Africa, with a best guess estimate of 4250 Leopards. Maximum and minimum values were explored through sensitivity testing.

The saturation level of Leopards in each core area also was estimated by the participants through discussion and consensus during the plenary discussion to calculate an approximate carrying capacity for each population (*Table 2*). No environmental variation was added to the carrying capacity, as variations in habitat quality are accounted for by environmental variation in reproduction and survival.

Table 2: Population and carrying capacity estimates for each of the 10 identified core Leopard habitats in South Africa.

	Est. Population Size			Saturation	Est.
Population Area	**Min.**	**Best**	**Max.**	**Level**	**K_{Best}**
Great Kruger	750	1200	1500	100%	1200
Northern Limpopo	500	1250	2000	80%	1563
Waterberg & Mpumalanga	400	850	1600	80%	1063
Northern KwaZulu-Natal	200	400	600	90%	444
Kalahari	30	50	70	90%	56
Orange River	20	30	60	50%	60
Western Cape	200	350	600	80%	438
Eastern Cape Mountain	35	40	80	65%	62
Eastern Cape Valley	30	50	150	70%	71
Wild Coast	20	30	120	100%	30
Total	**2185**	**4250**	**6780**	**86%**	**4987**

Many of the 10 identified core leopard populations are likely connected and allow for occasional movement of leopards between them (Figure 2). Dispersal among populations was included in the model as a small annual probability of leopards (ages 2 – 4 years, both sexes) moving between populations as shown in *Table 3*. These dispersal estimates were based upon expert opinion of habitat connectivity among core areas and estimated population sizes. Additional mortality is expected during dispersal due to the risk of being hit by cars, starvation, intraspecific aggression and other factors; survival during dispersal was modelled as 80% based on expert opinion.

Table 3: Annual probabilities (as percents) of dispersal from source populations (rows) to recipient populations (columns).

	Krugr	**N Limp**	**Wat/ Mp**	**KZN**	**Kala**	**Orng R**	**W Cape**	**E Cp Mtn**	**E Cp Vlly**	**Wild Cst**
Kruger	98.0	1.0	0.5	0.5	-	-	-	-	-	-
N Limpopo	0.5	98.3	1.0	-	0.2	-	-	-	-	-
Water/Mp	0.2	1.0	98.8	-	-	-	-	-	-	-
KZN	0.2	-	-	99.8	-	-	-	-	-	-
Kalahari	-	0.2	-	-	99.8	-	-	-	-	-
Orange R	-	-	-	-	-	99.8	0.2	-	-	-
W Cape	-	-	-	-	-	0.2	97.3	2.0	0.5	-
E Cape Mtn	-	-	-	-	-	-	2.0	96.0	2.0	-
E Cape Vlly	-	-	-	-	-	-	0.5	2.0	97.3	0.2
Wild Coast	-	-	-	-	-	-	-	-	0.2	99.8

Leopards are also estimated to migrate in and out of South Africa along the northern and eastern borders of the country (Figure 2). Migration rates were estimated by workshop participant base on expert opinion of Leopard behavior and habitat connectivity along trans-country boundaries. These losses and additions to the South African Leopard population were modelled as annual harvest and supplementation events in the Vortex model (Table 4). Immigrants were modelled as unrelated to the recipient population and therefore represented new genetic founders to the South African leopard population.

Table 4: Annual immigration and emigration incorporated into the Vortex model.

Population Area	Immigrants	Emigrants	Adjacent Population
Greater Kruger	5	20	Mozambique
N Limpopo	12	0	Botswana, Zimbabwe
Kalahari	10	5	Botswana
Orange River	1	0	Namibia

1.4.2 *Current global population trends*

___increasing ____decreasing ____ stable _X_ unknown

1.5 Conservation status

1.5.1 *Global conservation status (according to IUCN Red List)*

___Critically endangered
___Endangered
___Vulnerable
___Near Threatened
__X Least concern (2002)
___ Data deficient

1.5.2 *National conservation status for the case study country*

- 2004 Least Concern (Red Data Book for the Mammals of South Africa)
- 2007 Vulnerable (National List of Threatened or Protected Species)
- Appendix I CITES

1.5.3 *Main threats within the case study country*

___ No Threats
_X_ Habitat Loss/Degradation (human induced)
___ Invasive alien species (directly affecting the species)
_X_ Harvesting [hunting/gathering]

___ Accidental mortality (e.g. Bycatch)
_X_ Persecution (e.g. Pest control)
___ Pollution (affecting habitat and/or species)
_X_ Other: trade (illegal and legal) and habitat fragmentation
___ Unknown

2. SPECIES MANAGEMENT WITHIN THE COUNTRY FOR WHICH CASE STUDY IS BEING PRESENTED

2.1 Management measures

2.1.1 *Management history*

The management of Leopards is a function of the national and provincial authorities responsible for biodiversity and threatened species conservation. No national plans for Leopard conservation have however been drafted and the work of NGOs, academic institutions and private individuals has largely contributed to filling the significant gaps in Leopard conservation and management. The Population and Habitat Viability Assessment (PHVA) report produced in 2005 fulfils the role of a current national management plan for Leopards and has catalysed much conservation effort for Leopards including increased collaboration and information sharing, shared resources and improve cooperation, mostly through the establishment of the South African Leopard Forum (SALF), as an outcome of the PHVA. Thus, since 2005, an increased national effort to manage Leopards, collate and manage monitoring data, respond to human-wildlife conflict issues involving Leopards, generate improved species information and in general, to implement the recommendations arising from the PHVA, has been in place.

2.1.2 *Purpose of the management plan in place*

- To model various scenarios for management interventions and conservation actions to recommend appropriate courses of action for improved Leopard conservation and management.
- To improve levels of coordination and collaboration between role-players in Leopard conservation.
- To improve on the availability of accurate data to guide and inform decisions on Leopard utilisation, management and conservation.
- To collate current information and to thus provide a more accurate estimation of the current status of Leopards in South Africa.
- To provide informed, practical and effective conservation and management recommendations and objectives.

- To increase awareness of the threats and issues facing Leopards in conservation circles, the media and the public.

2.1.3 *General elements of the management plan*

- Species and habitat data.
- Threats data.
- Relevant presentations and papers.
- Working Group reports on population and biology, habitat and movement, human-wildlife conflict, population dynamics and modelling and utilisation and policy development.
- Management and population dynamics scenario modelling.
- Conservation and management recommendations and options.
- Stakeholder information.
- Relevant appendices, references and supportive information.

2.1.4 *Restoration or alleviation measures*

The PHVA report contains information on proposed management and utilisation options for improved population management, research recommendations, policy interventions and the need for urgent controls to be implemented to curb illegal offtake as the primary restoration measure. Scenarios modelled included future development in the Waterberg/Mpumalanga area (with a net loss of 15% of carrying capacity for Leopards and increase of 5% in illegal harvest), potential outbreak of distemper, corridor development among key populations (Orange River, Western Cape, Eastern Cape Mountain, Eastern Cape Valley, and Wild Coast), increased habitat (i.e., carrying capacity) for small populations, and elimination of illegal harvest.

2.2 Monitoring system

2.2.1 *Methods used to monitor harvest*

There are no formal, national monitoring programs for Leopards in South Africa. A number of projects have been established in recent years in southern Africa to conserve Leopards and their habitats and these are being implemented by non-governmental organizations, provincial nature conservation authorities and universities. There is however, little coordination of or collaboration between these activities and many operate in isolation of one another. It has been identified that accurate data on Leopard distribution, populations and status are fundamental to our ability to make sound, informed decisions, as information is sorely lacking for the species throughout its range. It has furthermore been urged that South Africa undertakes research and censusing projects to develop more accurate estimates of the national Leopard population. In response to this, in recent years, the efforts by some provincial authorities (for example CapeNature, Ezemvelo KwaZulu-Natal Wildlife and Mpumalanga Parks) have increased, in collaboration with numerous NGOs (Cape Leopard Trust, the Endangered Wildlife Trust, KERI Research, De Wildt Cheetah and Wildlife Trust and others) and most of the relevant role-players in Leopard conservation and research are members of the recently formed South African Leopard Forum (SALF) – primarily in response to the Leopard PHVA outcomes.

The South African government, through the Department of Environmental Affairs and Tourism (DEAT) reviews applications for CITES permits and thus, monitors legal, permitted trade through the CITES quotas.

2.2.2 *Confidence in the use of monitoring*

Monitoring of Leopard population, trends, distribution and offtake remains one of the biggest problems facing the species and the confidence levels are very low.

2.3 Legal framework and law enforcement: Provide details of national and international legislation relating to the conservation of the species

Leopards are included on CITES Appendix I. They are formally protected in most of the Asian range states: Armenia, Bangladesh, Cambodia, China, Georgia, India, Indonesia, Iran, Israel, Jordan, Laos, Malaysia, Nepal, North Korea, Pakistan, Russia, Saudi Arabia, Sri Lanka, Thailand, Turkmenistan, Uzbekistan and Viet Nam. In Africa, most countries also prohibit hunting: Algeria, Angola, Benin, Burkina Faso, Cameroon, Congo, Democratic Republic of Congo, Djibouti, Egypt, Equatorial Guinea, Gabon, Ghana, Guinea Bissau, Ivory Coast, Liberia, Mali, Mauritania, Morocco, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, Somalia, Sudan, Togo and Uganda (Nowell & Jackson 1996).

Data obtained from UNEP-WCMC from 1999 to 2002 indicates that South Africa mainly exported hunting trophies, skins and parts and derivatives obtained from hunting trophies.

In South Africa the Leopard is protected in all National Parks and government nature reserves. Leopards occurring outside protected areas are protected through their listing on the Threatened or Protected Species (ToPS) list and the associated regulations, promulgated under the National Environmental Management: Biodiversity Act (2004) which classifies the Leopard as Vulnerable and which implies a level of regulatory protection for the Leopard. Provincial nature conservation authorities are required to issue permits to hunt, catch, sell, import, convey, kill or export any Leopards under this legislation. Permits are issued upon a written application and each application is handled on its merits in accordance with environmental legislation and policies.

3. UTILIZATION AND TRADE FOR RANGE STATE FOR WHICH CASE STUDY IS BEING PRESENTED.

3.1 Type of use (origin) and destinations (purposes)

I. Fur / pelts; commercial trade (for clothing, handbags etc) as well as domestic, as symbols of power and strength
II. As a totem or symbol for many sects or tribes
III. Trophies as one of the 'Big Five'
IV. Parts (bones, teeth etc)

No utilization of captive-bred Leopards has been recorded and all captive management and breeding of Leopards is regulated by the ToPS regulations under the National Environmental Management: Biodiversity Act (10 of 2004).

National Environmental Management: Biodiversity Act, 10 of 2004

- A person may not carry out a restricted activity involving a specimen of a listed threatened or protected species without a permit.
- The Scientific Authority is required to carry out non-detriment findings on trade in specimens of listed threatened or protected species

3.2 Harvest

3.2.1 *Harvesting regime*

Leopards are not only harvested as trophies, but are persecuted as a result of human-wildlife conflict in which Leopards are blamed for livestock losses and depredation, often not as a result of the Leopard but other carnivores (including domestic dogs). They are also persecuted in response to competition for resources as they compete directly with people on commercial game farms for their natural prey (wild ungulates). The harvesting or persecution of Leopards is not seasonal but may increase (in the case of human-wildlife conflict) in breeding seasons due to increased conflict. As Leopards seldom prey on calves of all large ungulates older than 4-6 months, depending on the breed and size (Balme, pers comm.), many cattle ranchers have learned to confine breeding cows before they calve to paddocks adjacent to the homestead, only allowing them to return to paddocks where predation is a risk, when calves are big enough to be at a lesser risk.

3.2.2 *Harvest management/ control (quotas, seasons, permits, etc.)*

In 1983, CITES approved the first requests from seven southern and East African nations to export Leopard skins. The Leopard remains today a CITES Appendix I species, banning commercial trade in skins, but permitting import and export of hunting trophies between countries. By 2005, 11 nations were permitted exports of Leopard trophies under the approval of CITES. Although commercial trade remains prohibited, quotas can include skins from animals killed in government 'problem animal control' operations which is why Leopard skin rugs are sometimes for sale in the airport curio shops of these countries. In total, the number of Leopards approved by CITES for export each year was 2 345 but in 2004, at the 13th CITES Conference of the Parties held in Thailand, this was increased to almost 2 500. This increase was partly due to South Africa applying for an increase in their CITES quota for Leopard trophy exports from 75 to 150. Concern from a number of Parties (including the governments of Cameroon and India and TRAFFIC, the Wildlife Trade regulation body) was expressed over this increase and South Africa was urged, at this conference, to undertake a Leopard census and to improve the available information on Leopard numbers (Hunter & Balme 2004).

In South Africa CITES quotas for Leopard trophies remains at 150 exports per annum. These are however not allocated to provinces based on local take-off potential but rather, on a basis of equitable distribution of the quota and provincial requests. CITES quotas are not based on reliable data on Leopard numbers or trends in any of the countries trading in Leopards.

3.3 Legal and illegal trade levels

Harvest: Leopards are removed from the population each year through a variety of legal and illegal methods. The number of individuals removed each year through trophy hunting, legal and illegal local hunting, and the removal of problem animals was estimated at the PHVA by the workshop participants based on a facilitated plenary discussion based on expert opinion (*Table 5*). Removals were assumed to be adults of equal sex ratio, except for trophy hunting (60% male, 40% female).

Table 5: Annual harvest modeled in each population due to legal and illegal removal methods.

Population Area	Trophy hunting	Local Hunting Legal	Local Hunting Illegal	Problem animals	Total
Great Kruger	6	0	2	2	10
N Limpopo	25	10	40	15	90
Waterberg / Mp	25	10	40	15	90
KwaZulu-Natal	5	2	20	10	37
Kalahari	0	0	2	0	2
Orange River	0	0	2	2	4
Western Cape	0	0	3	4	7
E Cape Mountain	0	0	6	2	8
E Cape Valley	0	0	4	2	6
Wild Coast	0	0	2	0	2
Total	**61**	**22**	**121**	**52**	**256**

The PHVA workshop modelled various scenarios for Leopard conservation and management including trade (illegal and legal) reduction and management options for harvesting. The following results were obtained, based on the available data at the time:

Harvesting Strategies

The removal of Leopards can have major impacts on the persistence and viability of local populations and the number and distribution of Leopards across South Africa. The effects of harvest depend upon the number, sex and location of the Leopards harvested. Several harvesting strategies were explored with the Vortex model to evaluate these effects.

Current Harvest Levels

Model projections over a 100-year timeframe using current best estimates of Leopard population size, structure, and harvest levels (quota = 75) result in a persisting Leopard metapopulation in South Africa (mean population size of 4025 leopards with 0% risk of extinction). Populations in the core areas of Kruger, N. Limpopo, West Cape, and Kalahari show no risk of extinction and may serve as strongholds for the species. The East Cape Valley and Wild Coast populations are at high risk of extinction, and the remaining four populations show moderate risk of extinction, typically within the next few decades under current conditions.

Removing All Harvest

Eliminating all harvest from the model results in the persistence of all 10 local populations and the maintenance of about 5000 Leopards in South Africa (vs. about 4000 projected by the baseline model with current estimated harvest levels).

Removing Illegal Harvest

Illegal local hunting accounts for 47% of the annual harvest in the Vortex model and affects every Leopard population. Elimination of illegal hunting from the model has a very significant impact on the persistence of local populations; all populations are projected to have zero risk of extinction in the next 100 years (except for Wild Coast, which has a 1% probability of extinction) (*Table 6*). Model results suggest that even the smaller Leopard populations might be able to withstand the removal of occasional problem animals if illegal hunting is eliminated. Estimates of the rates of illegal hunting are uncertain, as by definition these activities are not permitted and often go undetected. Efforts to document and reduce / eliminate illegal removal of Leopards, particularly from the smaller populations and from KwaZulu-Natal, would help to improve the viability of these local populations.

Table 6: Effect of removing illegal harvest on Leopard populations.

Population Area	**PE_{100}**		**Mean Pop. Size (extant)**	
	Baseline	**No Illegal Harvest**	**Baseline**	**No Illegal Harvest**
Kruger	0	0	1184	1182
N Limpopo	0	0	1512	1545
Waterbg / Mp	0.08	0	619	1042
KwaZulu-Natal	0.32	0	322	436
Kalahari	0	0	56	56
Orange River	0.25	0	50	58
W Cape	0	0	425	429
E Cape Mtn	0.23	0	29	61
E Cape Vlly	0.87	0	27	69
Wild Coast	0.99	0.01	19	28
Metapopulation	0	0	4025	4909

CITES Hunting Quota: Number of Leopards

At the 2004 CITES CoP meeting, the annual quota for Leopard hunting trophies and skins in South Africa was increased from 75 to 150 individuals. The impact of this quota increase is unknown, and the development of a Vortex model to assess this factor was a primary concern of the PHVA workshop participants. The baseline and other scenarios incorporated the effects of the past quota of 75 Leopards, specifically by removing adult Leopards (60% male, 40% female) annually from four populations – Kruger, Limpopo, Waterberg / Mpumalanga and KwaZulu-Natal. Although 75 Leopards are allotted in this quota, participants estimated that only about 61 Leopards are removed annually, as some permits have been issued in the past without a Leopard being taken. Several model scenarios were run to assess the impact of increasing the CITES quota while retaining other sources of harvest. Quota levels tested (with full removal) were 0, 75, 90, 105, 120, 135 and 150 (see Table 7 for quota distribution for these scenarios).

Table 7: Quota distribution among populations used in the Vortex model.

Population	**Base**	**0**	**75**	**90**	**105**	**120**	**135**	**150**
Kruger	6	0	6	8	10	12	14	16
N Limpopo	25	0	30	36	42	48	54	60
Waterbg / Mp	25	0	30	36	42	48	54	60
KwaZulu-Natal	5	0	5	6	7	8	9	10
E Cape Mtn	0	0	4	4	4	4	4	4
Total removed	61	0	75	90	105	120	135	150

The number of Leopards harvested through trophy hunting in the range tested (0 to 150 annually) had no effect on the persistence of Leopards in Kruger, Limpopo, Kalahari and Western Cape, despite the fact that much of the harvest occurs in Kruger and Limpopo. The risk of extinction over 100 years remains zero for these populations; mean population size was also relatively unaffected except for Limpopo, where numbers decline slightly. Orange River, Eastern Cape Valley and Wild Coast populations are also relatively unaffected, as no Leopards are removed via trophy hunting from these populations.

As might be expected, Eastern Cape Mountain shows a sharp increase in risk of extinction with all levels of trophy hunting due to the constant removal of four Leopards per year under all quota levels. The allotment of four trophy permits per year to this area increases the risk of extinction in 100 years from 28% to over 60%. Surviving populations average 3-4 animals, possibly emigrants from adjacent populations and suggesting that a resident population may not persist. This small population cannot sustain this level of removal in combination with other threats.

The remaining two populations, Waterberg / Mpumalanga and KwaZulu-Natal, are subject to trophy hunting and become smaller and more susceptible to extinction as hunting quotas increase (Figure 3). The probability of extinction for the Waterberg population increases from 16% to 25% with the increase in quota from 75 to 150 Leopards. Of more concern, however, is the significant decline in mean population size with increased hunting, from over 1000 Leopards with no trophy hunting to 464 with a quota of 75 to only 6 Leopards with the quota of 150. At the 105 level (which equals the annual removal of 42 Leopards from Waterberg), the mean population size drops below 100, suggesting that this level of removal puts this population at high risk.

Increased trophy hunting has the greatest impact on population persistence for the KwaZulu-Natal population, with the risk of extinction rising from 11% with no hunting to 62% under the 150 quota scenario (Figure 3). Mean population size drops from 393 to 217. Despite the relatively large current population size and estimated carrying capacity, the removal of 2-3 additional Leopards per year put this population at substantially greater risk.

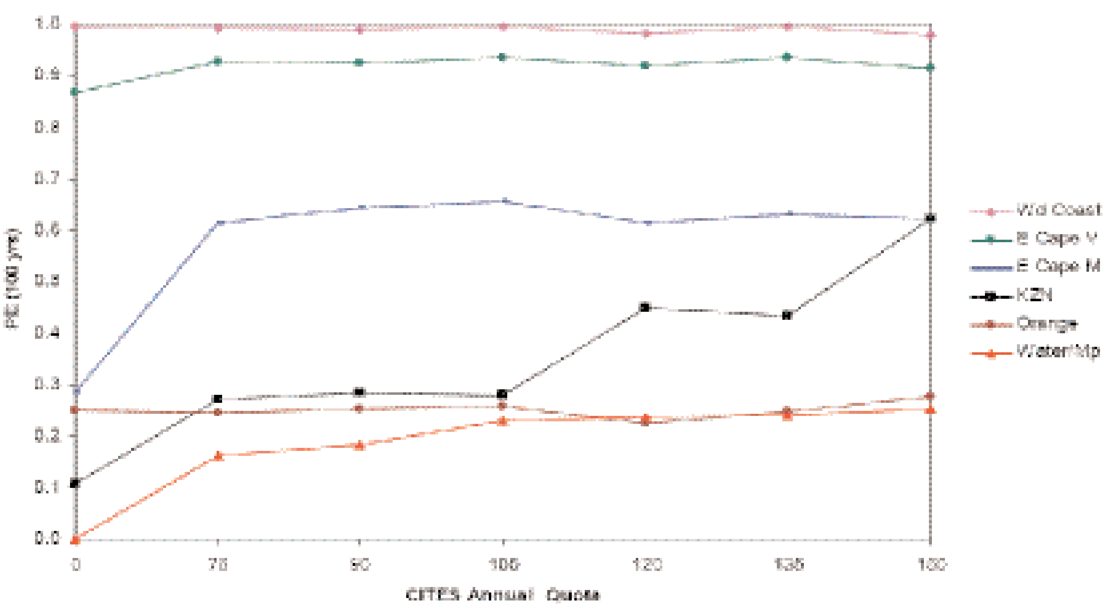


Figura 3: Effect of CITES quota on probability of extinction of Leopard populations.

Because many of the larger Leopard populations have no projected risk of extinction, the increase in the CITES quota from 75 to 150 Leopards does not increase the risk of extinction of Leopards in South

Africa over the next 100 years. The total number of Leopards living in South Africa, however, decreases with increased quota levels, due to the decreasing population size and higher risk of extinction of many of the local populations. Mean metapopulation size falls from 4631 with no trophy hunting, to 3844 with a quota of 75 to 3196 with the 150 quota, representing a decline in saturation from 93% to 64% of the carrying capacity of the habitat. These results suggest that the effects of increased quotas will depend in part upon the areas from which Leopards are taken and can lead to local extinctions and reduced population size.

CITES Hunting Quota: Targeting Males

In polygynous species the removal of breeding age females generally is more detrimental to the population than the removal of adult males. Since a male can mate with more than one female, fewer males are required to maintain the same level of reproduction, while the loss of females reduces the reproductive potential of the population and decreases its ability to respond to reductions in population size. It would be difficult to restrict illegal (and perhaps legal) local hunting and the removal of problem animals to males only, and in fact some populations might not be able to withstand the loss of a large proportion of males each year given the already female-biased sex ratio. However, it may be more feasible and desirable to target adult males for trophy hunting. Vortex was used to explore the effect of hunting males only in conjunction with the CITES quota.

Table 8 gives the results for harvesting 60% males (current situation) vs. 100% males via trophy hunting; all other sources of harvest in the model include equal sex ratio. The effects of only male trophy hunting are modest. Waterberg and Eastern Cape Mountain populations have a lower risk of extinction but few Leopards persist in these areas (probably consisting of immigrants from adjacent populations). The risk of extinction for the KwaZulu-Natal population is substantially lower and mean population size is higher, suggesting that a male-biased sex ratio of trophy hunting may be beneficial in this area. Mean population size is slightly higher in Limpopo and for the entire metapopulation with male-biased trophy hunting.

CITES Hunting Quota: Targeting Problem Animals

When large carnivores such as Leopards live in close proximity of human-inhabited areas, conflicts arise when livestock or human lives are threatened. Workshop participants estimated that about 50 problem Leopards are removed each year from South Africa due to such conflicts. One potential harvest strategy is to target these problem animals when hunting Leopards under the CITES quota. This in effect would reduce the number of Leopards removed from the population while satisfying both needs. To investigate this strategy, the 150 Quota scenario was tested with 30 of the 150 Leopards hunted being problem animals in Limpopo (11), Waterberg / Mpumalanga (11), KwaZulu- Natal (7), and Eastern Cape Mountain (1), with 60% of them being males.

In this scenario, hunting of problem Leopards for trophies has small effect in Limpopo (larger mean population size) and no effect on the Eastern Cape Mountain population (*Table 8*). Although the risk of extinction remains the same for Waterberg / Mpumalanga, the mean population size of surviving populations increases from just a few animals to 63, suggesting the survival of a small resident population. The greatest impact can be observed in KwaZulu-Natal, where the risk of extinction drops from 62% to 14% and mean population size almost doubles. There is a small increase in the metapopulation under this strategy.

The net impact of targeting problem animals is to reduce the removal of Leopards from the population. The effectiveness of this strategy will depend heavily upon the population area(s) from which problem Leopards are removed.

Table 8: Effect of sex ratio & inclusion of problem animals in trophy hunting takes on Leopard populations.

	Kruger	Limpopo	Water/Mp	KZN	ECape M	Metapop
PE						
60% male	0	0	0.25	0.62	0.62	0
100% male	0	0	0.19	0.37	0.51	0
Incl. 30 prob.	0	0	0.24	0.14	0.59	0
Mean Population Size						
60% male	1176	1409	6	217	4	3196
100% male	1180	1505	7	343	5	3435
Incl. 30 prob.	1176	1481	63	376	4	3554

Sustainable Harvest for Local Populations

Each local population differs in its ability to withstand harvest. This complicates the assessment of various quota levels or the effects of targeting problem animals for trophy hunting, as the impact of the same strategy will differ depending upon the distribution of harvest across the Leopard's geographical range in South Africa. To address this issue, the baseline model was used to vary annual harvest levels in each population separately to estimate the maximum level of annual harvest that would meet the PHVA workshop population goals of zero extinction risk for Kruger, KwaZulu-Natal, Kalahari and Western Cape populations and PE < 5% for the remaining six populations.

This analysis resulted in the following estimates for the maximum annual harvest from each population area (*Table 9*). Harvest here includes the loss of Leopards from all sources outside of normal mortality, including trophy hunting, legal and illegal local hunting, removal of problem animals, and emigration of Leopards out of South Africa. Harvest numbers indicate the maximum annual harvest for each population that does not exceed the risk of extinction specified in the PHVA population goals and results in a positive stochastic growth rate. In this scenario, up to 350 adult Leopards (53% males) can be removed each year without unacceptable risk to the populations. All local populations have a low risk of extinction in 100 years, and all populations except the Wild Coast maintain high levels of genetic variation. Mean population size is more variable for Kruger, Limpopo, Kalahari, Western Cape and the metapopulation as a whole as compared with the baseline model (as these are the populations that experience increased harvest under this scenario), while other local populations are more stable in size with lower harvest rates.

Table 9: Results of maximum harvest model on Leopard populations (at 100 years).

Population Area	**Total Harvest**	**PE**	**Stoch r**	**Mean N (extant)**	**SD (N)**	**% K**	**GD**	**Mean TE**
Kruger	85	0	0.006	791	482	66	0.980	0
N Limpopo	127	0	0.012	1106	603	71	0.991	0
Watergr/Mp	74	0.05	0.033	991	127	93	0.990	50
KwaZulu-Natal	23	0	0.052	431	25	97	0.997	70
Kalahari	16	0	0.32	38	17	68	0.997	0
Orange River	3	0	0.081	58	5	97	0.946	32
W Cape	12	0	0.044	419	28	96	0.964	0
E Cape Mtn	7	0.01	0.065	57	11	92	0.946	35
E Cape Vlly	3	0	0.068	68	5	96	0.936	16
Wild Coast	0	0	0.072	28	4	94	0.683	60
Metapop	350	0	0.034	3936	1054	79	0.996	0

Current estimates from the PHVA workshop include an annual loss of 77 animals through emigration and the removal of problem animals – sources of loss that may be difficult to manage. Participants estimated another 143 Leopards lost through legal and illegal local hunting, leaving about 130 animals to be harvested through trophy hunting under the maximum harvest strategy. Figure 4 compares the mean metapopulation size projected over the next 100 years with no trophy hunting (Quota 0), current baseline conditions (quota of 75, with actual removal of 61 Leopards annually), new increased quota of 150, and the maximum harvest strategy (approximate quota of 130 given no reduction in local hunting or removal of problem animals). With no trophy hunting, metapopulation size remains relatively stable at current levels. All CITES harvest levels are projected to result on average in population reduction due to local declines and extinctions (but not increased risk of extirpation of Leopards from South Africa). The maximum harvest level closely mirrors the baseline projection but includes the removal of an additional 69 Leopards annually, illustrating the importance of the area from which Leopards are harvested.

The number of Leopards that can be harvested from each population is specific to the input values in this Vortex model (i.e., age- and sex- specific demographic rates, population size and structure, dispersal and migration rates, and harvest estimates) most of which include some level of uncertainty. Therefore, these results should be viewed cautiously and used only as relative guidelines. As better estimates become available regarding rates of loss through these various causes, and as better demographic and population information becomes available, it will be possible to make more confident projections regarding how many Leopards can be sustainably removed both locally and nationally.

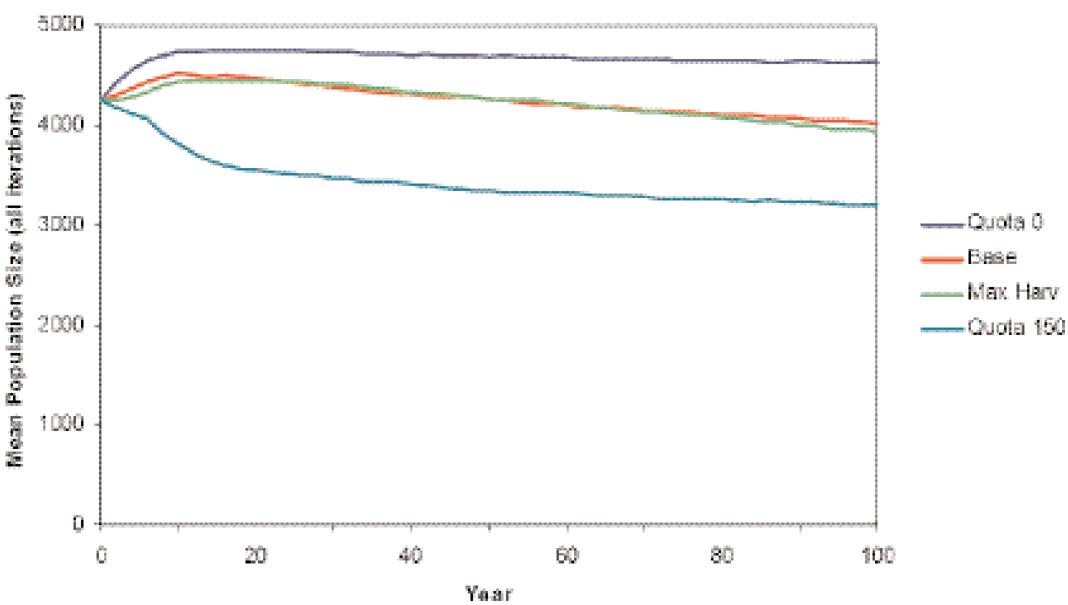


Figura 4: Mean metapopulation size with CITES quotas of 0, 75 (baseline) and 150 compared with maximum harvest strategy.

II. NON-DETRIMENT FINDING PROCEDURE (NDFS)

The PHVA workshop, Vortex modelling and the final report form the basis of this finding. A Population and Habitat Viability Assessment (PHVA) workshop brings together a diversity of stakeholders in a structured and facilitated setting to identify, describe and analyze the primary threats to the target species, and to develop goals and recommended actions to address these threats. A stochastic population model is developed using input parameter values based on published data and the consensus expert opinion of the participating stakeholders; this model is then used to project the relative viability of the target population under current and alternative management scenarios. Thirty-three people participated in the South Africa Leopard PHVA workshop, representing the conservation NGO community, the Department of Environmental Affairs and Tourism (DEAT), various academic institutions, SANParks, provincial conservation departments, private game reserves and the Professional Hunters Association of South Africa (PHASA). A Briefing Document was made available to all workshop participants prior to the workshop, covering the latest information on Leopard biology, ecology, population dynamics and trends, distribution, threats and conservation status in South Africa. The final report was peer-reviewed by workshop participants and covered all workshop outputs, management recommendations, modelling scenarios and in essence, fulfils the role of a conservation assessment and management plan for Leopard conservation in South Africa.

1. IS THE METHODOLOGY USED BASED ON THE IUCN CHECKLIST FOR NDFs?

__*yes* ___no

To a large degree, but this was not specifically aimed for.

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED

- Type and degree of harvest: Estimates of total current and proposed levels of export, trade and offtake / harvesting
- Levels of control of harvest and offtake
- Sustainability of the metapopulation and the sub-population based on current and future scenarios and threats
- Estimates of population size and demographics and changes / trends
- Source-sink considerations and supplementation / recruitment
- Status of the species at national levels
- Biological parameters / characteristics of the species

- Threat assessments
- Distribution and population trends
- Mortality trends and demographics factors
- Genetic factors
- Breeding systems and success rates
- Habitat quality and availability
- Habitat carrying capacity
- Possible catastrophes
- Adaptive management strategies
- Management plans and strategies
- Captive breeding impacts
- Efficacy of monitoring and quality of information on the species
- Protection measures afforded to the species

3. MAIN SOURCES OF DATA, INCLUDING FIELD EVALUATION OR SAMPLING METHODOLOGIES AND ANALYSIS USED

- Publications
- Personal communication with a wide selection of stakeholders
- Reports
- Policies and legislation (provincially and nationally)
- CITES records
- Provincial and national records for trade, offtake, problem animal control
- Red Data List assessments
- Anecdotal information and accounts on illegal offtake
- Researchers', government and NGOs reports and documents
- Species management plans
- Vortex modelling was used to process data and produce management scenarios; these models were peer-reviewed by the IUCN Species Survival Commission (SSC) Conservation Breeding Specialist Group (CBSG).

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

- Peer reviewed publications were utilised
- Anecdotal information was used by consensus of the PHVA group
- Most input data were reviewed by workshop participants as they received it in a briefing book 6 weeks prior to the PHVA workshop
- All data and information sources were openly discussed and if refuted, were not used
- The final report including the assessment and recommendations were reviewed by all
- PHVA participants before finalisation.
- The final models were reviewed by the IUCN CBSG.

5. MAIN PROBLEMS, CHALLENGES OR DIFFICULTIES FOUND ON THE ELABORATION OF NDF

- Lack of accurate data on Leopard population size, status and trends
- Lack of accurate data on Leopard distribution
- Lack of data on true extent and impact of illegal offtake of Leopards
- Insufficient data on the Leopard demographic rates
- Ineffective monitoring of Leopards and data management by authorities (data accumulation, collation, access, interpretation and availability)
- Lack of capacity and resources in government to implement effective monitoring of Leopards and to implement legislation to control the illegal offtake.

6. RECOMMENDATIONS

If the current CITES quota for Leopards is fully utilized in South Africa, without allocations for the provinces being made on sustainability assessments, the CITES quota will not be sustainable and trade will possibly lead to the decline in the Leopard population.

The baseline population model for Leopards developed at the PHVA is based upon best estimates of Leopard biology and threats to South African Leopard populations and, unless otherwise indicated, assumes that these conditions will remain constant over time. Because our understanding of Leopard population biology and current status is incomplete and conditions are not likely to remain constant, it is difficult to produce accurate population projections over 100 years. However, this model is useful for predicting population trends and evaluating the relative effectiveness of various management and harvest options.

With current estimated rates of legal and illegal harvest of Leopards and movement of Leopards among populations and across international borders, model results indicate that there is little risk of extinction of Leopards in the areas of Greater Kruger, North Limpopo, Western Cape and Kalahari and therefore no risk of extirpation of Leopards from South Africa. Populations in other areas of the country (specifically, Waterberg / Mpumalanga, North KwaZulu-Natal, Orange River, East Cape Mountain and Valley, and Wild Coast) are at some risk of extinction depending upon population size and carrying capacity, demographic rates, dispersal rates among populations and harvest rates. Populations in Eastern Cape Valley and the Wild Coast in particular are highly vulnerable to extinction in the next few decades. Potential strategies to promote the persistence of these six populations include augmentation of natural corridors among adjacent populations and minimizing harvest of Leopards from these populations.

The Vortex Leopard model suggests that *some level* of controlled harvest can be sustained without unacceptable risk to the metapopulation. It is currently difficult however, due to a paucity of reliable data, to determine the exact level of harvest that is sustainable as this is dependent on demographic rates, population size and distribution, available habitat and the sex and location of harvested animals. *The maximum harvest model suggests that no more than an additional 69 Leopards and possibly fewer, can be removed from the South African metapopulation*. If these are restricted to male animals, this may have a slightly less negative impact on the smallest, most isolated populations. An increased off-take (should an increased CITES quota be fully implemented) can only be sustained in four of the populations and in the smaller populations even a slight increase in individuals taken vastly increases the possibility of local extinction.

Eliminating illegal hunting has a significant positive impact on survival of local populations, all of which will then have zero risk of extinction in the next 100 years. Improved protection of Leopards may in the long-term potentially allow an increase in legal hunting quotas. All efforts should therefore be made to minimise illegal hunting in all areas and to prevent the killing or removal of any Leopards from small, fragmented populations to reduce the risk of local extinction.

Increased population monitoring and data gathering is imperative to assess the impact of harvesting and to allow harvesting rates to be adjusted as needed. As better data on Leopard biology and populations become available, the Leopard population model can be revised to improve the ability to project the impact of harvesting on Leopard populations throughout South Africa.

LEOPARD (*PANTHERA PARDUS*) CASE STUDY

AUTHORS:
Yolan Friedmann and Kathy Traylor-Holzer

In 2004 South Africa applied for and received an increase in its CITES quota for legal take of leopards (*Panthera pardus*) from 75 to 150 individuals. In response to this proposed increased quota, the Endangered Wildlife Trust (EWT) and the IUCN Conservation Breeding Specialist Group (CBSG) conducted a multi-stakeholder Population and Habitat Viability Assessment (PHVA) workshop in 2005 to evaluate the current status of leopards in South Africa and the potential impact of increased trophy hunting through an increased quota. Published data and expert opinion were used to estimate current population size, structure, carrying capacity and loss of leopards through legal and illegal take. An individual-based computer simulation model (Vortex) was used to project population viability under various harvest regimes. Although accurate demographic, population and harvest data are scarce, the model and process suggest that increased harvest may lead to local extinctions of leopards across portions of its range in South Africa given the best estimates of population size and potential illegal take. Additional data collection and monitoring are needed to accurately project the impact of legal harvest on leopard populations.

CITES NON-DETRIMENTAL FINDING CASE STUDY FOR THE EXPORTING CRAB-EATING MACAQUES (*MACACA FASCICULARIS*) FROM CHINA

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I. BACKGROUND INFORMATION ON THE TAXA

1. BIOLOGICAL DATA

1.1. Scientific and common names

Scientific name: *Macaca fascicularis* (Raffles, 1821).
Common name: Crab-eating macaque or long tailed macaque.
Chinese name: Shixiehou, translated from Crab-eating macaque?.

1.2. Distribution

Macaca fascicularis is native to Bangladesh, Brunei Darussalam, Cambodia, India (Andaman Is., Nicobar Is.), Indonesia, Malaysia, Myanmar, Palau, Philippines, Singapore, Thailand and Viet Nam. *Macaca fascicularis* as an introduced species has established populations in Hong Kong and Mauritius (IUCN 2007).

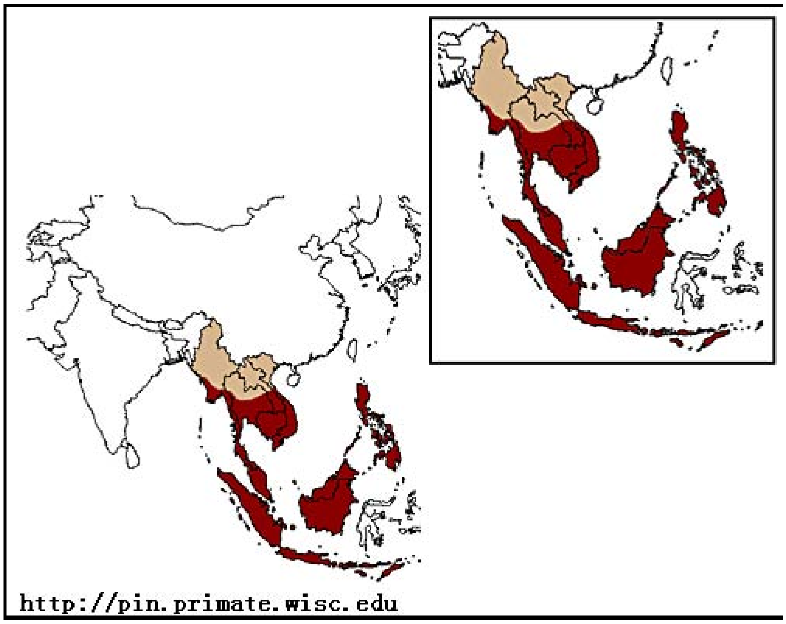

Figure 1 Distribution of *Macaca fasciculari* in the world.

1.3. Biological characteristics

1.3.1. *Summary of general biology*

Macaca fascicularis is a social animal that lives in troops from 5 to 60+ animals. These troops are multi-male groups, normally containing 2-5 males and 2-3 times as many females in strict dominance hierarchy. After a gestation period of 167-193 days, the female normally gives birth to one infant. Males reach sexual maturity at approximately 5-6 years of age and are likely to emmigrate at or near that time to find and to settle down in another troop, whereas females mature at about 4 years of age and mostly choose to stay in their birth group. Crab-eating macaques are primarily frugivory but have an omnivory diet, and exploit many different food types, such as fruits, crabs, flowers, insects, leaves, fungi, grasses and clay, reflecting the diversity of habitats the macaque utilizes (Groves, 2005).

1.3.2. *Habitat types*

Macaca fascicularis is "ecologically diverse." Some of the habitats in which they have been found are primary forests, disturbed and secondary forests, and riverine and coastal forests of nipa palm and mangrove. However, *Macaca fascicularis* lives most successfully in disturbed habitats and on the periphery of forests (Groves, 2005).

1.3.3. *Role of the species in its ecosystem*

Crab-eating macaques are opportunistic mammals and reach higher densities in degraded forested areas, including habitats highly disturbed by humans. The macaques may negatively impact biodiversity by eating the eggs and chicks of endangered forest birds. They also compete with native birds for resources such as native fruits. On the hand, the crab-eating macaques facilitate the dispersal of seeds of exotic plants. Crab-eating macaques raid on sugar cane and other crops, affecting agriculture and livelihoods of those villagers who live near habitat of crab-eating macaques, and the macaques can be aggressive towards humans. Crab eating macaque is listed in "100 of the world's worst invasive alien species" by Invasive Species Specialist of IUNC (IUCN, 2008). Crab-eating macaques may carry potentially fatal human diseases, including B-virus.

1.4. Population:

1.4.1. *Global Population size*

Macaca fascicularis is the primate species with the third largest range after human and rhesus monkey. Although the estimation of its global population has note been reported, *Macaca fascicularis* is abundant in its core ranges according to reports (Groves, 2005). For instances, Macaca fascicularis was described as abundant in part of Malaysia, Thailand, and Indonesia. According to the Wildlife Department's of Malaysia statistics, there are 742,000 *Macaca fascicularis* in the country, of which 258,000 are found in city areas, including Kuala Lumpur[1]. Considering the growing captive population of *Macaca fascicularis* in breeding facilities, world *Macaca fascicularis* population is stable or increase.

1.4.2. *Current global population trends:*

___increasing _X_decreasing ____stable ____unknown

1.5. Conservation status

1.5.1. *Global conservation status* (IUCN Red List: LR/nt ver 2.3 (1994)):

___Critically endangered	___Near Threatened
___Endangered	_X_Least concern
___Vulnerable	___Data deficient

1.5.2. *National conservation status for the case study country*

As a species listed in CITES Appendix ?, *Macaca fascicularis* although an exotic animal, is automatically granted the Class II Key Stat Protected

[1] The Sydney Morning Herald. Saturday August 18, 2007

Wild Animal Species status under Wild Animal Protection Law of the People's Republic of China (P. R. China). Import, export, breeding, and transportation of crab-eating macaque should first obtain permits from wild management departments of the government. For importing and exporting crab-eating macaques, the permits are also required by national CITES authorities in China.

1.5.3. *Main threats within the case study country*

___No Threats
___Habitat Loss/Degradation (human induced)
___Invasive alien species (directly affecting the species)
___Harvesting [hunting/gathering]
___Accidental mortality (e.g. Bycatch)
___Persecution (e.g. Pest control)
___Pollution (affecting habitat and/or species)
___Other_______________
___Unknown

Macaca fascicularis exported from the country are crab-eating macaques of generations lower than second generation bred in primate breading bases.

2. SPECIES MANAGEMENT WITHIN THE COUNTRY FOR WHICH CASE STUDY IS BEING PRESENTED

2.1. Management measures

2.1.1. *Management history*

Before 1980s, domestic experimental primates in the country were mostly rhesus monkey, *Macaca mulatta*. China ratifies CITES in 1982. During early 1980s, since implication open-up and market economy reform in China, the cross-border trade was booming in the country. As a result of CITES enforcement, illegal trades of the crab-eating monkeys were detained and seized along the international border trade posts in southern China. Those macaques all were sent to local wildlife rescue centres. Comparing with rhesus monkey, crab-eating monkey is easier to breed in captivity; those confiscated macaques formed the initial founder populations of crab-eating monkeys in China. Late 1980s, the international demands for primate as laboratory animals increased. Around 1990, for breeding *Macaca fascicularis*, four primate breeding companies were established. The founder animals mostly came from the crab-eating macaques kept at those local wildlife rescue centers with the breeding stocks supplemented from primate breeding centers in Southeast Asia. Mounting demands in international market for crab-eating monkey greatly stimulated the breeding of crab-eating macaques in the country. In August 2008, there are 40 primate breeding companies in the country, which keep about 170,000 crab-eating macaques mainly for the export and to meet the growth of demand for experiment animals worldwide. For standardizing the feeding standard of *Macaca* as laboratory animals, the State Forestry Administration (SFA) of P. R. China also formulized the Feeding Standards of Macaca as Laboratory Animals in 2005.

From 2004 to 2007, China imported 36,620 crab-eating macaques, and exported 12,244 crab-eating macaques. All macaque trades are with CITES permits and come from captive populations.

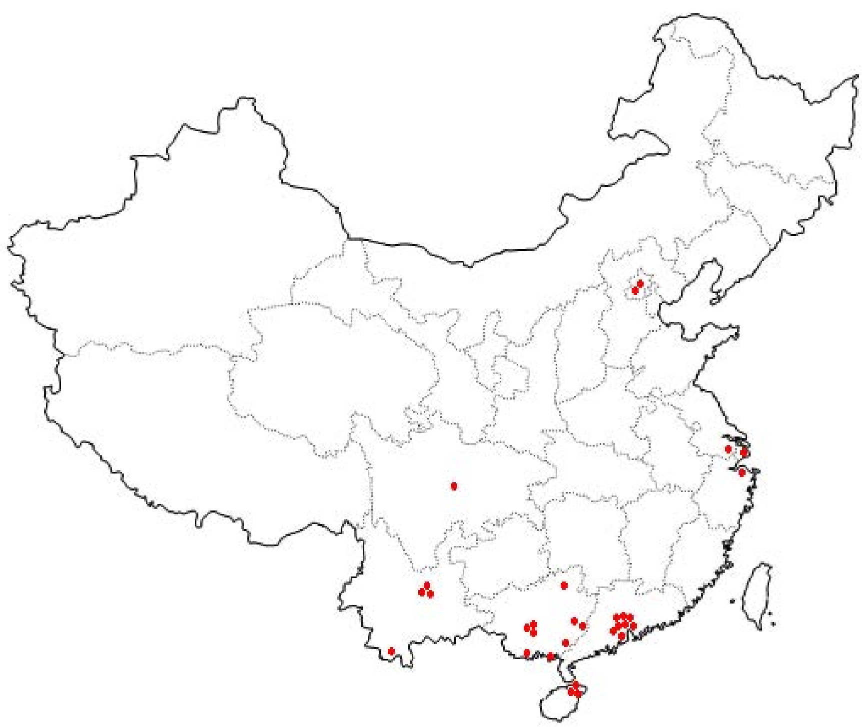

Figure 2 Major Macaca fascicularis breeding companies in China

To manage the growing crab-eating monkey breeding business in the country, China national wildlife authority (Wild Fauna and Flora Conservation Department, SFA) and national CITES authorities (The Endangered Species Import and Export Management Office of the P.R. China and Endangered Species Scientific Commission, P. R. China) have brought the international trade of crab- eating monkeys under firmly control within the frames of CITES and China national wildlife protection law.

Each primate breeding company should apply for a breeding permit, the application are evaluated before an expert commission panel meeting case by case through rigorous evaluation processes. The country is implying a microchip labeling system for all primates bred in captivity.
Chinese national CITES authorities set up an import and export quota system for *Macaca fascicularis*, annual export quota is discussed and evaluated by the wildlife experts commission. The import quota is to control the inflow of crab eating macaques even though those macaques are legally bred in artificial breeding bases abroad, while the exporting quota is for controlling the sale of artificial bred macaques to international market. Both quotas regulate the *Macaca fascicularis* population size in the country. National and provincial CITES authorities and wildlife management authorities also conduct annual or periodic inspections on these primate breeding centers.

Figure 3 A primate breeding company in the Guangxi Zhuang Autonomous Region, China (Photo, Jiang Z.)

Figure 4 A crab-eating macaque breeding facility on the Hainan Island, China (Photo, Jiang Z.)

2.1.2. *Purpose of the management plan in place*

Purpose of the management of crab eating macaque in the country is to maintain a healthy breeding stock for sustainable trade of crab-eating macaque to the international laboratory primate market.

2.1.3. *General elements of the management plan*

The Wild Fauna and Flora Conservation Department of State Forestry Administration administrates the breeding permits, transportation permits, labeling, buying and selling of all terrestrial wild animals, including primates. The national wildlife management authority is also responsible for implication of the annual primate export quota system in the country. CITES national scientific and management authorities actively involved in the annual importing and exporting quota setting process and CITES national management authority is responsible for issuing export permits for import and export crab-eating macaques. China Experimental Primates Breeding and Developing Society with all primate breeding companies as its members, negotiates minimum price, coordinates meetings, and negotiates feeding standards and breeding standards and exchanges information.

Breeding permit and export quota are decided by an expert commission panel meeting which is called in by the national wildlife management authority. The commission is composed with specialists from the national CITES scientific authority, academics and universities, wildlife society, zoos, safaris, and CITES management authority.

According to the Administration Permission Law of PRC which was put in effect in 2004, those who want to set up a primate breeding company?import and sale of artificially propagated primates should first submit applications to the provincial wildlife management authorities, the provincial wildlife management authorities then transfer the applications to the national wildlife management authority. On receiving such applications, the national wildlife management authority will inform the applicant that his/her application has been received and processed, a decision of "Yes" or "No" will be given within 20 working days after receiving his/her application. Then the expert commission panel meeting, which usually chaired the executive director of the national CITES scientific authority, will be held. The expert commission will review each application for primate breeding company case by case. During the evaluation process, applicant will first give an oral presentation of his application before the panel. The applicant is asked to present his/her wildlife breeding permits, his/her business operation licenses, certificate of the operational funds, the certificates of the veterinaries and technicians in the primate breeding company, documents of origin of the breeding herds and photos of their breeding facilities. The applicant should also demonstrate his/her company has met the requirements of sanitation and animal welfare requirements. After the presentation and documents checking, the experts will discuss the issue in a close door meeting. A notification of "Yes" or "No" decision will be reached after the meeting and the decision will be sent to the applicant with 15 days. When it is "No" decision, reasons for refusing the application will be given in the notification.

2.1.4. *Restoration or alleviation measures*

Crab-eating macaque is an exotic species to China. Restoration or alleviation measures do not apply to this case.

2.2. Monitoring system

2.2.1. *Methods used to monitor harvest*

The State Forestry Administration, national CITES management and scientific authorities closely monitor the trade of primates in the country. Such a monitoring system has several parts: the annual export quota and its modulation, issuing export permits and checking the permits at border control by custom officers, monitoring data base maintained by the national CITES authorities and annual review of the annual export quota. Experts are involved in the monitoring of harvest of crab- eating macaques.

2.2.2. *Confidence in the use of monitoring*

Until now, the country has successfully implemented a primate trade monitoring system. Monitoring of the trade of crab eating macaques in country is conducted with scientists. Experts are actively participate in the process of issuing breeding permits, setting up import and export quota, inspection of primate breeding companies. We have confidence in the use of monitoring system is because all crab- eating macaques are in captivity and under man's care.

2.3. Legal framework and law enforcement: Provide details of national and international legislation relating to the conservation of the species.

China ratifies CITES in 1982. In 2005, the State Council of P. R. China proclaimed the Regulations of the People's Republic of China on Administration of Import and Export of Endangered Wild Animals and Plants as a national law for enforcement of CITES. All international trade of endangered species must have CITES permits in the country, even those captive bred wild animals as sika deer (*Cervus nippon*) and wapiti (*Cervus elaphus*). All exporting and importing of CITES Appendix I species and the exporting the CITES Appendix II species should have a Non-detrimental Finding evaluation by national CITES scientific authority, before the national CITES management authority issuing an export or import permit. The custom officer will check the permits of each wildlife trade. For importing CITES Appendix I species, the exporting permit form the CITES management authority of the country of origin should be obtained at first hand and presented to the national CITES scientific authority before issuing an importing permit.

All primates are protected by the National Wild Animal Protect Law of P. R. China which proclaimed in 1988. It needs permits from the national wildlife management authority to capture, to breed, to transport, and to sell and buy a Class I National Protected Wild Animal, for Class II National Protected Wild Animal, it needs a permit from the provincial wildlife management authority. According to the National Wild Animal Protect Law and Regulations of the People's Republic of China on Administration of Import and Export of Endangered Wild Animals and Plants, exotic wild animals listed in CITES Appendix I, are granted the Class I National Protected Wild Animal status whereas exotic wild animals listed in CITES Appendix I, are granted the Class II National Protected Wild Animal status in the country.

Noticing the increasing demands for primates as laboratory animals in the international laboratories and booming the primate farming business, particularly crab-eating macaque farming in the country, SFA issued an official notice, The Official Notification No.124 of SFA, in 2004. In the document specifies the management of experimental monkeys, such regulations on breeding, selling quota, lowest sell price, and methods of examining the primate breeding companies.

3. UTILIZATION AND TRADE FOR RANGE STATE FOR WHICH CASE STUDY IS BEING PRESENTED

3.1. Type of use (origin) and destinations (purposes) (e.g. commercial, medicinal, subsistence hunting, sport hunting, trophies, pet, food). **Specify the types and extent of all known uses of the species. Indicate the extent to which utilization is from captive-bred, artificially propagated, or wild specimens**

Crab-eating macaques are important members of ecosystems and may serve as a basis for ecotourism ventures in the countries of origin. Along with other species of macaques, crab-eating monkeys have benefited humans through their use as research models in immunology, surgery, toxicology, and pharmacology. The crab- eating macaques which exported from China are basically for medicinal and research purposes.

3.2. Harvest:

3.2.1. *Harvesting regime*

All crab-eating macaques were harvested from captive-bred herds for exporting. Age of the export macaques are of range of 2-5 year old. Some customers may have special requirement, such as for using as model of diabetics study, experimenters may want to buy aged macaques.

3.2.2. *Harvest management/control* (quotas, seasons, permits, etc.)

Harvest quota and permits are required for harvest crab-eating macaques in China.

3.3. Legal and illegal trade levels: To the extent possible, quantify the level of legal and illegal use nationally and export and describe its nature.

In legal trade level, China CITES authorities authorized exporting of 2,580 living crab-eating macaques in 2005, 3,474 living crab-eating macaques in 2006, and 6,190 living crab-eating macaques as experimental animals in 2007. The main destination of the trade was the U.S.A. More than 5,000 units of other derivatives of crab-eating macaques such as serum, plasma, or tissues were exported from medical experiments from 2005 to 2007. Main destinations of those crab-eating macaque derivatives were Japan, U.S.A., Canada and France. Two cases of illegal imports of several hundreds living crab-eating monkeys were reported in 2004 and 2006, respectively. The smuggling of live primates were sized in southern China and detained and smugglers were prosecuted. However, the level of illegal trade of crab eating macaques was low to compare with legal tread level.

II. Non-detriment finding procedure (NDFs)

Provide detailed information on the procedure used to make the non-detriment finding for the species evaluated.

1. IS THE METHODOLOGY USED BASED ON THE IUCN CHECKLIST FOR NDFs?

__yes _X_no

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED

Criteria/parameters are needed to be considered for NDFs of *Macaca fascicularis*:

a) The *Macaca fascicularis* is artificially bred in the country with artificially bred macaques from the ranging countries as founders.
b) *Macaca fascicularis* breeding company do not require wild caught crab-eating macaques for breeding.
c) The exporting volume of captive breed *Macaca fascicularis* is small compared to the captive breed macaque population; thus such a exporting will not hinder the breeding of the population.

Methodologies can be implemented to measure them:
We are closely monitoring *Macaca fascicularis* population size and other population parameters such as birth rate, mortality, age structure under current import and export quota system in the country.

How can be those data analysed to take decisions on that species use:
a) A large scale artificial propagation of Macaca fascicularis can meet the demands for medicinal, biological, behavioral and psychological experiments.
b) Such an artificial propagation of Macaca fascicularis is self sustainable, which does not need recruitment of wild Macaca fascicularis.

3. MAIN SOURCES OF DATA, INCLUDING FIELD EVALUATION OR SAMPLING METHODOLOGIES AND ANALYSIS USED

The national wildlife management authority and national CITES authorities investigated the trade and breeding of *Macaca fascicularis* in the country. Particularly, the CITES scientific authority investigated nine *Macaca fascicularis* breeding companies of the sizes of less than 100 to more than 12,000 crab-eating macaques for writing of the NDF case study this year. The *Macaca fascicularis* breeding companies were established during the period form 1986 to 2003. The founders of the breeding herds were mainly from confiscated or imported captive bred Macaca fascicularis from Southeast Asia countries. Those breeding centers had different crab-monkey breeding capacity, the breeding cages they have ranged from 3 to 600. One male and seven to ten female monkeys are kept in a breeding cage. Average annual survival rate of captive-bred crab-eating monkeys in China is about 94%±3%. Average annual mortality of those breeding centers is about 4.3%±2.2%. Up to August 2008, there are about 170,000 crab-eating monkeys including 60,000 female and 10,000 male breeders kept in 40 breeding companies in the country. In 2007, 50,000 crab eating macaque infants were born in the primate breeding companies in China. In that case, annual quota of exporting crab-eating monkeys in China is within the level of sustainable trade. Average number of Macaca fascicularis exported from China during 2004 to 2007 was around 3,000 each year.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

The data are collected during investigation to primate breeding companies, provincial wildlife management and national CITES management authority. Data quality was cross checked with the quota of national wildlife management, national CITES management and scientific authority. The trade records were kept by the national CITES management authority of trade permits cross checked with national custom records. The case study is collaborated with specialists, officers and entrepreneurs.

Sampling size and intensity is suitable for the case study. Altogether only nine primate breeding companies in four provinces or autonomous region: Guangxi Zhuang Autonomous Region, Hainan Province, Yunnan Province and Gaungdong Province were investigated. The sampling intensity was about 20% of primate breeding companies and more than 30% of all *Macaca fascicularis* were sampled in country. The Macaca fascicularis trade and quota information are on the whole the country base.

5. MAIN PROBLEMS, CHALLENGES OR DIFFICULTIES FOUND ON THE ELABORATION OF NDF

None for the Macaca fascicularis case study.

6. RECOMMENDATIONS

1) China already has a large captive population of *Macaca fascicularis*. Under current trend, the artificially bred *Macaca fascicularis* will increase rapidly in the country. After several years, the artificially bred *Macaca fascicularis* population will excess 200,000 in the country.
2) The increasing number of the captive bred *Macaca fascicularis* in China and South-east Asian countries will not pose impacts on the wild *Macaca fascicularis* population, because captive bred Macaca fascicularis populations are large enough for those populations to self sustain.
3) We estimate the share of international market demand for macaques as laboratory animals in coming several years is between 30,000-60,000 macaques per year for China. Such a demand will be met with the current size of captive bred *Macaca fascicularis* populations in the country. The long term trend of using Macaca fascicularis in world medicinal and biological laboratories are unknown, we suggest to study world demand for *Macaca fascicularis* and to set an upper limit of captive bred *Macaca fascicularis* for curbing the rapid macaque breeding business expansion.
4) Because of the high cost in maintaining laboratory animals and animal welfare issue, many companies in developed countries want to move their animal experiments overseas, especially to the developing countries. To carter to this demand, those primate breeding companies in developing countries should be transformed into animal laboratories with experimental facilities, trained personals and advanced animal keeping and health techniques. Now the experimental tissue samples from those experiments with *Macaca fascicularis* as experimental animals are exported from China are increasing rapidly, which indicating many experiments are undergoing in the country. For example, if generally an experimental macaque may produce 20 or so samples during an experiment, the number of the macaques used in those experiments was probably large. When primate breeding companies upgraded their experimental standard, those samples may be analyzed in the primate breeding companies *in situ*.

REFERENCE

BONADIO, C. 2000. *Macaca fascicularis*. Animal Diversity Web. Accessed July 30, 2008 at http://animaldiversity.ummz.umich.edu/site/accounts/information/Macaca_fascicularis.html.

GROVES, C. 2005. Primates, in Wilson, D. E., and Reeder, D. M. (eds): *Mammal Species of the World*. 3rd edition. Johns Hopkins University Press. Pp.161-162.

INVASIVE Species Specialist Group/IUCN. *100 of the world's worst invasive alien species*. Retrieved on 2008-6-30.

IUCN 2007. *2007 IUCN Red List of Threatened Species*. IUNC.

WOLFHEIM. J. H. 1983. *Primates of the World: Distribution, Abundance and Conservation*. Routledge.

CITES NON-DETRIMENTAL FINDING CASE STUDY FOR THE EXPORTING CRAB-EATING MACAQUES (*MACACA FASCICULARIS*) FROM CHINA

AUTHORS:
Zhigang Jiang, Zhibin Meng, Yan Zeng, Zhongza, and Zhihua Zhou

Macaca fascicularis is native to Southeast Asia but is an exotic species to China. *Macaca fascicularis* inhabits in primary forests, disturbed and secondary forests, and riverine and coastal forests of nipa palm and mangrove, but it lives most successfully in disturbed habitats and on the periphery of forests. Although the estimation of its global population has note been reported, *Macaca fascicularis* population in the world is stable or increase. Global conservation status of *Macaca fascicularis* are Near Threatened and Least concern (IUCN Red List ver 2.3). As a species listed in CITES Appendix Ⅱ, *Macaca fascicularis* is automatically granted the Type II Key Stat Protected Wild Animal Species status in China. Import, export, breeding, and transportation of *Macaca fascicularis* should first obtain permits from wild management authorities. There is no threat to *Macaca fascicularis* in China. Before 1980s, domestic experimental primates in the country were mostly *Macaca mulatta*. During early 1980s, since the market economy reform in China, the cross-border trade was booming in the country. As a result of CITES enforcement, illegal trades of the crab-eating monkeys were detained and seized. Those macaques all were sent to local wildlife rescue centres, which formed the initial founder populations of *Macaca fascicularis* in China. Late 1980s, the international demands for primate as laboratory animals increased. Around 1990, four large primate breeding companies in China were established. In August 2008, there are 40 primate breeding companies in the country, which keep about 170,000 crab-eating macaques. From 2004 to 2007, China imported 36,620 *Macaca fascicularis*, and exported 12, 244. Average number of *Macaca fascicularis* exported from China during 2004 to 2007 was around 3,000 each year.*Macaca fascicularis* exported from the country are *Macaca fascicularis* of generations lower than second generation bred in primate breading bases. All macaque trades are with CITES permits and come from captive populations. The smuggling of live primates were sized in southern China and detained and smugglers were prosecuted. However, the level of illegal trade of *Macaca fascicularis* is low to compare with legal tread level. Criteria to be considered for NDFs of *Macaca fascicularis* are: (a) *Macaca fascicularis* is artificially bred in the country; (b) *Macaca fascicularis* breeding company do not require wild individuals for breeding; (c) Exporting volume of captive breed *Macaca fascicularis* will not hinder the breeding of the population. Restoration or alleviation measures do not apply to this case. The State Forestry Administration, national CITES management and scientific authorities closely monitor the trade of primates in the country. International market demand for macaques as laboratory animals in coming years should be carefully study. Because of the high cost in maintaining laboratory animals and animal welfare issue, many companies in developed countries will gradually move their animal experiments overseas, primate breeding countries.

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ENDANGERED WILDLIFE TRUST
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Leopard (*Panthera pardus*) Population & Habitat Viability Assessment 2005

LEOPARDS IN SOUTH AFRICA

Endangered Wildlife Trust

- Incomplete knowledge of Leopard life history & distribution;
- Difficulties in censusing;
- No data to support sustainable harvesting;
- Illegal killing not recorded;
- Inaccurate Leopard numbers and subpopulations are small & localised;
- Fragmented habitat & distribution;
- Ongoing conflict with farmers;

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LEOPARDS IN SOUTH AFRICA

- Loss of habitat and prey base;
- Perception & incorrect identification (94%) as livestock killer;
- Impact of current Leopard losses is impossible to determine;
- Insufficient ecological information to guide appropriate decisions on Leopard utilisation;
- Poor implementation of current legislation;
- YET, in 2004, South Africa & Namibia had an approved increase in Leopard CITES quotas from 75 – 150 animals pa.

THE POPULATION & HABITAT VIABILITY ASSESSMENT (PHVA)

- Process developed by the Conservation Breeding Specialist Group (CBSG) of the IUCN Species Survival Commission.
- Powerful tool for developing strategic recovery/ conservation plans for threatened species & their habitats globally.
- Data on population status & trends, distribution, genetics, health status, biology, threats & ecology of the species integrated with estimates of threats like land-use & utilisation patterns.

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LEOPARD PHVA APRIL 2005

- PHVA comprises plenary & working group sessions;
- Established 5 working groups:
  - Population Biology Working Group
  - Habitat & Movement Working Group
  - Conflict Management Working Group
  - Utilisation & Policy Working Group
  - Population Modelling & Dynamics Group
- Each group developed situation overview, problem statements, prioritised solutions / goals & detailed action plans with steps to achieve goals identified.

POPULATION MODELLING & DYNAMICS WORKING GROUP

- Developed a stochastic population model for best-guess projections of long-term population viability for leopards in South Africa.
- Tested management scenarios to determine if, where & how increased utilisation quotas can be implemented without risking the survival of individual subpopulations.
- Participants felt input data were not accurate but agreed that modelling could highlight critical problems & provide insight into the species’ situation and persistence.

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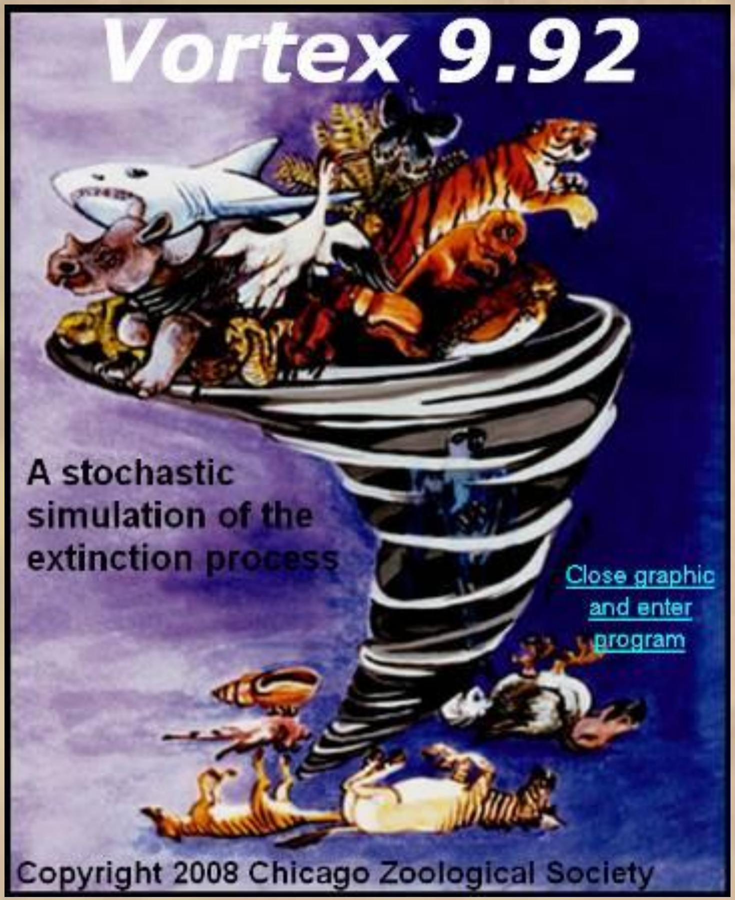
VORTEX SIMULATION MODEL



- Individual-based, stochastic population model
- Best suited for relatively small, diploid, vertebrate populations
- Used in PVAs for over 150 species
- Simulate life history events, trends, external factors & management actions
- Assess risk of extinction
- Primary threats to population viability
- Relative impacts of alternative management scenarios
- Identify gaps in knowledge

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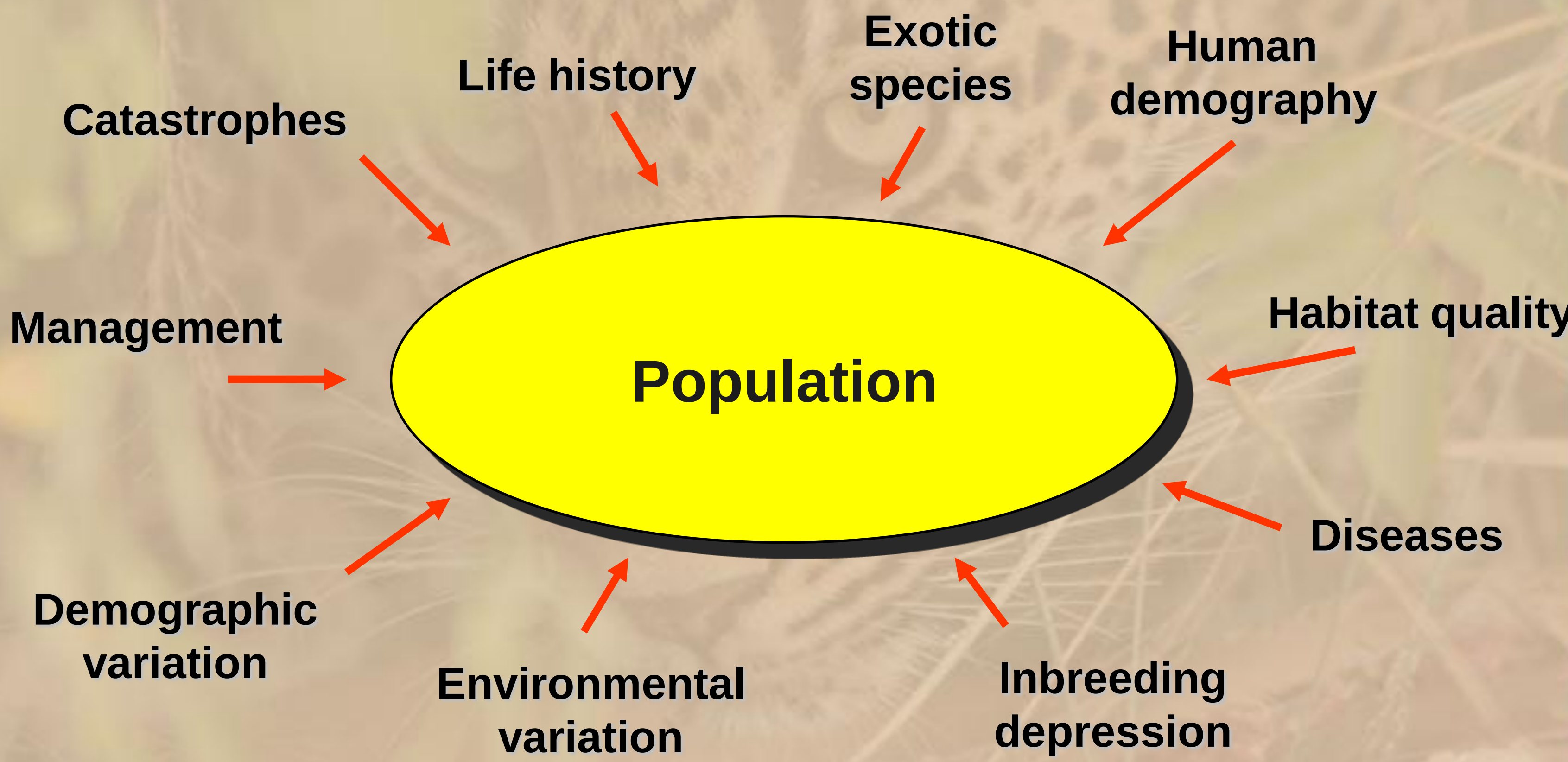
POPULATION VIABILITY ANALYSIS:

Evaluation of Interacting Factors Affecting Population Extinction



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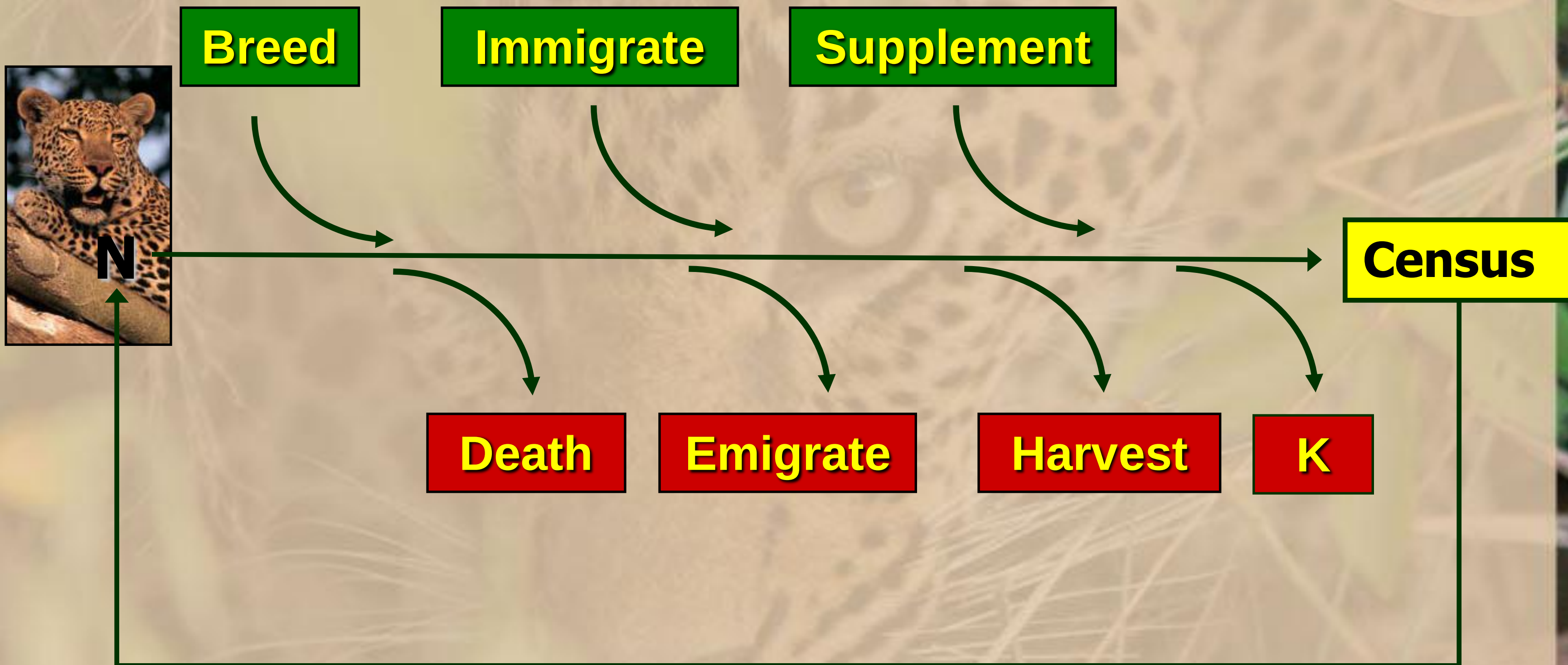
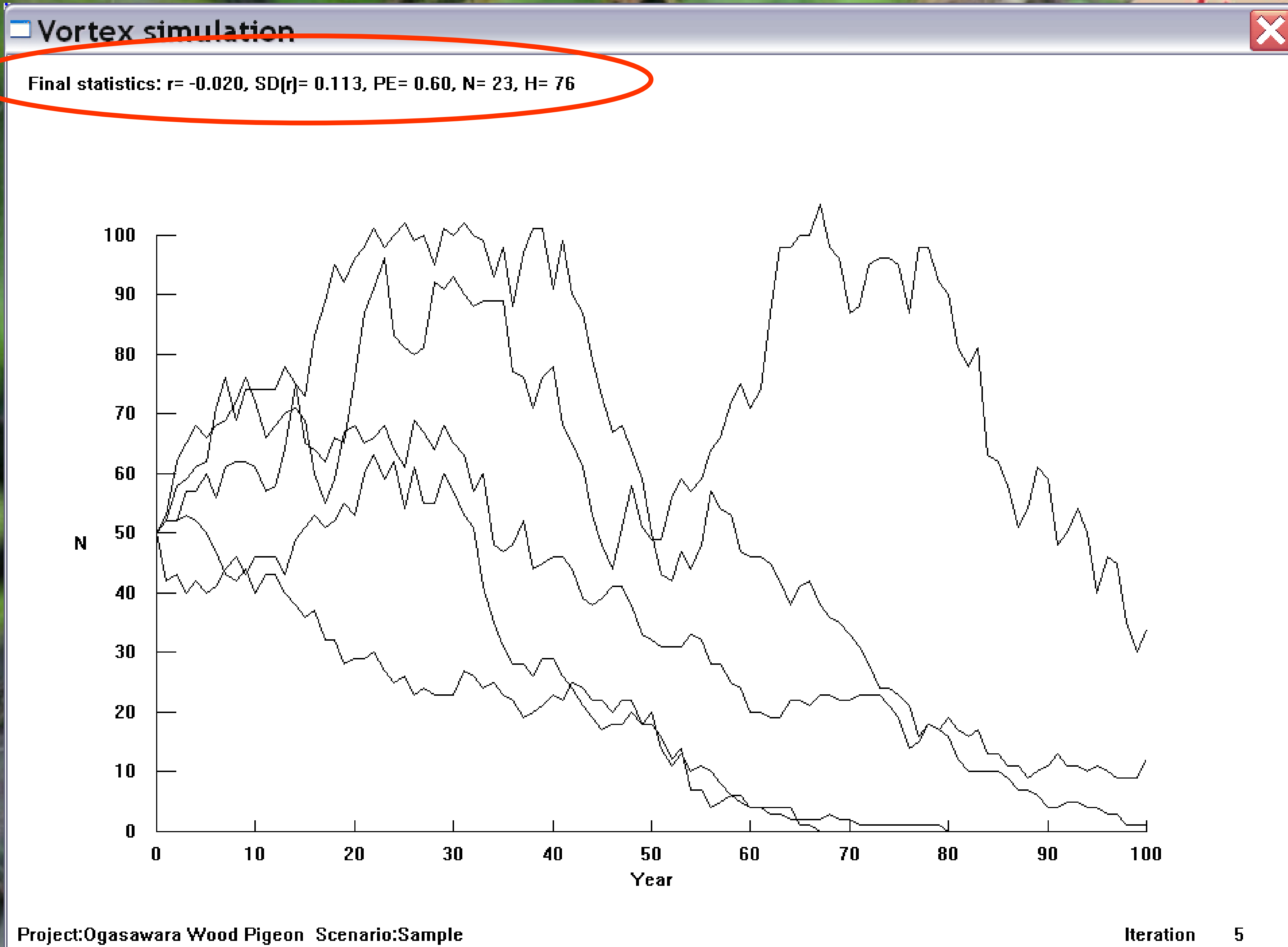
VORTEX MODEL TIMELINE



Increment One Year


Vortex simulation
Final statistics: r= -0.020, SD(r)= 0.113, PE= 0.60, N= 23, H= 76
N
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80
70
60
50
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30
20
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10
20
30
40
50
60
70
80
90
100
Year
Project:Ogasawara Wood Pigeon Scenario:Sample
Iteration 5

SIMULATION MODEL RESULTS

Distribution of outcomes across large number of runs (iterations)

- Mean population size
- Trend (population growth or decline)
- Probability of extinction
- Loss of genetic variation

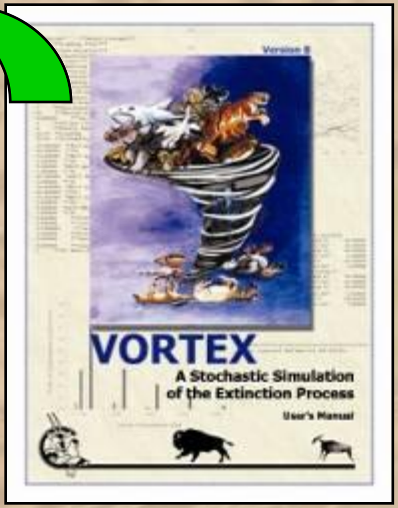
Sample outcome: 15% probability of extinction in 100 years

Compare to population goals

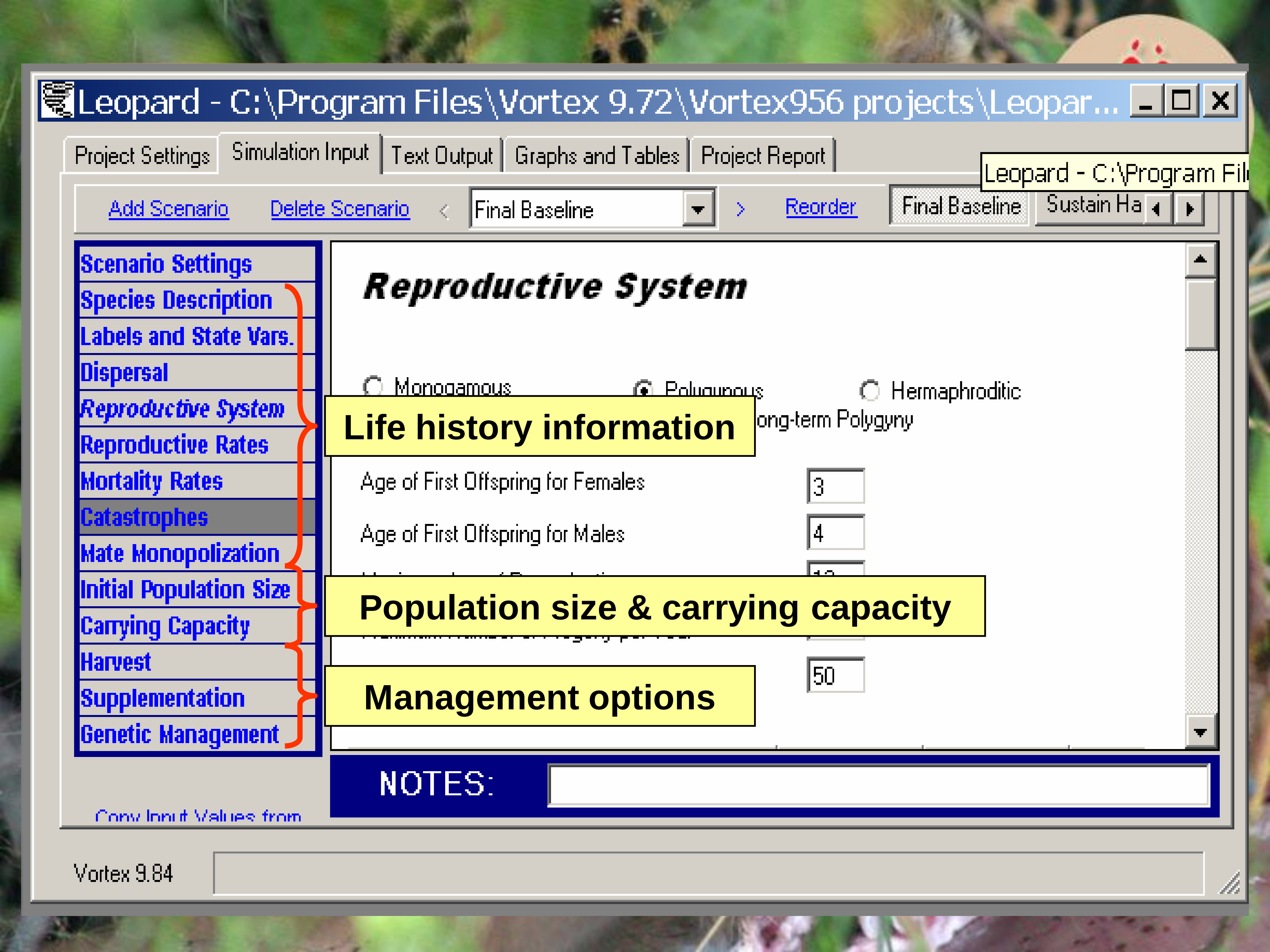
Population and Habitat Viability Assessment (PHVA)

Vortex Simulation Model

Topic-based Working Groups



Development of research and management strategy for the species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Project Report
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Add Scenario
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Final Baseline
Sustain Ha
Scenario Settings
Species Description
Labels and State Vars.
Dispersal
Reproductive System
Reproductive Rates
Mortality Rates
Catastrophes
Mate Monopolization
Initial Population Size
Carrying Capacity
Harvest
Supplementation
Genetic Management
Reproductive System
Monogamous
Polygynous
Hermaphroditic
ong-term Polygyny
Age of First Offspring for Females
3
Age of First Offspring for Males
4
50
Life history information
Population size & carrying capacity
Management options
NOTES:
Vortex 9.84

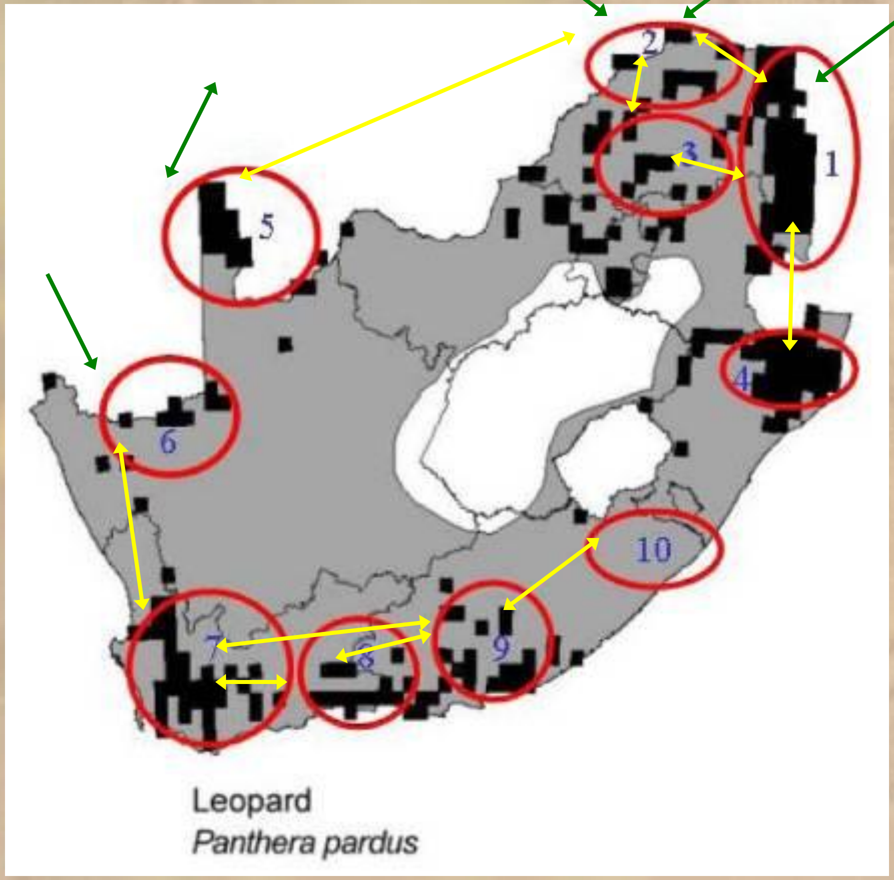
BASELINE MODEL PARAMETERS

- 500 iterations over 100 years
- Age of first offspring: 3 yrs / 4 yrs
- Interbirth interval: 2 years (50% ♀♀ breeding)
- Mean litter size: 1.92 cubs (1-4 cubs/litter)
- Maximum age: 12 yrs
- Annual mortality: 40% (juvenile); 10-14% (subadult); 5-7% (adult); 15-20% (10+ years)
- Incorporated inbreeding depression (3.14 LE)
- Incorporated annual environmental variation (20% COV) and demographic stochasticity

ATTEMPTS AT DETERMING LEOPARD NUMBERS IN SA

Martin and de Meulenaer (1988)	23,472	Linking densities with annual rainfall
Norton (1988)	2,390	Individual populations for each habitat type
Bailey (1993)	900	Density at 3.5 adults per 100 km^2, Kruger National Park
Friedmann & Daly (2004)	Between 2,500 and 10,000	For the purposes of assessing IUCN Red List Status only

TEN SUBPOPULATIONS OF LEOPARDS IN SOUTH AFRICA



1. Greater Kruger Area
2. Northern Limpopo Area
3. Waterberg & Mpumalanga Area
4. Northern KZN
5. Kalahari Area
6. Orange River
7. Western Cape
8. Eastern Cape Mountain
9. Eastern Cape Valley
10. Wild Coast

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POPULATION AND CARRYING CAPACITY ESTIMATES FOR THE 10 SUBPOPULATIONS

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Population Area	Est. Population Size			Saturation Level	Est. K_{Best}
	Min.	Best	Max.		
Great Kruger	750	1200	1500	100%	1200
Northern Limpopo	500	1250	2000	80%	1563
Waterberg & Mpumalanga	400	850	1600	80%	1063
Northern KwaZulu-Natal	200	400	600	90%	444
Kalahari	30	50	70	90%	56
Orange River	20	30	60	50%	60
Western Cape	200	350	600	80%	438
Eastern Cape Mountain	35	40	80	65%	62
Eastern Cape Valley	30	50	150	70%	71
Wild Coast	20	30	120	100%	30
Total	***2185***	***4250***	***6780***	***86%***	***4987***

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LEOPARD REMOVAL / LOSSES

- Total Leopards lost annually estimated to be **281** (only 61/75 current CITES quota utilised):
  - trophy hunting
  - legal & illegal local hunting
  - removal of problem animals
  - emigration from Greater Kruger & Kalahari populations to Mozambique & Botswana.
- Estimated 28 animals supplementing pop from Mozambique, Zimbabwe & Botswana.

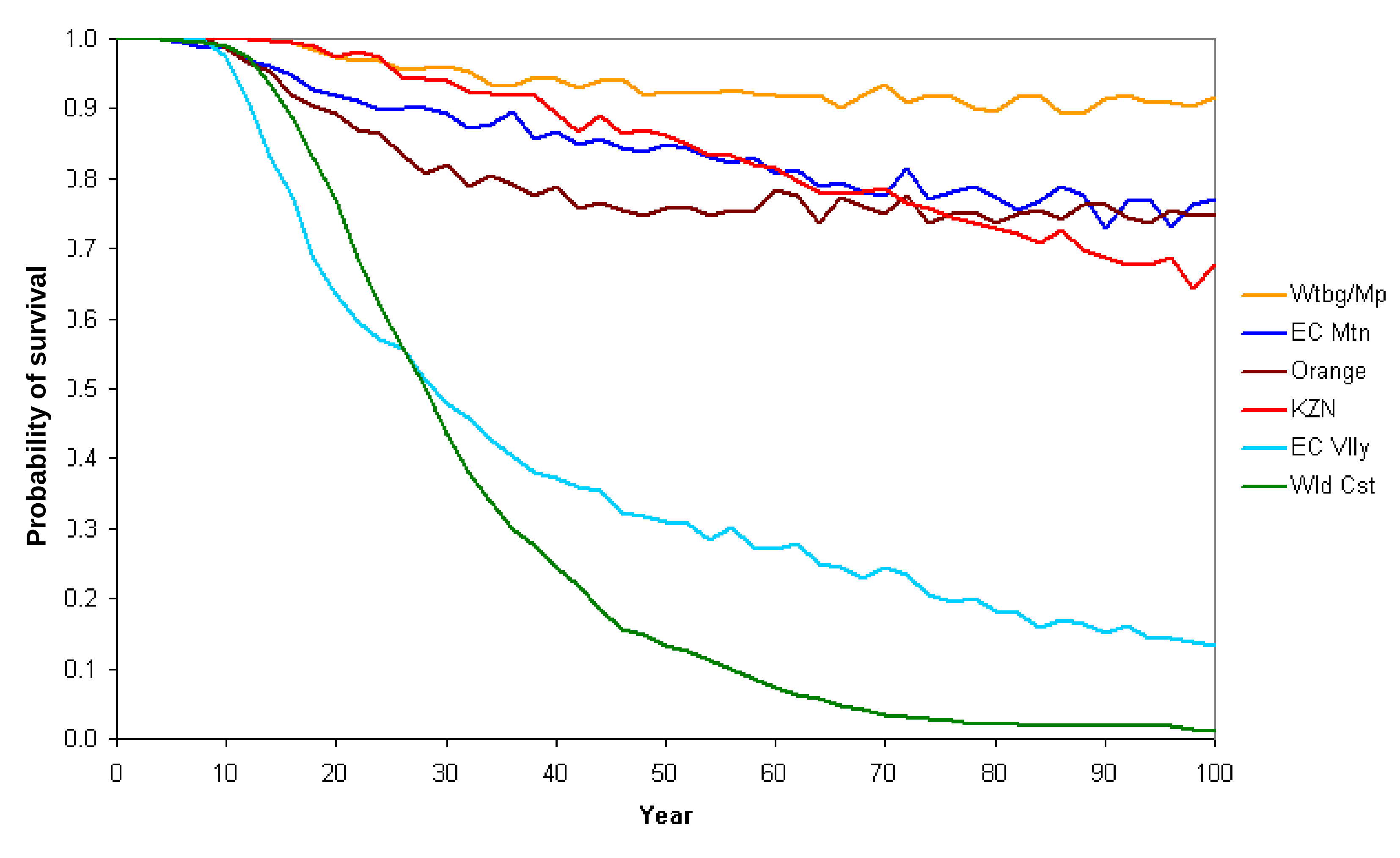
ANNUAL HARVEST MODELLED IN EACH SUBPOPULATION

Population Area	Trophy hunting	Local Hunting		Problem animals	Emigrants	Total
		Legal	Illegal			
Kruger	6	0	2	2	20	30
N Limpopo	25	10	40	15	0	90
Waterbg / Mpl	25	10	40	15	0	90
KZN	5	2	20	10	0	37
Kalahari	0	0	2	0	5	7
Orange River	0	0	2	2	0	4
Western Cape	0	0	3	4	0	7
E Cape Mtn	0	0	6	2	0	8
E Cape Valley	0	0	4	2	0	6
Wild Coast	0	0	2	0	0	2
Total	*61*	*22*	*121*	*52*	*25*	*281*

BASELINE MODEL RESULTS

- SA Leopard *metapopulation* persists over next 100 years
- Little loss in numbers or genetic diversity.
- HOWEVER fate of *individual* populations is shaky:
    - 4 populations (Kruger, Limpopo, Western Cape & Kalahari) fare well (PE=0; positive growth; high GD)
    - 4 populations (Waterberg/Mpl, KZN, Orange River & E Capt Mtn) have moderate risk of extinction and reduced population size
    - 2 populations (E Cape Valley & Wild Coast) have high risk of extinction, population decline and low GD
    - Sensitivity testing suggests that uncertainty in demographic rates only affects viability of those populations with moderate risk

BASELINE FOR 6 DECLINING POPS



Management Options: *Development*

- Development modelled with estimated loss in K of 15% & increase in illegal harvest of 5%.
- Results indicate increase in PE of local pop from 8% - 13% over 100 years & decrease in mean size of surviving pop from 619 to 460.
- Remaining pops & metapop relatively unaffected.

Management Options: *Corridors*

- Corridors modelled by doubling dispersal rate. Had little effect on metapop or bigger pops.
- Corridors between Orange River & W Cape & 3 pops of W & E Cape lowers extinction risk of Orange River & E Cape pops.
- Impact of corridors depends on movement through these areas & mortality associated with dispersal.

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Management Options: *Removing Illegal Harvest*

- Illegal local hunting estimated to account for 43% of annual harvest & affects all pops.
- Eliminating illegal hunting significantly improves persistence of local pops; all have <u>zero</u> risk of extinction in next 100 years.
- Results suggest that even small pops can withstand the removal of occasional problem animals if illegal hunting is eliminated.
- Estimates of illegal hunting are uncertain & efforts to document and reduce/eliminate illegal Leopard removal are recommended.

Management Options:

Effect of removing illegal harvest

Population Area	PE_{100}		Mean Pop. Size	
	Baseline	No Illegal Harvest	Baseline	No Illegal Harvest
Kruger	0	0	1184	1182
N Limpopo	0	0	1512	1545
Waterbg / Mp	0.08	0	619	1042
KwaZulu-Natal	0.32	0	322	436
Kalahari	0	0	56	56
Orange River	0.25	0	50	58
W Cape	0	0	425	429
E Cape Mountain	0.23	0	29	61
E Cape Valley	0.87	0	27	69
Wild Coast	0.99	0.01	19	28
Metapopulation	**0**	**0**	**4025**	**4909**

Management Options: CITES quotas

Quota distribution among populations used in Vortex model

Population	Base	0	75	90	105	120	135	150
Kruger	6	0	6	8	10	12	14	16
N Limpopo	25	0	30	36	42	48	54	60
Waterbg / Mp	25	0	30	36	42	48	54	60
KwaZulu-Natal	5	0	5	6	7	8	9	10
E Cape Mtn	0	0	4	4	4	4	4	4
Total removed	61	0	75	90	105	120	135	150

Only tested CITES quota offtake for populations likely to be utilised: Kruger, Limpopo, Waterberg/Mpl, KZN & E Cape

Management Options: CITES quotas

Throughout range (0 to 150 annually):

• no effect on pops in Kruger, Limpopo, Kalahari & W Cape;
• Limpopo numbers decline slightly;
• Orange River, E Cape Valley & Wild Coast pops relatively unaffected, as no Leopards removed via trophy hunting from these pops;
• E Cape mnts = extinction risk increases from 28% - 60% in 100 yrs) with utlisation of 4 permits pa;
• Waterberg/Mpl pop increases extinction risk from 16% - 25%
• KZN pop increases extinction risk from 11% - 62%
• Metapop: 4631 Leopards (0 quota) – 3844 Leopards (75 quota) – 3196 (150 quota) and drop in saturation from 93% - 64%.

Effect of sex ratio and inclusion of problem animals in trophy hunting takes on Leopard populations

	Kruger	Limpopo	Water/Mp	KZN	ECape M	Metapop
PROBABILITY OF EXTINCTION						
60% male	0	0	0.25	0.62	0.62	0
100% male	0	0	0.19	0.37	0.51	0
Incl. 30 prob.	0	0	0.24	0.14	0.59	0

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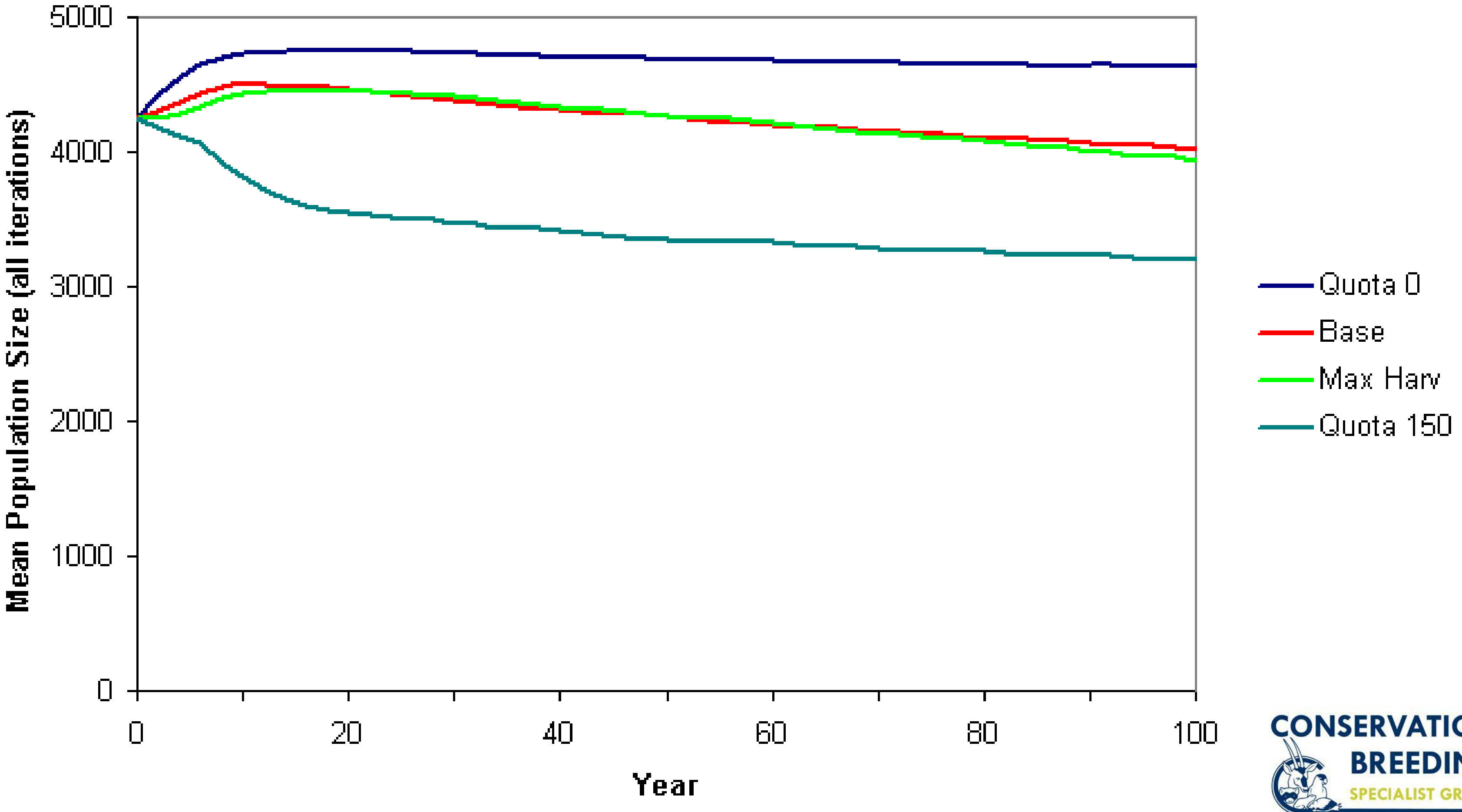
SUSTAINABLE HARVEST FOR LOCAL POPS

- Varied annual harvest levels in each pop to estimate max level of harvest that meets pop goals of *0 extinction risk* for Kruger, KZN, Kalahari & W Cape populations & PE $\leq$ 5% for remaining 6 pops.
- Harvest includes loss from all sources outside of normal mortality,
- It is estimated that **absolute max of 350** adult Leopards (53% males) can be removed pa without unacceptable risk to the metapop.
- Current estimates include annual loss of 77 animals through emigration & problem animal removal, 143 Leopards removed through legal & illegal local hunting, leaving approx 130 available for trophy hunting.
- Of remaining 130, 61 Leopards are currently taken pa under CITES quota of 75. Thus a **maximum** of another 69 animals may be hunted before extinction risks become unacceptable.

SUSTAINABLE HARVEST FOR LOCAL POPS

- This assumes that estimates of current Leopard losses are correct at 281
- If figure of actual losses is higher the no. of Leopards “available” must be reduced.
- With no off-take through trophy hunting, the metapop size remains relatively stable at current baseline model values.
- Any CITES quota off-takes will result on average in overall pop reduction, through local declines & extinctions.
- Max harvest level emphasises importance of careful selection of the geographic area from which Leopards are harvested.
- Imperative that these figures are treated with caution due to paucity of reliable data.
- Recommended that adequate resources are committed to filling data gaps & modelling revision is undertaken before quota increases are implemented.

MEAN METAPOPULATION SIZE WITH CITES QUOTAS



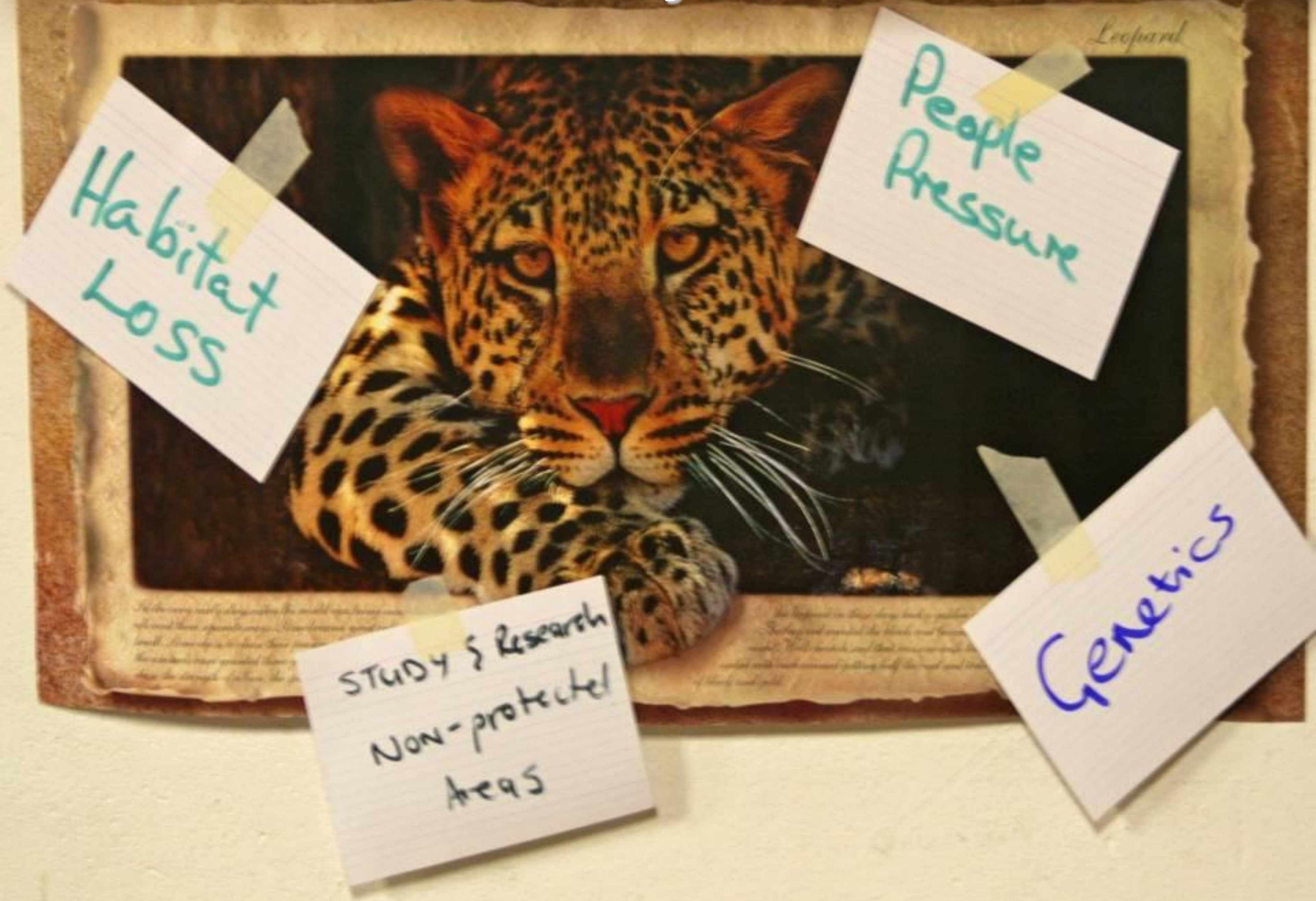
CONCLUSION

- Current estimated rates of Leopard harvest indicate low risk of extinction in Kruger, Limpopo, W Cape & Kalahari.
- No risk of extirpation of Leopards from South Africa.
- Pops in Waterberg/Mpl, KZN, Orange River, E Cape Mnt & Valley & Wild Coast are at some risk of extinction
- E Cape Valley & Wild Coast pops are highly vulnerable to extinction in next few decades.
- Strategies to promote persistence of VU 6 pops include natural corridors among adjacent popns & minimizing harvest.
- Some controlled harvest can be sustained without extreme risk to the metapop but data too poor to be exact.

CONCLUSION

- Max harvest model suggests that MAX additional 69 (MSY) Leopards can be removed from the SA metapop.
- Eliminating illegal hunting positively impacts survival of all local pops, all have zero risk of extinction in next 100 years.
- Improved protection of Leopards may allow increased legal hunting quotas.
- Illegal hunting in all areas must be reduced or stopped.
- Increased pop monitoring & data gathering is imperative to assess the impact of harvesting & allow harvesting rates to be adjusted as needed.
- As better data on Leopard biology & pops become available, models should be revised to better project the impact of harvesting on Leopard populations throughout SA.

Thank you


Habitat
Loss
People
Pressure
Leopard
Study & Research
Non-protected
Areas
Genetics

CITES NON-DETRIMENTAL FINDING FOR EXPORTING RHESUS MONKEY (*MACACA MULATTA*) FROM CHINA

AUTHORS:
Zhigang Jiang [1,2] Presenter
Zhibin Meng [1,2]
Yan Zeng [1,2,]
Zhongze Wu[3],
Zhihua Zhou[3]

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[2] Endangered Species Scientific Commission of the P.R. China 100101
[3] The Endangered Species Import and Export Management Office of the P.R. China, Beijing 100074

I. Background information on the taxa

1. BIOLOGICAL DATA

1.1. Scientific and common names

Scientific name: *Macaca mulatta* (Zimmermann, 1780).
Common name: rhesus monkey, rhesus macaque.
Chinese name: Mihou (phoneticizing Chinese name).

1.2. Distribution

Macaca mulatta is native to Bangladesh, Bhutan, China, Hong Kong, India, Lao People's Democratic Republic, Myanmar, Nepal, Pakistan, Thailand and Viet Nam in Asia (IUCN, 2007, Fig. 1). Distribution range of *Macaca mulatta* is overlaped with the range of broad leaf forests in China, distribution center of *Macaca mulatta* is located in ever-green broadleaf forest area in southern China (Fig. 2).

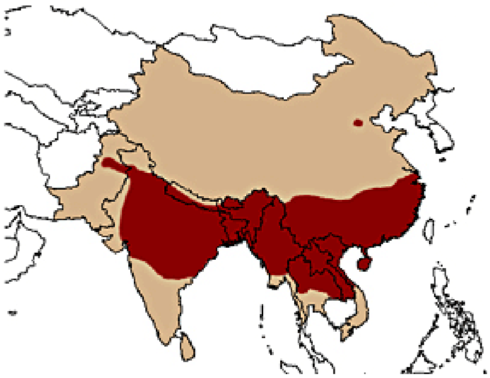

Fig. 1 World *Macaca mulatta* distribution. (From Cawthon), 2005.

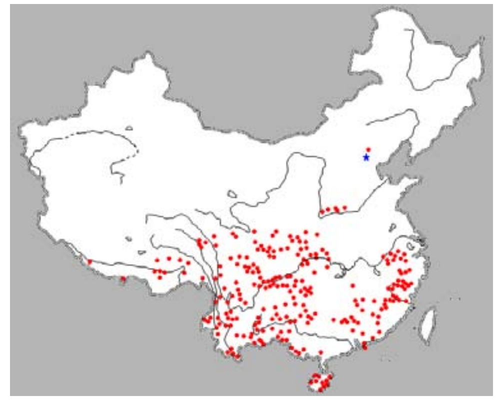

Fig. 2 *Macaca mulatta* distribution in China. (From Zhang, 1997)

There use to be an isolated *Macaca mulatta* popualtion located at the northern edge of the distribution range of *M. mulatta* near Beijing in China (Fig. 2). The *Macaca mulatta* there were once classified as a independent species, *Macaca tcheliensis*, but most of researchers consider the population of rhesus monkey as a subspecies of *Macaca mulatta*. Quan *et al*. (1993) questioned whether the *Macaca mulatta* was native inhabitats to the place, or it might be introduced to that place by people.

The known introduced countries of *Macaca mulatta* including Brazil, Cook Islands, Mexico, Puerto Rico and United States (Felix, 2007)

1.3. Biological characteristics

1.3.1. Summary of general biology

Macaca mulatta is a median size primate, which weighs about 7-12 kg (males) or 4-7 kg (females) (Zeng *et al*., 1983). *M. mulatta* lives in highly socialized groups normally containing 4-60 monkeys, occasionally the troop size may be up to 150 monkeys (Jiang *et al*., 1989; Zheng *et al*., 1993). The proportion of adult male and female in rhesus monkey troops varies bewteen 1:1 to 1:5, and males born in the group used to leave the origin troop at about 2 years old and become solitary males until they find other *Macaca mulatta* troops (Jiang *et al*., 1989; Qu *et al*., 1993). Female reaches the sexual maturity at 3-5 years old whereas males at 3-6 years old (Zeng *et al*., 1983; Qu *et al*., 1993). The rhesus monkeys mate year around. Normally, one infant is born after a pregnancy of about 160 days (Zeng *et al*., 1983; Wang *et al*., 1992; Qu *et al*., 1993; Jiang *et al*., 1995; Hou *et al*., 1998).

1.3.2. *Habitat types*

Macaca mulatta has the largest range compare to any primate species, thus it is an "ecologically diverse" species in China as *Macaca fascicularis* in Southeast Asia. *Macaca mulatta* is found in primary broadleaf forests and secondary broadleaf forests below altitude of 3,000 meters (Ma and Wang, 1988; Jiang *et al*., 1989; Wang *et al*., 1992; Zheng *et al*., 1994; Quan *et al*., 1993; Jiang *et al*., 1995). *Macaca mulatta* lives well in zoos, crowded parks and other recreational places (Zhou *et al*, 1993).

Macaca mulatta is the most popular primate in Chinese zoos; almost all zoos in China keep *Macaca mulatta* according to our recent investigation in Chinese zoos during 2007-2008. Of 55 zoos only 3 did not keep *Macaca mulatta.* The average *Macaca mulatta* population size is 39 ±17 monkeys, altogether, more than 7900 rhesus monkeys live in the 52 zoos. 98% of the *Macaca mulatta* herds in Chinese zoos were capable of breeding without further catch of *Macaca mulatta* from wild (Jiang, unpublished data).

1.3.3. *Role of the species in its ecosystem*

Rhesus monkeys basically are frugivores and folivores, they eat fruits, leaves, mushrooms and although they occasionally prey on bird eggs, insects and snails (Wang et al., 1992; Wang *et al*., 1999; Wang, 2001). However, *Macaca mulatta* is not an important predator for regulating those animal populations in nature broadleaf forest ecosystems. There are not reports about the negative effects of *Macaca mulatta* in natural ecosystem. Now, the *Macaca mulatta* lives near villages may raid crops, bamboo plantations and fruit gardens (Jiang, 2005).

1.4. Population:

1.4.1. *Global Population size*

Although no estimation of its global population size has been reported, considering the census form local and national surveys, *Macaca mulatta* still is abundant in its original habitat. At the end of 20th century, China had about 200,000 wild *Macaca mulatta* (Liu, 1998). Forestry Department of Yunnan Provincial Government (2007) reported that there were 59, 237rhesus monkeys in the Yunnan Province, China alone. Rhesus monkey's range covers 20 provinces in China. The forested area in China increased from 8.6% in 1949 to 16 % of national land area in 1998. 200,000 rhesus monkeys could be the lower estimate of rhesus monkeys in China. In the State of Himachal Pradesh, North India, another figure of 200,000 rhesus monkeys has been reported (Pirta *et al*., 1997).

1.4.2 *Current global population trends:*
___increasing ____decreasing ___stable _X__unknown

Above was the current population status of IUCN recently launched IUCN Red List evaluation for the species on 2008, Nevertheless, wild population trend of Rhesus monkey is increasing in China. Rhesus monkey has been under national protection in China since 1989. Rhesus monkey is a species which adapt to various habitats with relative large population size, once its habitats and populations are protected and the persecution is relaxed, rhesus monkey populations will soon recover. In China, there are many recent reports about restoration of rhesus monkey populations in its original ranges (Xinhua News Agency, 2001; Guo, 2003; Lu, 2003; Yang *et al*., 2007; Forestry Office of Jiyuan City Government, 2006). Even in the above mentioned isolated former range of rhesus monkey near Beijing where rhesus monkey was extirpated for almost 20 years (Quan *et al*., 1993), 5-6 rhesus monkeys were seen again by local residents in 2005 (Forestry Department of Hebei Province, 2005). A three-year survey at Shimla of India also discovered an increasing trend in local rhesus populations (Pirta *et al*., 1997).

1.5. Conservation status

1.5.1. *Global conservation status* (according to IUCN Red List):

___Critically endangered ___Near Threatened
___Endangered ___Least concern
___Vulnerable ___Data deficient

1.5.2. *National conservation status for the case study country*

Rhesus monkey is a Class II State Key Protected Wild Animal Species under Wild Animal Protection Law of the People's Republic of China. Wild rhesus monkeys and their habitats are protected nationwide.

The construction of nature reserve system in China was started in 1956, but it experienced a long period of quiescence in 1960s and 1970s. However, the number of nature reserves had started to bloom since 1980s, the total number of nature reserves in China reached 1,551 by the end of 2002, the area of those nature reserves summed up to 1,414,866 km2, which accounted for 14.7% of the land territory of China. Most of the natural habitats of rhesus monkeys are now protected by nature reserves or national forest parks in China.

1.5.3. *Main threats within the case study country*

_X_Habitat Loss/Degradation (human induced)
___Invasive alien species (directly affecting the species)
___Harvesting [hunting/gathering]
___Accidental mortality (e.g. Bycatch)
___Persecution (e.g. Pest control)
___Pollution (affecting habitat and/or species)
___Other_______________
___Unknown

2. SPECIES MANAGEMENT WITHIN THE COUNTRY FOR WHICH CASE STUDY IS BEING PRESENTED

2.1. Management measures

2.1.1 *Management history*

Before 1980s, rhesus monkey populations decreased due to the habitats loss and hunting (Ma et al., 1988; State Forestry Administration and the Ministry of Science and Technology, 1983; Zheng *et al*., 1994). During that period, founders of breeding populations of primates in the country were mostly taken from the wild. For an example, more than 5,000 live rhesus monkeys were harvested in early 1980s (State Forestry Administration and the Ministry of Science and Technology, 1983). Since 1988, since the Wild Animal Protection Law of the People's Republic of China went into effect, as one of the Class II Key Stat Protected Wild Animal Species, rhesus monkey has gained gradually strengthening management in its natural habitats.

Captive breeding of rhesus monkey as experimental animals was started in early 1980s in China. Rhesus monkey breeds well in captivity; its population increased in breeding centers. Zhou and Yu (1996) reported the breeding of *Macaca mulatta* in a breeding farm with male: female ratios of 1:6-1:10. When the monkeys were grouped *ad hoc*, the birth rate ranged from 53% to 56%, when the breeding male and females were selectively paired, the birth rate ranged from 66-73%. Wei (1998) reported there were about 20,000 *Macaca mulatta* in 15 primate breeding centers in China in 1998. In August 2008, there are 40 primate breeding companies in the country, which keep about 40,000 *Macaca mulatta* mainly for the export as experiment animals.

Now, few live rhesus monkeys are taken from wild for recruitment of new blood in the primate breeding centres in China. Most of live rhesus monkeys exported from the country are come from captive breeding operations. According to a survey by the China Experimental Primates Breeding and Developing Society, more than 40,000 rhesus monkeys are kept in breeding facilities in China. Of them there are 2,000 breeding males, 15,000 breeding females, and about 10,000 juveniles were born in the Chinese primate breeding centers. Under strict control within the frames of CITES and China national wildlife protection law. Each primate breeding company should apply for a breeding license before its operation. The applications for primate farming license are evaluated before an expert commission panel case by case through rigorously evaluation processes. For better management, the country is implying a microchip labelling system for all primates bred in captivity.

Chinese national CITES authorities set up an import and export quota system for *Macaca mulatta*, annual export quota is discussed and evaluated by the wildlife experts commission. The import quota is to control the inflow of rhesus monkeys even though those rhesus monkeys are legally bred in artificial breeding bases, while the exporting quota is for controlling the sell of artificial bred rhesus monkeys to international market. Both quotas regulate the population size of rhesus monkeys in the primate breeding centres in China. National and provincial CITES authorities and wildlife management authorities also conduct annual or periodic inspections on these primate breeding centers.

2.1.2 *Purpose of the management plan in place*

Purpose of the management of rhesus monkey in the country is to maintain its ecological function and evolutionary potential in natural ecosystems while maintaining a healthy breeding stock for sustainable trade to the international laboratory primate market.

2.1.3 *General elements of the management plan*

The Wild Fauna and Flora Conservation Department of State Forestry Administration administrates the breeding permits, transportation permits, labelling, buying and selling of all terrestrial wild animals, including primates. The national wildlife management authority is also responsible for implication of the annual primate export quota system in the country. CITES national scientific and management authorities actively involved in the annual importing and exporting quota setting process and CITES national management authority is response for issuing export permits for import and export rhesus monkeys. China Experimental Primates Breeding and Developing Society with all primate breeding companies in China as its members, negotiates minimum price, coordinates meetings, and sets up feeding standards and breeding standards and exchanges information. Breeding permit and export quota are decided by an expert commission panel is called in by the national wildlife management authority. The commission is composed with specialists from the CITES scientific authority, academics and universities, wildlife society, zoos, safaris, and CITES management authority.

According to the Administration Permission Law of PRC which was put into effect in 2005, those who wants to set up a primate breeding company, to import and to sell off artificially propagated primates should first submit applications to the provincial wildlife management authorities, the provincial wildlife management authorities then transfer the applications to the national wildlife management authority. On receiving such applications, the national wildlife management authority will inform the applicant that his/her application has been received and processed, the decision of "Yes" or "No" will be given within 20 working days after receiving his/her application. Then the expert commission meeting, which usually chaired the executive director of the national CITES scientific authority, will be held. The expert commission will review each application from the primate breeding companies case by case. During the evaluation process, applicant will first give an oral presentation of his application before the commissioners. The applicant is asked to present his/her wildlife breeding permits, his/her business operation licenses, certificate of the operational funds, the certificates of the veterinaries and technicians in the primate breeding company, documents of origin of the breeding herds and photos of their breeding facilities. The applicant should also demonstrate his/her company has met the requirements of sanitation and animal welfare. After the presentation and documents checking, the expert panel will discuss the issue in a close door meeting. A notification of "Yes" or "No" decision will be reached after the meeting and the decision will be sent to the applicant with 15 days. When it is "No" decision, reasons for refusing the application will be given in the notification.

2.1.4. *Restoration or alleviation measures*

Besides the general conservation measures, since 2003, harvest of wild animals, including rhesus monkey, have been suspended, except for the purposes of scientific research and education with permits of the national wildlife management authority.

2.2. Monitoring system

2.2.1 *Methods used to monitor harvest*

The national wildlife management authority of State Forestry Administration (SFA), national CITES management and scientific authorities in the country closely monitor the trade of primates in the country. Such a monitoring system has several parts: the annual export quota and its modulation, issuing export permits and checking the permits at border control by custom officers, monitoring data base maintained by the national CITES authorities and annual review of the annual export quota, and finally report the export and import quantity, purpose, source and trade destines of each trade of CITES Appendix species including primates to the CITES Secretariat by the national CITES management authority. Experts are involved in the monitoring of harvest of captive bred rhesus monkeys.

2.2.2 *Confidence in the use of monitoring*

Until now, the country has successfully implemented a primate trade monitoring system. Monitoring of the trade of rhesus monkey in country is conducted by scientists and wildlife professionals. Experts are actively participate in the process of issuing breeding permits, setting up import and export quota, inspection of primate breeding companies. We have confidence in the use of monitoring system of rhesus monkey breeding because rhesus monkeys are in captivity and under man's care.

2.3. Legal framework and law enforcement: Provide details of national and international legislation relating to the conservation of the species.

China ratifies CITES in 1982. In 2005, the State Council of P. R. China proclaimed the Regulations of the People's Republic of China on Administration of Import and Export of Endangered Wild Animals and Plants as a national law for enforcement of CITES. All international trade of endangered species must have CITES permits. All exporting and importing of the CITES Appendix I species and the exporting of the CITES Appendix II species should have a Non Detrimental Finding evaluation by national CITES scientific authority, before the national CITES management authority issuing an export or import permit. The custom officer will check the permits of each wildlife trade. For importing CITES Appendix I species, the exporting permit from the CITES management authority of the country of origin should be obtained first and presented to the national CITES scientific authority of P. R. China before issuing an importing permit.

All primates are protected by the National Wild Animal Protect Law of P. R. China which proclaimed in 1988. It needs permits from the national wildlife management authority to capture, to breed, to transport, to sell and to buy a Class I National Protected Wild Animal. For Class II National Protected Wild Animal, it needs permits from the provincial wildlife management authority. According to the National Wild

Animal Protect Law and Regulations of the People's Republic of China on Administration of Import and Export of Endangered Wild Animals and Plants, exotic wild animals listed in CITES Appendix I, are granted the Class I National Protected Wild Animal status whereas exotic wild animals listed in CITES Appendix I, are granted the Class II National Protected Wild Animal status in the country.

Noticing the increasing demands for primates as laboratory animals in the international laboratories and booming the primate farming business, SFA issued an official notice, the Official Notification No.124, for management of experimental monkeys in 2004. For standardizing the feeding standard of *Macaca* as laboratory animals, SFA also formulized the *Feeding Standards of Macaca as Laboratory Animals* in 2005.

3. UTILIZATION AND TRADE FOR RANGE STATE FOR WHICH CASE STUDY IS BEING PRESENTED

3.1. **Type of use** (origin) **and destinations** (purposes) (e.g. commercial, medicinal, subsistence hunting, sport hunting, trophies, pet, and food). **Specify the types and extent of all known uses of the species. Indicate the extent to which utilization is from captive-bred, artificially propagated, or wild specimens**

Rhesus monkeys were originally used as folk sideshow and occasionally Chinese traditional medicines. Nowadays these rhesus monkeys bred in captivity are used as experimental animals whereas other uses are greatly reduced, compared with the medical experimental uses.

According to the CITES Trade database maintained by WCMC and UNEP (2000-2008), the importing purpose of *Macaca mulatta* from China, 23,429 rhesus monkeys were labelled with code "T", 6669 were labelled with code "S", 4589 were labelled with code "M", 226 were labelled with "B" and only 35 exported rhesus monkeys were not given any importing purpose. Predominately, the exported rhesus monkeys from China were used for scientific and medical research purposes.

3.2. Harvest:

3.2.1. *Harvesting regime*

Almost all rhesus monkeys for exporting were harvested from captive-bred troops. Age of the export macaques are of range of 2-5 years old. Some customers may have special requirement, such as for using as model of diabetics study, experimenters may want to buy aged macaques.

3.2.2. *Harvest management/ control (quotas, seasons, permits, etc.)*
Harvest quota and permits are required for harvest rhesus monkeys in China.

3.3. Legal and illegal trade levels: To the extent possible, quantify the level of legal and illegal use nationally and export and describe its nature.

According to outputs from the CITES Trade Database Version 6.0 maintained by UNEP and WCMC, from 1980 to 2006, 45,494 *Macaca mulatta* were exported from China to Britain, Japan and USA etc. Of those monkeys, 28,389 were labeled with "C"; 2,066 of them marked with code "W", 3,920 were not labeled with any code. The truth was UNEP-WCMC CITES Trade Database does not contain source information for most reports prior to 1991 (UNEP-WCMC, 2004). Another 3657 *Macaca mulatta* were re-exported from China to above mentioned primate importing countries for the same purposes "S" or "T". Of those exported *Macaca mulatta*, 2066 were labeled with code "W" whereas 1591 were labeled with "U". We checked the trade records maintained by the Endangered Species Import and Export Management Office of the P.R. China, all traded *Macaca mulatta* from China were from captive bred herds in primate breeding centers.

According to the CITES Trade database maintained by WCMC and UNEP, the export of *Macaca mulatta* from China started in early 1980s. The volume of exporting increased to about 4000 monkeys until 2002. Prior to 2000, trade volume of *Macaca mulatta* was once up to 1000-3500 monkeys per year (export and re-export combined) now the trade is decreasing to a minimal level (Fig. 3). The sharp decline in exporting of *Macaca mulatta* from China probably due to (1) Because of the high cost in maintaining laboratory animals and animal welfare issue, many companies in developed countries transferred their animal experiments overseas, especially to the developing countries, including China; (2) The role as an experimental animal of rhesus monkey had been replaced by Crab-eating monkey since 1990s, due to small body size of the latter and (3) the data for the CITES trade database in 2007 may be not completed yet.

According to the China CITES trade database, only in the year of 2002, 9 wild source rhesus monkeys were imported (Trade id: 2002CN/IC0311/GZ). All exported rhesus monkeys from China during the period from 2000 to 2007 were rhesus monkeys bred in primate captive bred centres in the country.

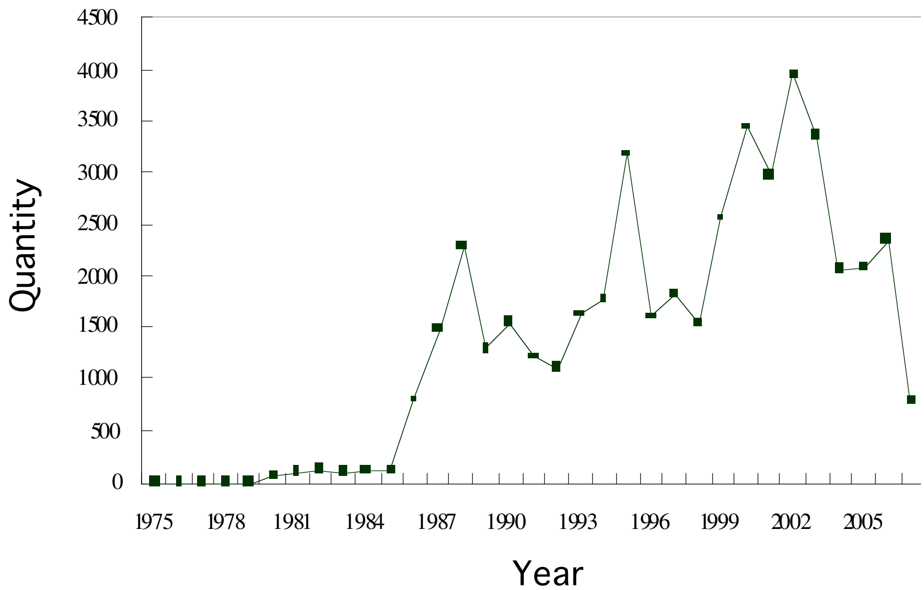

Fig. 3 *Macaca mulatta* exported from China according the output of UNEP-WCMC CITES Trade data base.

Illegal transportation and trades of rhesus monkeys were prosecuted by wildlife law enforcement authority in China. For instances, three men were charged by the Chongqing municipal forest police for illegal transporting 57 rhesus monkeys in March, 2007 (http://www.chinacourt.org/html/article/200709/18/265347.shtml). In 2008, the largest illegal rhesus monkey trade in country was prosecuted in Shaanxi Province. The forest police confiscated 991 rhesus monkeys. Ten people involved in the case were charged for illegal sale and transporting of rhesus monkey. The illegal rhesus monkey dealers were sentenced to 2-15 years in prison (http://www.slga.gov.cn/slga/article_detail.asp?id=543). However, the news did not specify whether the rhesus monkey were form wild source or breeding centers.

II. Non-detriment finding procedure (NDFs)

Provide detailed information on the procedure used to make the non-detriment finding for the species evaluated.

1. IS THE METHODOLOGY USED BASED ON THE IUCN CHECKLIST FOR NDFs?

___yes _√_no

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED

Criteria/parameters are needed to be considered for NDFs of rhesus monkeys:

a) The *Macaca mulatta* is abundant in wild and artificially bred in large scale in the country.
b) *Macaca mulatta* breeding companies do not require catching any wild rhesus monkeys for breeding.
c) The exporting volume of captive breed *Macaca mulatta* is within the annual natural recruitment of *Macaca mulatta* in breeding centers; within the level of sustainable trade of the captive breed population. The maximum export of rhesus monkey from this country was 3,950 in the year of 2002 according to CITES Trade Database, the annual production of rhesus monkey in primate breeding centers in China is about 10,000. Such an exporting level will not hinder the breeding of the population. Few and few wild rhesus monkeys are traded during recent years.

METHODOLOGIES CAN BE IMPLEMENTED TO MEASURE THEM:
We are closely monitoring *Macaca mulatta* population size and other population parameters such as birth rate, mortality, age structure under current import and export quota system.

HOW CAN BE THOSE DATA ANALYZED TO TAKE DECISIONS ON THAT SPECIES USE:
a) Large wild populations and extensive distribution of *Macaca mulatta* increase the viability of rhesus monkeys.
a) A large scale artificial propagation of *Macaca mulatta* can meet the demands for medicinal, biological, behavioral and psychological experiments.
b) The artificial propagation population of *Macaca mulatta* is self sustainable.

3. MAIN SOURCES OF DATA, INCLUDING FIELD EVALUATION OR SAMPLING METHODOLOGIES AND ANALYSIS USED

The data of rhesus monkey in breeding centers or breeding companies were obtained during surveys, from the statistic data of the national CITES trade data base, some of the data were cited from the references.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

The data are collected during investigation to primate breeding companies, provincial wildlife management and national CITES management authority. Data quality was cross checked with investigation records with the quota of national wildlife management, national CITES management and scientific authority. Those trade records of trade permits were cross checked with national custom records by the national CITES management authority. The NDF case study is collaborated with specialists, officers and entrepreneurs.

There are some discrepancy between the data in the CITES Trade Database and the trade database maintained by The Endangered Species Import and Export Management Office of the P. R. China, I compared the data of *Macaca mulatta* export data in both data bases from 2000 to 2007, the figure of the year 2000 in CITES Trade Database was higher than that in the data base of The Endangered Species Import and Export Management Office of the P.R. China, however, the data in former were lower in rest of the years (Table 1). The discrepancy of the two data sets in 2000 was due to The Endangered Species Import and Export Management Office of the P. R. China started to use a new database in 2000, only two months data of trade data were input in the year of 2000. The data of 2006 needs special attention and that of 2007 may be an incomplete record.

Table 1 Comparison of *Macaca mulatta* export data in the CITES Trade Database and the trade database maintained by The Endangered Species Importing and Exporting Office of P. R. China

Year	CITES Trade Database	CN Database	Difference
2000	3437	990	2447
2001	2986	3246	-260
2002	3950	5139	-1189
2003	3362	4139	-777
2004	2055	2180	-125
2005	2077	2306	-229
2006	2352	9052	-6700
2007	793	2199	-1406
Sum	**21012**	**29251**	**-8239**

5. MAIN PROBLEMS, CHALLENGES OR DIFFICULTIES FOUND ON THE ELABORATION OF NDF

We should update of rhesus monkey trade data base in a timing and speedy fashion.

REFERENCE

CAWTHON, L. K. 2005. Primate Factsheets: Rhesus macaque (*Macaca mulatta*) Taxonomy, Morphology, & Ecology. http://pin.primate.wisc.edu/factsheets/entry/rhesus_ macaque.

FELIX, A. G. 2007. Macaca mulatta. http://www.issg.org/database /species /ecology.asp.

FORESTRY Department of Hebei Province. 2005. Sights on rhesus monkeys in Xinglong County of Hebei Province. http://www.cnwm.org.cn/particular.asp?id=6292.

FORESTRY Department of Yunnan Government. 2007. Further finding out the resource situation of rhesus monkey in Yunnan Province. http://www.biodiv.gov.cn/lygz/lydt/200704/ t20070430_ 10335.htm.

FORESTRY Office of Jiyuan City Government. 2006. General situation of Henan Taihang Mountain rhesus monkey reserve. http://www.jyxnc.gov.cn/Template/subsite/ jyly/ly_article.jsp?mid.

GUO, Z. Y. 2003. Resource situation and conservation of rhesus monkey in Jincheng City. *Forestry of Shanxi* 2003(6): 23-24.

HOU, J. H., Zhai W. Y., Chen L. and Zhang H. X. 1998. Study on the reproductive behaviors of rhesus monkey in Taihang Mountan. *Chinese Journal of Ecology* 17(4): 22-25.

IUCN. 2007. *IUCN Red List of Threatened Species*. Glande: IUNC.

JIANG H. -S., Wang J., Lian J. -S. and Feng M. 1995. Comparison among five rhesus monkey populations in tropic and subtropic areas. In Zhang, J. (Ed.): *Studies on Mammal Biology in China*. Beijing: China Forestry Publishing House. Pp. 4-10.

JIANG, H. -S., Liu Z. -H., Yuan X. -C., and Wang H. S. 1989. Population Structure of rhesus monkeys at Nanwan Peninsula of Hainan Island. *Acta Theriologica Sinica* 9(4): 254-261.

JIANG Z.-G. 2005. *Biodiversity of the Qingmuchuan Nature Reserve, Shaanxi Province*. Beijing: Tsinghua University Press

LIU, Z. -H. 1998. Rhesus monkeys. In Wang, S. (ed): *China Red Data Book of Endangered Animals*. Beijing: Science Press. Pp. 40-44.

LU, Z.-H. 2003. Good landscape attracts rhesus monkeys to restore their population. *Forestry of Zhejiang* 40: 40.

MA, S. -L. and Wang Y. -X. 1988. The recent distribution, status and conservation of primates in China. *Acta Theriologica Sinica* 8(4): 250-260.

PIRTA, R. S., Gadgil, M. and Kharshikar, A.V. 1997. Management of the Rhesus monkey (*Macaca mulatta*) and Hanuman langur (*Presbytis entellus*) in Himachal Pradesh, India. *Biological Conservation* 79: 97–106.

QU, W.-Y., Zhang Y.- Z., Manry D. and Southwick C. H. 1993. Rhesus monkeys (*Macaca mulatta*) in the Taihang Mountains, Jiyuan County, Henan, China. *International Journal of Primatology* 14: 607-621.

QUAN, G. -Q., Lin Y. -L. and Liang M. -Y. 1994. Survey on primates of Lorisidae and Cercopithecidae in Southwest China. In Song, D.- X. (ed.) *Survey on Animal Resources in Wuling Mountain of Southwest China*. Beijing: Science Press. Pp. 304-317.

QUAN, G.- Q., Lin Y.- L., Zhang R. -Z., Lin L. -W. and Wang G. -Z. 1993. Extinction of rhesus monkey from Xinglong, Hebei Province. In Xia, W. -P. and Zhang J. (Eds): *The Successions of Mammals in China under the Influences of Human Activities*. Beijing: China Science and Technology Press. Pp. 9-13.

STATE Forestry Administration and the Ministry of Science and Technology. 1983. Notice on the strengthening both of management of nature resource and scientific research. http://www.lawyee.net/ Act/Act_ Display.asp.

UNITED Nations Environment Programme and World Conservation Monitoring Centre. 2004. A Guide to Interpreting Outputs from the CITES Trade Database Version 6.0. UNEP.

WANG, D.-S. 2001. Present state and conservation of rhesus monkeys in Panzhihua City. *Science and Technology Information of Panzhihua* 26(1): 27-29.

WANG, J., Jiang H. -S. and Feng M. 1992. The distribution and conservation of rhesus monkeys in Wulin Mountain area, Northwestern Hunan. *Tropical Geography* 12: 65-70.

WANG, Y.- J., Liao W. -B. and Chang H. 1999. Analysis on food resources and feeding habits of *Macaca mulatta* from Neilingding Island, Guangdong Province. *Biodiversity Science* 7: 97~105.

WEI, Q. 1998. Research and quality control of experimental Rhesus monkey in *China. Chinese Journal of Experimental Animals* 6: 52-56.

XIHUA News Agency. 2001. Many rhesus monkeys recur along Lancang River. http://www.people. com.cn/GB/huanbao/57/20010919/564906.html

YANG, G. -Z. 2007. Present status of *Macaca mulatta* and its protection and utilization. *Journal of West China Forestry Science* 36(2): 147-147.

ZENG Z. -X. and Chen Y. -l. 1983. Observations on breeding of rhesus monkeys (*Macaca mulatta*) in captivity. Acta Theriologica Sinica 3: 147-155.

ZHANG, R. -Z. 1997. *Macaca mulatta*. In CITES Management Authority of China (Ed): Distribution on mammalian species in China. Beijing: China Forestry Publishing House. P. 57.

ZHENG, S.- W., Cao Y. -H., Yuan W. and Jin X.- L. 1993. Present status, historical distribution and cause for reducing of geographical range of rhesus monkey in Shaanxi Province. In Xia, W. -P. and Zhang J. (Eds.): *The Succession of Mammals in China under the Influences of Human Activities*. Beijing: China Science and Technology Press. Pp. 1-8.

ZHENG, S. -W., Zuo H. and Xu H. -H. 1994. Survey on the rhesus monkey resource of Nanzheng in Shaanxi Province. *Sichuan Journal of Zoology* 13: 26-27.

ZHOU, C. -L., Lu C.- L., Zhao Z.- R., Lei Y-. Q., Pan G.- J. and Zhou J. 1993. Preliminary study on winter ecology of *Macaca mulatta* at Qianling Park in Guiyang. *Guizhou Science* 11: 78-83.

ZHOU F.-G and Yu Z.-P. 1996. Artificial breeding of Rhesus monkey. *Journal of Animal Husbandry and Veterinary Science of Jiangxi* 1996(4): 16-17.

NDF WORKSHOP
WG 5 – Mammals
CASE STUDY 6 SUMMARY
Macaca mulatta
Country – **China**
Original language – English

CITES NON-DETRIMENTAL FINDING FOR EXPORTING RHESUS MONKEY (*MACACA MULATTA*) FROM CHINA

AUTHORS:
Zhigang Jiang, Zhibin Meng, Yan Zeng, Zhongze Wu and Zhihua Zhou

Macaca mulatta is native to southeast Asia but its distribution center in the ever-green broadleaf forest area in southern China. *Macaca mulatta* has the largest range compare to any non- human primate species, thus it is an "ecologically diverse" species with adapte to a range of habitas. Although no estimation of its global population size of *Macaca mulatta* has been reported, considering the census form local and national surveys, *Macaca mulatta* still is abundant in its original habitat. Current global population trend is increasing. At the end of 20th century, China had about 200,000 wild *Macaca mulatta. Macaca mulatta* lives well in zoos, crowded parks and other recreational places. According to our recent investigation in Chinese zoos during 2007-2008, 52 zoos kept more than 7900 rhesus monkeys. *Macaca mulatta* has been under national protection in China since 1989. Wild *Macaca mulatta* and their habitats are protected nationwide. Global conservation status of *Macaca mulatta*, according to IUCN Red List, is Near Threatened. Main threats before 1980s, *Macaca mulatta* populations decreased due to the habitats loss and hunting, since 1989, rhesus monkey has been protected in its natural habitats. Habitat loss and illegal harvest have been alleviated. Captive breeding of rhesus monkey as experimental animals was started in early 1980s in China. Founders of breeding populations of primates in the country were mostly taken from the wild. In August 2008, there are 40 primate breeding companies in the country, which keep about 40,000 *Macaca mulatta* mainly for the export as experiment animals. Now, few live rhesus monkeys are taken from wild for recruitment of new blood in the primate breeding centres in China. Most of live rhesus monkeys exported from the country are come from captive breeding operations. All international trade of endangered species must have CITES permits. Chinese national CITES authorities set up an import and export quota system for *Macaca mulatta*, which regulates the population size of rhesus monkeys in the primate breeding centres in China. Annual export quota is discussed and evaluated by a wildlife expert commission. National and provincial CITES authorities and wildlife management authorities also conduct annual or periodic inspections on these primate breeding centers. According to outputs from the CITES Trade Database maintained by UNEP and WCMC, from 1980 to 2006, 45,494 *Macaca mulatta* were exported from China. Predominately, the exported rhesus monkeys from China were used for scientific and medical research purposes. Illegal transportation and trades of rhesus monkeys were prosecuted by wildlife law enforcement authority in China. Criteria/parameters to be considered for NDFs of *Macaca mulatta*: (a) The *Macaca mulatta* is abundant in wild and artificially bred in large scale in the country; (b) *Macaca mulatta* breeding companies do not require catching any wild individuals for breeding.;(c) The exporting volume of captive breed *Macaca mulatta* is within the annual natural recruitment of *Macaca mulatta* in breeding centers.

CITES Non-detrimental Finding for Exporting *Macaca* from China

Zhigang Jiang [1] Zhibin Meng [2] Yan Zeng [2] Zhongze Wu [3], Zhihua Zhou [3]

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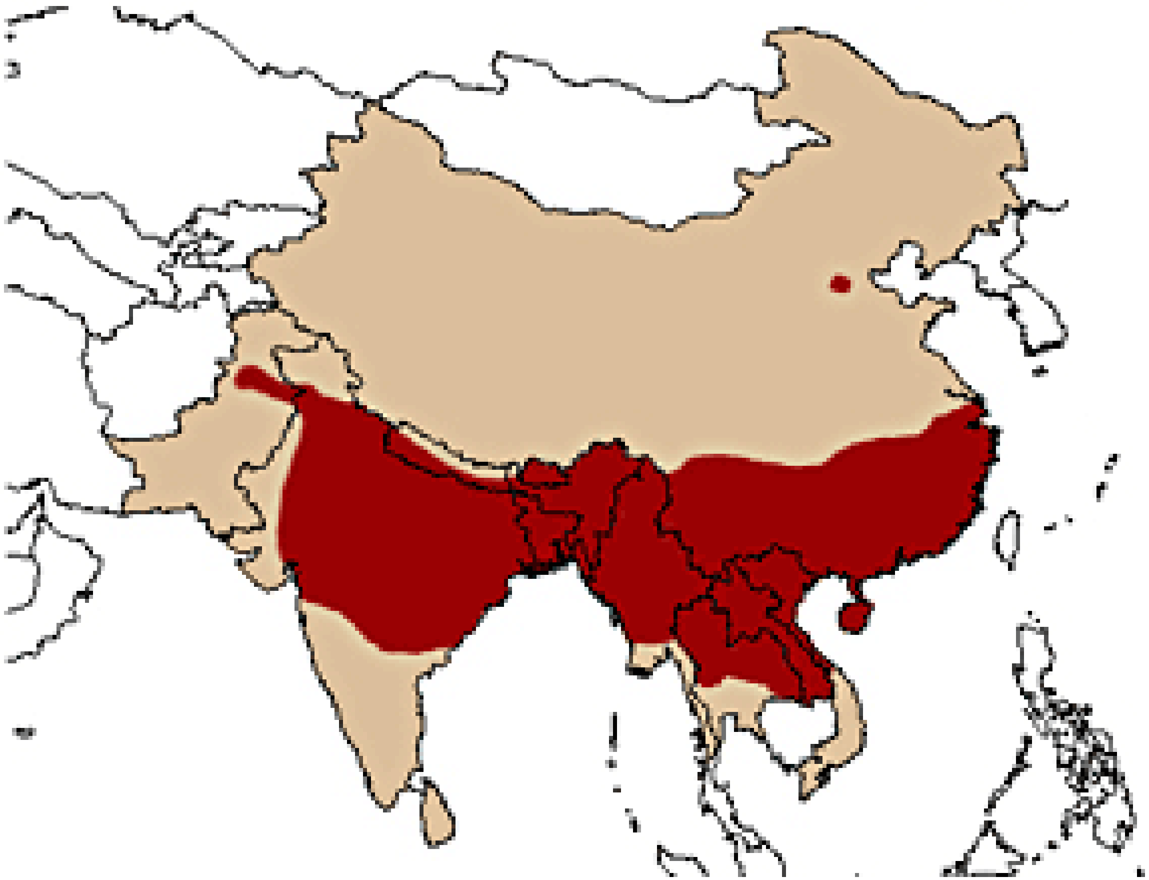
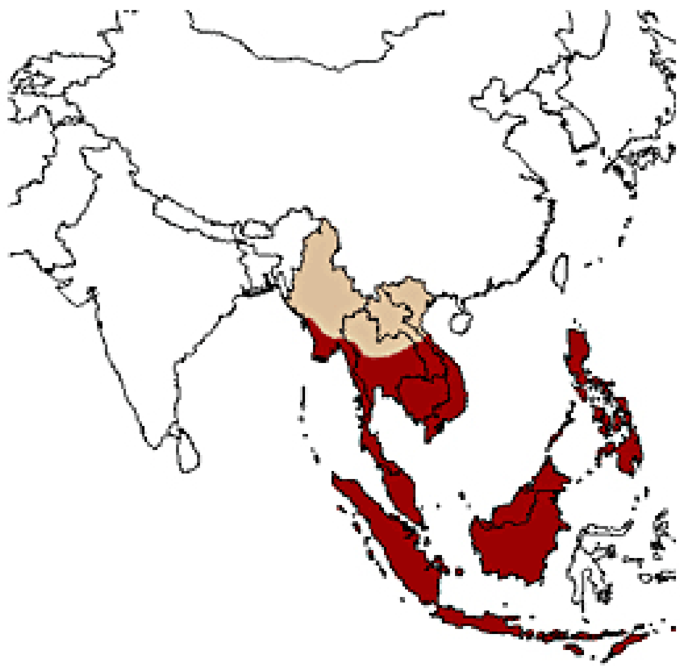
Main *Macaca* species for exporting

- *Macaca mulatta*
- *Macaca fascicularis*

Distribution of *Macaca mulatta*

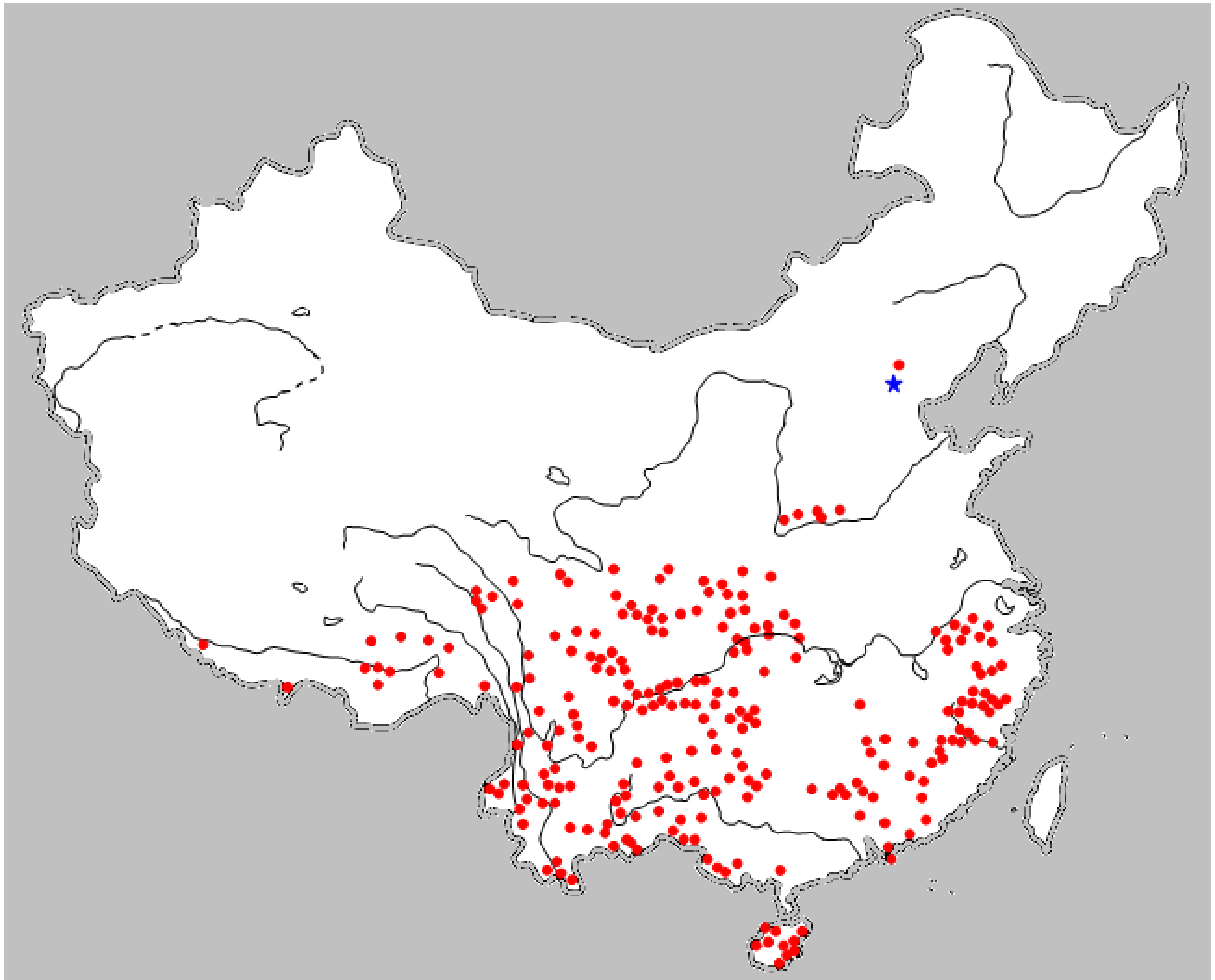


Distribution of *Macaca fascicularis*



http://pin.primate.wisc.edu

Distribution of *Macaca mulatta in* China



Conservation status: *M. mulatta*

1.1.1. Global conservation status (according to IUCN Red List):

___Critically endangered

___Endangered

___Vulnerable

___ Near Threatened

√__Least concern

___ Data deficient

Conservation status: *M. fascicularis*

1.1.1. Global conservation status (IUCN Red List: LR/nt ver 2.3 (1994)):

___Critically endangered

___Endangered

___Vulnerable

__ Near Threatened

_√_Least concern

___ Data deficient

National conservation status for the case study country

- Rhesus monkey is a Class II State Key Protected Wild Animal Species. Wild rhesus monkeys and their habitats are protected nationwide.
- Total number of nature reserves in China reached 1,551 by the end of 2002, the area of those nature reserves summed up to 1,414,866 km^2, which accounted for 14.7% of the land territory of China. Most of the natural habitats of rhesus monkeys are now protected by nature reserves or national forest parks in China.
- *Macaca fascicularis* as CITES Appendix species is granted the status of Class II State Key Protected Wild Animal Species.

Main threats to *M. Malatta* within the case study country

_√_Habitat Loss/Degradation (human induced)

___Invasive alien species (directly affecting the species)

___Harvesting [hunting/gathering]

___Accidental mortality (e.g. Bycatch)

___Persecution (e.g. Pest control)

___Pollution (affecting habitat and/or species)

___Other________________

___Unknown

Main threats to *M. fascicularis* within the case study country

√__No Threats
___Habitat Loss/Degradation (human induced)
___Invasive alien species (directly affecting the species)
___Harvesting [hunting/gathering]
___Accidental mortality (e.g. Bycatch)
___Persecution (e.g. Pest control)
___Pollution (affecting habitat and/or species)
___Other_________________

___Unknown

Captive breeding of *M. malatta*

- Before 1980s, rhesus monkey populations decreased due to the habitats loss and hunting;
- During that period, founders of breeding populations of primates in the country were mostly taken from the wild;
- Since 1988, since the Wild Animal Protection Law of the People's Republic of China went into effect, rhesus monkey has gained gradually strengthening management in its natural habitats.

Captive breeding of *M. malatta*

- Captive breeding of rhesus monkey as experimental animals was started in early 1980s in China.
- Wei (1998) reported there were about 20,000 *Macaca mulatta* in 15 primate breeding centres in China in 1998.
- Now, more than 40,000 rhesus monkeys are kept in breeding facilities in China. Of them there are 2,000 breeding males, 15,000 breeding females, and about 10,000 juveniles were born in those breeding centres.

Captive breeding of *M. fascicularis*

- Late 1980s, the international demands for primate as laboratory animals increased.
- Around 1990, for breeding *Macaca fascicularis*, four primate breeding companies were established. The founder animals mostly came from the crab-eating macaques kept at those local wildlife rescue centers with the breeding stocks supplemented from primate breeding centers in Southeast Asia.
- In August 2008, there are 40 primate breeding companies in the country, which keep about 170,000 crab-eating macaques mainly for the export and to meet the growth of demand for experiment animals worldwide.

Macaca breeding centers

Macaca breeding centres


Crab-eating Macaques


Crab-eating Macaques


Rhesus monkey *Macaca malatta* Z. Jiang

General elements of the management plan

- The Wild Fauna and Flora Conservation Department (WFFCD) of SFA administrates the breeding permits, transportation permits, labeling, buying and selling of all terrestrial wild animals, including primates;
- WFFCD is also responsible for implication of the annual primate export quota system in the country. National CITES scientific and management authorities actively involved in the process;
- National CITES management authority is responsible for issuing permits for import and export.

Purpose of the management plan in place

- Purpose of the management for rhesus monkey in the country is to maintain its ecological function and evolutionary potential in natural ecosystems while maintaining a healthy breeding stock for sustainable trade to the international laboratory primate market.
- Purpose of the management for crab-eating macaque in the country is to maintain a healthy breeding stock for sustainable trade to the international laboratory primate market.

Restoration or alleviation measures

- Besides the general conservation measures, since 2003, harvest of wild animals, including rhesus monkey, have been suspended, except for the purposes of scientific research and education with permits of the national wildlife management authority.

Setting up a breeding company

- Under strict control within the frames of CITES and China national wildlife protection law. Each primate breeding company should apply for a breeding license before its operation.

Administration Permission Law

- **Applicant**

Provincial Wildlife Management

Wildlife Management, SFA

Expert Panel Meeting

Administration Permission Law

Expert Panel Meeting

Wildlife Management, SFA

Decision of “Yes” or “No”

- **Applicant**

Methods used to monitor harvest

The monitoring system has several parts:

- Annual review of export quota and its modulation;
- Issuing export permits;
- Checking the permits by custom officers;
- Monitoring data base maintained by the national CITES authorities;
- Reporting trade to the CITES Secretariat by the national CITES management authority.

Confidence in the use of monitoring

Monitoring of the trade of rhesus monkey and crab-eating macaque in country is conducted by scientists and wildlife professionals. Experts are actively participate in the process of issuing breeding permits, setting up import and export quota, inspection of primate breeding companies. We have confidence in the use of monitoring system of *Macaca* breeding because rhesus monkey and crab-eating macaque in trade are kept in captivity and under man’s care.

Legal framework and law enforcement

- China ratifies CITES (1982);
- National Wild Animal Protect Law of P. R. China (1988);
- The Checklist of Key Protected Wild Animal Species and Plants in PRC (1989);
- Official Notification No.124 of SFA, for management of experimental monkeys (2004);
- The Regulations of the People's Republic of China on Administration of Import and Export of Endangered Wild Animals and Plants (2005).

Type of use (origin) and destinations (purposes)

- According to the CITES Trade database maintained by WCMC and UNEP (2000-2008): the importing purpose of *Macaca mulatta* from China, 23,429 rhesus monkeys were labeled with code “T”, 6669 were labeled with code “S”, 4589 were labeled with code “M”, 226 were labeled with “B” and only 35 exported rhesus monkeys were not given any importing purpose. Predominately, the exported rhesus monkeys from China were used for scientific and medical research purposes.

Harvesting regime

- Almost all rhesus monkeys for exporting were harvested from captive-bred troops. Age of the export macaques are of the range of 2-5 years old. Some customers may have special requirement, such as for using as model of diabetics study, experimenters may want to buy aged macaques.

Harvesting regime

- Of those exported *Macaca mulatta*, 2066 were labeled with code “W” whereas 1591 were labeled with “U”. We checked the trade records maintained by The Endangered Species Import and Export Management Office of the P.R. China, all traded *Macaca mulatta* from China were from captive bred herds in primate breeding centers.
- According to the China CITES trade database, only in the year of 2002, 9 wild source rhesus monkeys were imported (Trade ID: 2002CN/IC0311/GZ). All exported rhesus monkeys from China during the period from 2000 to 2007 were rhesus monkeys bred in primate captive breeding centres in the country.

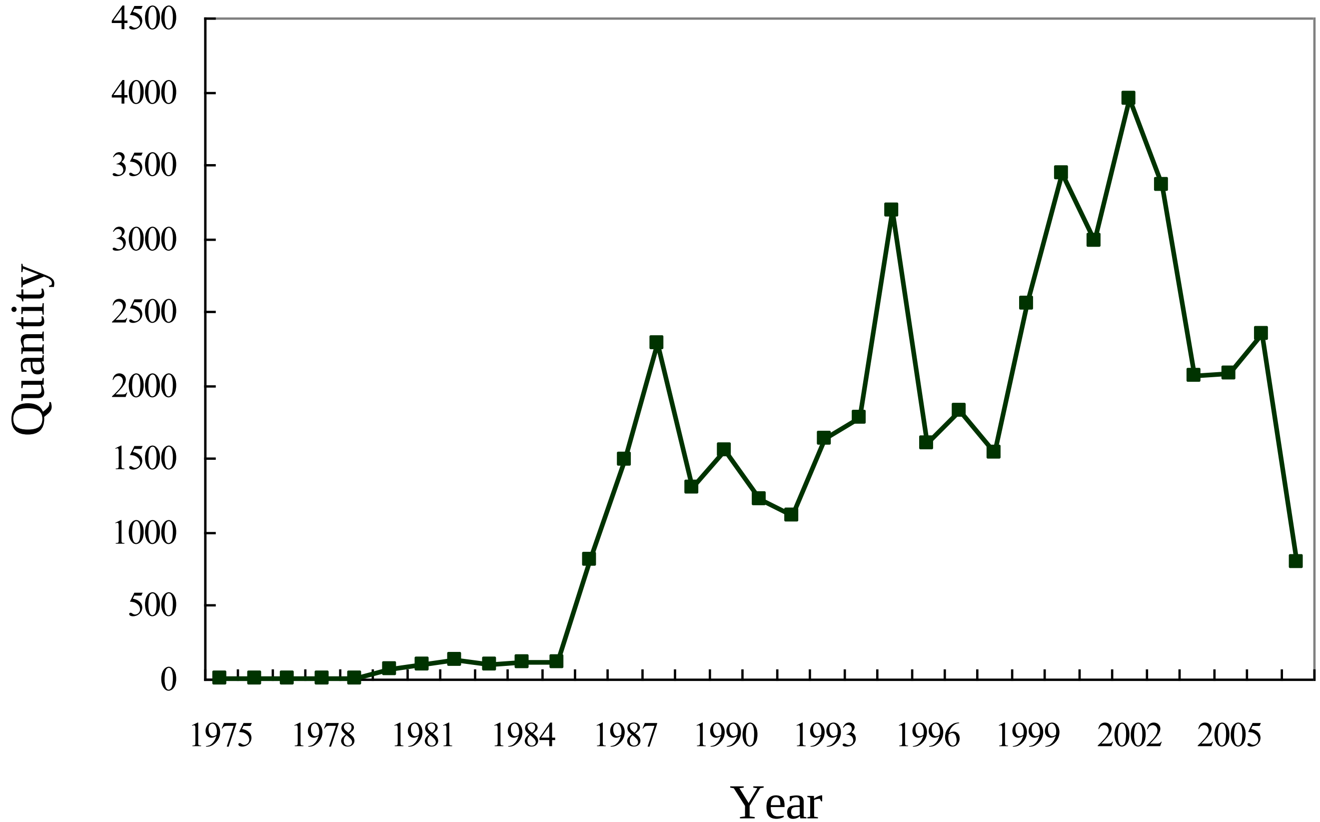
Harvesting regime

- From 1980 to 2006, 45,494 *Macaca mulatta* were exported from China to Britain, Japan and USA etc. Of those monkeys, 28,389 were labeled with “C”; 2,066 of them marked with code “W”, 3,920 were not labeled with any code. The truth was UNEP-WCMC CITES Trade Database does not contain source information for most reports prior to 1991 (UNEP-WCMC, 2004). Another 3657 Macaca mulatta were re-exported from China to above mentioned primate importing countries for the same purposes “S” or “T”.

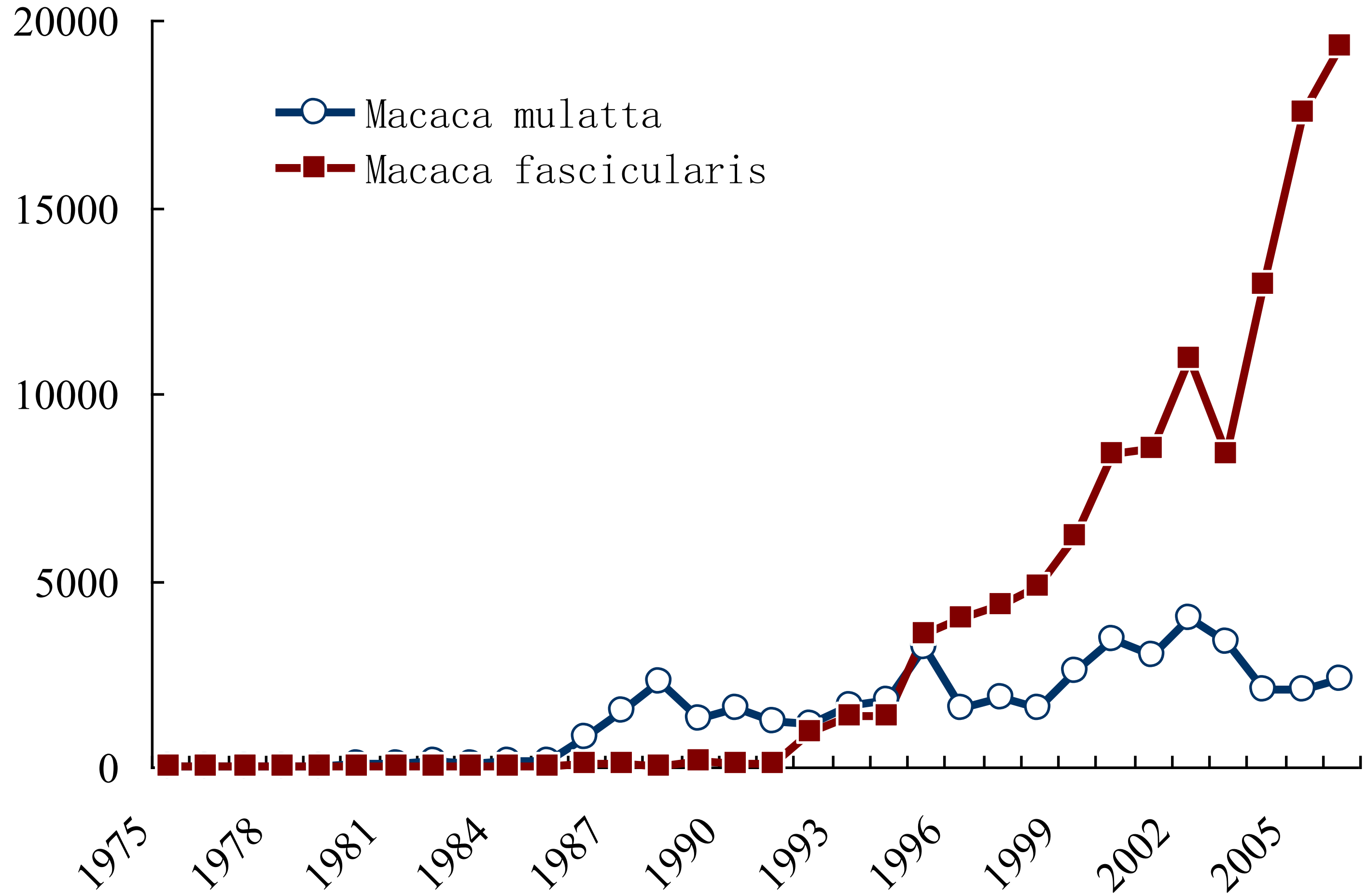
Trade level of *M. fascicularis*

- China exported of 2,580 living crab-eating macaques in 2005, 3,474 in 2006, and 6,190 in 2007. The main destination of the trade was the U.S.A. More than 5,000 units of other derivatives such as serum, plasma, or tissues of crab-eating macaques from medical experiments were exported from 2005 to 2007. Main destinations of those crab-eating macaque derivatives were Japan, U.S.A., Canada and France. Two cases of illegal imports of several hundreds living crab-eating monkeys were reported in 2004 and 2006, respectively.

Macaca mulatta exported from China (UNEP-WCMC CITES Trade data base)



Trades of *M. malatta* and *M. fascicularis*



Illegal trade: *M. malatta*

- Illegal trades of rhesus monkeys were prosecuted by wildlife law enforcement authority in China. For instances, three men were charged by Chongqing municipal forest police for illegal transporting 57 rhesus monkeys in March, 2007. In 2008, the forest police confiscated 991 rhesus monkeys. Ten people were charged for illegal sale and transporting of rhesus monkey. They were sentenced to 2-15 years in prison. However, the news did not specify whether the rhesus monkey were form wild source or breeding centers.

Non-detrimental Finding procedure: *M. malatta*

Criteria/parameters are needed to be considered for NDFs of rhesus monkeys:

(a) The *Macaca mulatta* is abundant in wild and artificially bred in large scale in the country.

(b) *Macaca mulatta* breeding companies do not require catching any wild rhesus monkeys for breeding.

(c) The exporting volume of captive breed *Macaca mulatta* is within the annual natural recruitment of *Macaca mulatta* in breeding centers; within the level of sustainable trade of the population.

Non-detrimental Finding procedure: *M. fascicularis*

Is the methodology used based on the IUCN checklist for NDFs? __yes _√_no

Criteria/parameters are needed to be considered for NDFs of *Macaca fascicularis*:

(a) Artificially bred in the country ;

(b) *Do* not require wild caught crab-eating macaques for breeding.

(c) The exporting volume of captive breed *Macaca fascicularis* is small compared to the captive breed macaque population.

How can be those data analyzed to take decisions on that species use

(a) Large wild populations and extensive distribution of *Macaca mulatta* increase the viability of rhesus monkeys.

(a) A large scale artificial propagation of *Macaca mulatta* can meet the demands for medicinal, biological, behavioral and psychological experiments.

(b) The artificial propagation populations of *Macaca* are self sustainable.

Main sources of data

- The data of *Macaca* in breeding centers or breeding companies were obtained during surveys;
- From the statistic data of the national CITES trade data base;
- Popualtion data of *Macaca malatta* were obtained during field surveys
- Some of the data were cited from the references.

Comparison of *Macaca mulatta* export data

Year	CITES Trade Database	CN Database	Difference
2000	3437	990	2447
2001	2986	3246	-260
2002	3950	5139	-1189
2003	3362	4139	-777
2004	2055	2180	-125
2005	2077	2306	-229
2006	2352	9052	-6700
2007	793	2199	-1406
Sum	21012	29251	-8239

Recommendations

- China already has a large captive population of *Macaca*.
- The increasing number of the captive bred *Macaca* will not pose threats to the wild *Macaca* populations.
- Demand for macaques as laboratory animals in coming years is between 30,000-60,000 macaques per year. Such a demand will be met with the current size of captive bred *Macaca*
- Primate breeding companies in developing countries should be transformed into animal laboratories.


Thank you!

NDF WORKSHOP CASE STUDIES
WG 5 – Mammals
CASE STUDY 7
Monodon monoceros
Country – **GREENLAND**
Original language – English

GREENLAND, NARWHAL (*MONODON MONOCEROS*)

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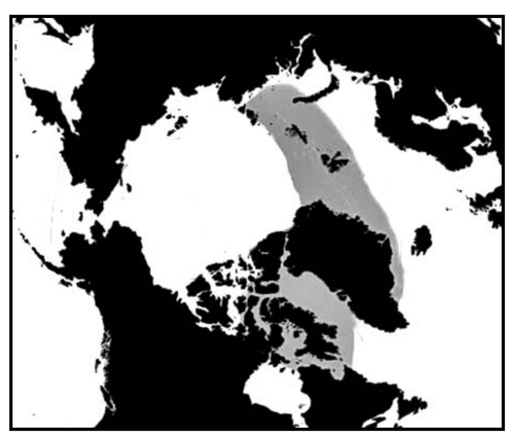
I. BACKGROUND INFORMATION ON THE TAXA

1. BIOLOGICAL DATA

1.1. Scientific and common names
Narwhal (*Monodon monoceros*)

1.2. Distribution
Narwhals are distributed in the North Atlantic Arctic, with the majority of the abundance being in Arctic Canada and Greenland. The summer distribution is largely continuous, but divided into relatively isolated aggregations with site fidelity to separate fjord systems during summer. During winter the species can be found in the drift ice between Greenland and Canada, off the west coast of Greenland, off East Greenland, in the Greenland and in the northern Barents Sea.



1.3. Biological characteristics

1.3.1. *Provide a summary of general biological and life history characteristics of the species*

Narwhals may exceed 100 years of age, with the majority of females being sexually mature at about seven years of age. The average calving interval for mature females is three years.

1.3.2. *Habitat types*

The species is found in drift ice during winter often at deep water where it feeds on halibut. During summer it is often found in deep fjord systems.

1.3.3. *Role of the species in its ecosystem*

A top predator that feeds on halibut and squid in deep waters. Narwhals are preyed upon by killer whales (*Orcinus orca*) and men.

1.4. Population

1.4.1. *Global Population size*

An aerial line-transect survey that did not cover the total range of narwhals in Arctic Canada estimated 45,000 (95% CI: 23,000-88,000) narwhals in 1996. Aerial line-transect surveys off West and East Greenland carried out in 2006 (west, spring), 2007 (northwest, summer) and 2008 (east, summer) are currently being analysed. Numbers in Svalbard and the Barents Sea are unknown, but the densities are lower than in Arctic Canada and Greenland. Abundance estimates are listed by NAMMCO 2005[1](See ANNEX 1 *JCNB/NAMMCO SWG workshop report on narwhal and beluga*).

1.4.2. *Current global population trends*

___increasing ___decreasing ___stable _X_unknown

1 NAMMCO 2005. Report of the Thirteenth meeting of the NAMMCO Scientific Committee Annex 1. Report of the joint meeting of the NAMMCO Scientific Committee Working Group on the Population Status of Narwhal and Beluga in the North Atlantic and the Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga Scientific Working Group. NAMMCO Annual Report 2005, pp. 219-251. www.nammco.no/nammco/mainpage/publications/annualreports/

1.5. Conservation status

1.5.1. *Global conservation status* (according to IUCN Red List)

___Critically endangered
___Endangered
___Vulnerable
___ Near Threatened
___Least concern
_X_Data deficient

1.5.2. *National conservation status for the case study country*

Greenland Red List, "Critically endangered" in West Greenland and data deficient in East Greenland.

1.5.3. *Main threats within the case study country*

___No Threats
___Habitat Loss/Degradation (human induced)
___Invasive alien species (directly affecting the species)
_X_Harvesting [hunting/gathering]
___Accidental mortality (e.g. Bycatch)
___Persecution (e.g. Pest control)
___Pollution (affecting habitat and/or species)
_X Other: natural die-back and climatic events
___Unknown

2. SPECIES MANAGEMENT WITHIN THE COUNTRY FOR WHICH CASE STUDY IS BEING PRESENTED

2.1. Management measures

2.1.1. *Management history*

Before 2005 there was an unregulated hunt on narwhals in West and East Greenland with approximately 700 narwhals taken per year. Continuing from 2005 a quota system has been in place with a current annual quota of 385 narwhals in West Greenland.

No quota system is in place for narwhals in East Greenland, with an average reported take of 95 narwhals per year over the ten year period between 1997 and 2006. Catches have increased in East Greenland during the past 20 yrs.

2.1.2. *Purpose of the management plan in place*

To regulate the hunt and make the catches in West Greenland sustainable.

2.1.3. *General elements of the management plan*

There is no long-term management strategy. Quotas for West Greenland are set in a year-to-year basis, taking into consideration both the biological advice and the hunter's opinion. Resulting quotas are higher than the biological advice and lower than the average yearly catches before the introduction of quotas.

2.2. Monitoring system

2.2.1. *Methods used to monitor harvest*

The harvest is monitored through hunters reports.

2.2.2. *Confidence in the use of monitoring*

While some under-reporting is likely to take place, over-reporting may also have occurred, especially prior to 2005. No measure of the overall credibility of the reporting system has been made.

2.3. Legal framework and law enforcement

In West Greenland, the quota and harvest are monitored by the municipal authorities and by the Fisheries, Hunting and Agriculture Agency, through a licence and reporting system. Management advice is given by The Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga (JCNB). The scientific advice for JCNB on harvest sustainability is provided by a Joint Working Group (JWG) of the Scientific Working Group of JCNB and a Working Group from the Scientific Committee of the North Atlantic Marine Mammal Commission (NAMMCO). Quotas are based on management recommendations from JCNB and on advice from the Hunting Council, which includes representatives from the Organization of Fishermen and Hunters (KNAPK), the Organization of Leisure Hunters (TPAK) and the Greenland Association of Municipalities (KANUKOKA). Quotas are proposed by the Department of Fisheries, Hunting and Agriculture and adopted by the Cabinet. The municipal authorities distribute the quota among the different settlements and individual hunters. It is the responsibility of the municipal authority to stop the harvest once the quota has been reached. Any excess catches and illegal captures are subtracted from the municipal quota the following year. Calves and females accompanied by calves are protected. All usable meat and skin should be utilised. Failure to comply with the executive order can result in confiscation of catch and equipment and fine. Narwhals found in ice-entrapments are not included in the quota and can, following approval by the Department of Fisheries, Hunting and Agriculture, be hunted without regulations.

3. UTILIZATION AND TRADE FOR RANGE STATE FOR WHICH CASE STUDY IS BEING PRESENTED

3.1. **Type of use** (origin) **and destinations** (purposes)

Meat and skin are consumed locally or distributed within Greenland. Tusks are generally sold and resold by a number of intermediaries. Tusks reach the final consumer both as whole tusks and pieces used for artwork. Export of narwhal products was banned in 2006. Narwhal products are legally traded within Greenland. Only subsistence hunting takes place, trophy hunt is not allowed.

3.2. Harvest:

3.2.1. *Harvesting regime*

Extractive (hunt). Hunting methods vary according to local rules and traditions; narwhals are taken with hand harpoons from kayak, with high-powered rifles from open boats or with nets placed at strategic places. Narwhals are hunted during summer in the east and northwest and during winter in the west.

3.2.2. *Harvest management/ control*

In West Greenland hunters have to apply for a licence from the local authorities before setting out to hunt narwhals. After the hunt, hunters report their catch by filling a form for each narwhal taken (ANNEX 2 Hunter Reporting Form). This form contains biological information, as well as information about the licence and the hunter. Hunters have to deliver catch reports to the municipal authorities in order to sell the products of their hunt and to obtain a new licence. Besides the specific report for each narwhal caught, once a year all hunters have to report monthly catches of most species, including narwhals. This yearly reports are mandatory in order to renew the hunting permits.

Judging by the numbers of catch reports received, the system works better in west than in east Greenland.

3.3. Legal and illegal trade levels

The meat, skin and tusks are sold legally within Greenland. The skin is considered a delicacy with high cultural value and high demand within Greenland.

Prior to the export ban in 2006, tusks, and artwork from tusks, where exported legally, mainly as personal items bought in Greenland. Export is now prohibited, but export permits can be issued to Greenland residents that are taking up residence in another country, and own narwhal products as part of their household items. A few individuals have taken advantage of this exception and transported several narwhal tusks to their new homes in Denmark.

To our knowledge, there are no statistics about narwhal products smuggled out of Greenland. But given the lack of systematic control in harbours and airports, it is not impossible that a number of narwhal items leave the island unnoticed.

II. Non-detrimental Finding procedure (NDFs)

1. IS THE METHODOLOGY USED BASED ON THE IUCN CHECKLIST FOR NDFS?

__yes _X_no

The procedure used for the NDF of narwhal and other species in Greenland is not based on the IUCN checklist. It follows instead a protocol that was developed by the Greenland Scientific Authority in 2005. The protocol is in Danish, and its major points are outlined below.

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED

Nearly all the NDF-relevant species in Greenland have multiple stocks, and multi-stock considerations are thus essential in the NDF protocol developed by the Greenland Scientific Authority. Generally speaking, we would make a positive NDF for multi-stock species only if 1) the hunt on all stocks are considered sustainable, or 2) the harvest on at least some of the stocks are sustainable and there is a system in place that can trace products to stock origin. In the latter case it would be possible to issue a positive NDF for the stocks with a sustainable hunt, and a negative NDF for stocks with an unsustainable hunt. However, as no tracing system is yet in place in Greenland, we would generally only make a positive NDF if the hunt on all stocks is sustainable.

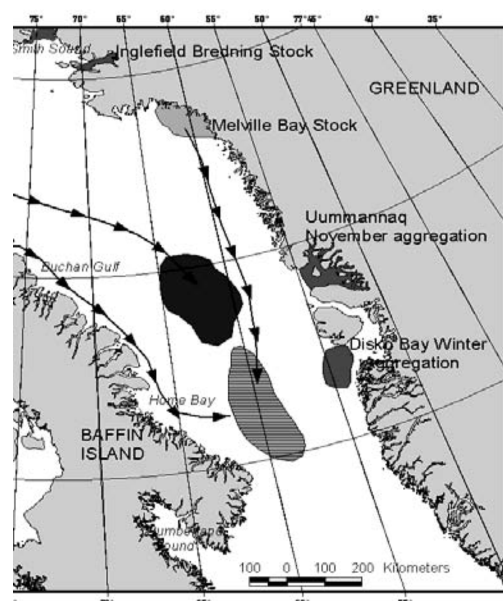
The final set of rules in our procedure for NDFs is for the clarification of when the hunt on a given stock is to be considered sustainable. If the Scientific Working group of the international body that deals with the species in question has produced a clear statement/recommendation of the sustainability of a hunt on a stock, it should be straight forward to conclude whether the hunt is sustainable or not. However, such statements/recommendations might be missing for several reasons. A stock might not yet have been assessed by a working group, or it might have been considered but found that there was not enough data to make recommendations. Our internal rules on sustainability are based on precautionary principles so that positive

NDFs should be made only when there is positive evidence that the hunt is sustainable. We would generally make a positive NDF only if 1) the catch is below or equal to a level recommended by a scientific evaluation of the relevant international body, or 2) there are no explicit evaluation of sustainability but the issue of a sustainable hunt has been considered by the scientific working group and no concerns were raised. If instead there are no explicit evaluation of sustainability but the issue of a sustainable hunt has been considered by a scientific working group and concerns were raised, or the issue of sustainability has not yet been considered by a scientific working group, we would conclude that we cannot conclude that the hunt is sustainable and, thus, no positive NDF would be made. Likewise, we would conclude that the hunt is unsustainable if the hunt exceeds a recommended level for sustainability.

3. MAIN SOURCES OF DATA, INCLUDING FIELD EVALUATION OR SAMPLING METHODOLOGIES AND ANALYSIS USED

Many of the species (i.e. narwhal, beluga, polar bear and walrus) that require NDFs in Greenland are hunted and subject to scientific recommendations on sustainable harvest levels through international bodies, such as the North Atlantic Marine Mammal Commission (NAMMCO), the Canada /Greenland Joint Commission on the Conservation and Management of Narwhal and Beluga (JCNB), and the IUCN Polar Bear Technical Committee. The NDFs guidelines for Greenland are based on the recommendations from the Scientific Working groups of these bodies (see e.g. NAMMCO 2005[2] for narwhal).

The international scientific bodies typically make their recommendations based on an



In West Greenland, narwhals are hunted during summer in Smith Sound, Inglefield Bredning and Melville Bay , and during winter in Uummannaq and South of Disko Island. Narwhals from Melville Bay winter in the pack-ice with narwhals that summer in Arctic Canada

2 The relevant international body for narwhal is a joint JCNB/NAMMCO working group

assessment that includes a population dynamic modelling over the available data on stock structure, abundance estimates and catch statistics. Assessment models for narwhals have included Bayesian statistical integrations with age-structured and discrete density-regulated models over the entire time period of the known catch history, making it possible to estimate the catch level that would allow a population to increase with a certain probability.

4. EVALUATION OF DATA QUANTITY AND QUALITY FOR THE ASSESSMENT

By basing the NDFs on the scientific recommendations of international bodies, the Scientific Authority achieves several things. First of all the scientific evaluations of sustainable use become internationally peer-reviewed and thus likely to represent a more firm background for the NDFs than any sustainability evaluation performed by the Scientific Authority itself. Thirdly the evaluation becomes more robust to internal political pressure, should such pressure arise. Duplication of work is also avoided, which is another essential factor in a small country with only few heads to do the work. And finally, by letting the NDFs depend on the scientific recommendations of the international bodies, and not on recommendations at the Council or Commission level, the NDFs become based on scientific arguments only.

A potential problem with this process is that scientific data may need to be available for all harvested stocks, even for those that are widely dispersed and only hunted locally as is the case for most species in East Greenland. This usually calls for very expensive studies to provide data for the scientific process and in some cases it might even be practically impossible to attain scientific data of sufficient precision for a proper assessment.

5. MAIN PROBLEMS, CHALLENGES OR DIFFICULTIES FOUND ON THE ELABORATION OF NDF

Challenges on the elaboration of a narwhal NDF in Greenland

We have been unable to provide a positive NDF for narwhals in Greenland because the catches in the west are larger than what was recommended by the Scientific Working Group of the JCNB.

The current recommended takes are much lower than the catches before the introduction of quotas, and hunters are very reluctant to accept such a large reduction; they encounter narwhals often and consider them abundant. In the end, the government sets quotas that are a compromise between the scientific advice and the hunter's knowledge.

Several hunters and a few politicians have expressed mistrust towards the biological advice and narwhal quotas are a hot issue in the Greenlandic news.

A key problem for providing credible management advice is the lack of detailed knowledge about the narwhal populations. Due to our limited knowledge, and in accordance with the precautionary principle, the current biological advice is conservative. JCNB would be able to provide more accurate recommendations if the range and abundance of the separate stocks were better understood. A more accurate advice would probably reduce the distance between the biological advice and the actual catches.

In West Greenland, narwhals are caught in three different locations of the far north during summer and two locations further south during winter (see figure above). In East Greenland narwhals are caught in several fjord systems during summer. The main scientific challenges are to obtain abundance estimates for all locations and to understand if the different locations correspond to separate stocks or are linked through seasonal migrations or intra-seasonal movements of individual narwhals. Studies from Arctic Canada and West Greenland have shown that stock delineation among narwhals is complex.

At the Greenland Institute of Natural Resources, we are working towards improving the knowledge about range, migration and abundance of the major narwhal stocks in Greenland. For this purpose, we are carrying out a series of studies using satellite telemetry, aerial surveys and analysis of biological samples obtained from the harvest.

The satellite telemetry should help to understand the stock delineation by giving information about range and migrations. In addition, satellite tags provide us with information about the proportion of time when the narwhals are on the upper layers of the water column and are available for observation during aerial surveys.

The aerial surveys give information about the distribution and abundance of narwhals in the different areas. We expect that all the important areas have been surveyed at least once in recent years by September 2009.

The analysis of biological samples should help to understand the population dynamics and genetic relationships. However, it is difficult to use DNA analysis to understand stock delineation because narwhals have an extremely low genetic diversity.

As a consequence of this ongoing research program, we expect that JCNB will be able to provide an improved management advice already in 2009.

Problems and difficulties on the elaboration of NDFs in Greenland

The internal protocol for the Greenland Scientific Authority provides guidelines to make NDFs relatively easily and consistently with basis on the recommendations of the relevant international scientific bodies. The international scientific bodies generally evaluate the sustainability of the hunt on a population/stock level, and do not tend to consider socio-economic aspects that could be relevant for an NDF, such as the impact of trade on a population.

Although NDFs, in principle, should evaluate if export is of detriment to the species, the Greenlandic guidelines do not consider direct analyses of the impact of export on a population. This is partly because the statistics on export of products from species listed by CITES contain several confounding factors and cannot be used directly to provide insight into the number of animals involved in the trade.

In theory, a direct evaluation of the impact of export should be necessary and sufficient for a positive NDF if the hunt on a species is unsustainable but the hunt is independent of international trade. Such cases are of interest in Greenland, where it has been argued that since the current hunt on narwhals in West Greenland is limited by quotas and driven strongly by local demand, exports would not have any impact on the hunt and, thus, it should be allowed to export narwhal tusks even though current takes are probably unsustainable.

In Greenland, the main objective of harvesting species such as narwhals, polar bears and walrus is subsistence. However, international trade can add additional value to the hunt and therefore export may have some impact on the hunt. A positive NDF requires that it can be documented that the export has no impact on the hunt and thus has no detrimental effect on the stock. This level of documentation was a priory considered to be impossible for species like narwhals, polar bears, and walrus where the exported products have an important economical value for the hunters. When such documentation is considered impossible, any analyses on the direct impact of the export seems redundant, because any positive NDF necessarily must depend upon whether the hunt is considered to be sustainable or not. The NDFs in Greenland are thus based almost exclusively on precautionary principles of sustainability. We would, however, appreciate any expert discussion on a possible inclusion of analysis of the effect of international trade, especially in relation to the possibility of providing positive NDFs for cases with a potentially unsustainable harvest.

ANNEX 1

JOINT MEETING OF THE

NAMMCO SCIENTIFIC COMMITTEE WORKING GROUP ON THE POPULATION STATUS OF NARWHAL AND BELUGA IN THE NORTH ATLANTIC

AND THE

CANADA/GREENLAND JOINT COMMISSION ON CONSERVATION AND MANAGEMENT OF NARWHAL AND BELUGA SCIENTIFIC WORKING GROUP

Nuuk, Greenland, 13-16 October 2005

1 OPENING REMARKS

Chairmen Lars Witting and Øystein Wiig welcomed the participants (Appendix 1) to the third joint meeting of the Canada/Greenland Joint Commission on Conservation and Management of Narwhal and Beluga (JCNB) Scientific Working Group and the North Atlantic Marine Mammal Commission (NAMMCO) Scientific Committee Working Group on the Population Status of Narwhal and Beluga in the North Atlantic (hereafter referred to as the Joint Working Group or JWG). The chairmen noted that, since the last meeting of the JWG, the JCNB had met once and NAMMCO Council had met twice.

At the ninth meeting of the JCNB, held in May 2004, the Commission agreed to ask the Scientific Working Group to focus on narwhal and complete that assessment and to update the West Greenland beluga assessment using any new information available. In addition the Commission posed the following questions (not in order of priority) to the SWG:

1) The Scientific Working Group should consider ways to resolve the issue of reproductive rate of narwhal.
2) Recent changes have been observed in the distribution of narwhal in Canada. For instance in Pelly Bay, hundreds of narwhal now regularly occur where they seldom occurred in the past. Are there any explanations available for these distributional changes?

The Scientific Working Group was also requested to consider the implications for its own structure and the organization of its work of a possible extension of the Commission's competence to include walrus or other marine mammal species.

NAMMCO Council endorsed the plan of the NAMMCO Scientific Committee to update and finalise the assessment of West Greenland narwhal in 2005 in cooperation with the Scientific Working Group of the JCNB. The Council also requested that the Scientific Committee carry out an assessment of East Greenland narwhal and provide an estimate of sustainable yield for the stock. The management objective in this case is to maintain the stock at a stable level. If the assessment cannot be completed with available information, the Scientific Committee was asked to provide a list of research that would be required to complete the assessment.

The JWG will therefore concentrate on the following tasks:

a. Update and finalize the assessment of West Greenland narwhal.
b. Make progress on assessments of other stocks of narwhal, particularly stocks summering in Canada. This will include provision of advice for the different putative management units.
c. Identify research required to complete an assessment of East Greenland narwhal.
d. Update the available information on the status of West Greenland beluga, taking into account recent harvest levels.
e. Address the specific questions posed by the Commission of the JCNB, above.

In addition the JWG should look at the recent information and if necessary revise previous statements about the extent of sharing of narwhal between Canada and Greenland.

2 ADOPTION OF JOINT AGENDA

The draft Agenda (Appendix 2) was adopted.

3 APPOINTMENT OF RAPPORTEURS

Daniel Pike and Patrice Simon were appointed as rapporteurs for the meeting, with the assistance of other members as required.

4 REVIEW OF AVAILABLE DOCUMENTS

The list of documents (Appendix 3) available for the meeting was reviewed..

5 NARWHALS

5.1 Stock structure

5.1.1 Genetic information

There was no new genetic information available.

5.1.2 Satellite tracking

JWG-2005-12 Laidre, K. and Heide-Jørgensen, M.P. Late summer and early fall movements of narwhals in Inglefield Bredning, Northwest Greenland

A new technique was developed for instrumenting narwhals in Inglefield Bredning, Greenland involving the deployment of satellite tags by hand harpoon from Inuit hunters in kayaks. Four narwhals were tagged in September 2004 and 2005 and movements of each animal were monitored for approximately one month. Tags were thrown into whales from a distance of 2-3 meters and all placed to the left or right of the dorsal ridge. On 6 September 2004, a female narwhal was tagged and positions were received from this animal for 19 days until 24 September. On 12 September 2004 two whales (one adult female and one adult male) were tagged. Positions were received from these two animals until 26 September and 28 September, respectively. Finally, on 30 August 2005 a male narwhal was tagged and positions were received for 20 days until 18 September. All four whales made localized movements in Inglefield Bredning and were generally stationary in the fjord through September. Shifts to the west and south were observed for all animals by the end of the month, however no data were collected on migration routes or wintering grounds because of the limited tag attachment duration. The assumption that only Inglefield Bredning supplies the fall and winter harvests in Greenland at this point should be taken with caution.

Discussion

The JWG noted the importance of the management issue being addressed by this study, the migratory destination of Inglefield Bredning whales and whether or not they contribute to catches further south, and encouraged further work in this area. For this purpose the duration of the tags must be doubled or tripled. It was considered likely that the relatively short transmission-life of the tags was due to attachment failure rather than tag failure, as the battery life of the tags should have been longer than the longest transmission time. Therefore further attempts will be made to refine the attachment system and deployment methods.

It was also noted that this work was being carried out in cooperation with hunters, who had made an important contribution to the development of the tagging methodology.

5.1.3 Management units

JWG-2005-16: Heide-Jørgensen, M.P., Dietz, R. and Laidre, K. Metapopulation structure and hunt allocation of narwhals in Baffin Bay

A model of the metapopulation structure of narwhals in Baffin Bay and adjacent waters is proposed based on a review of recent genetic studies, heavy metals, oroganochlorines, stable isotopes, satellite tracking, hunting statistics and compilations of local knowledge. This model is similar to the model presented at previous meetings but new evidence on migrations and homing of narwhals from Admiralty has been added. The default definition of a stock or management unit should be based on the assumption that disjunct summering aggregations of narwhals are separate stocks with little or no exchange between whales from other summering grounds. Coastal summering concentrations of narwhals in Canada are proposed to constitute at least five separate stocks: Eclipse Sound, Admiralty Inlet, Somerset Island, East Baffin stocks, and Cumberland Sound. Coastal summering concentrations in Greenland constitute at least two separate stocks: Inglefield Bredning and Melville Bay. Stocks that are shared between Canada and Greenland include Jones and Smith sound. In northwest Greenland, whales in Inglefield Bredning likely migrate south to Uummannaq and winter in Disko Bay, although this is the only major aggregation of narwhals that has not been tracked beyond 1 October. Inuit hunting of narwhals will differentially impact the stocks in Canada and Greenland depending on the temporal dispersal of the whales. Therefore, it is important to identify which stocks and aggregations contribute to which hunt in order to assess the sustainability of the hunt. Eighteen major hunting grounds in Canada and Greenland are identified at which several stocks appear to be hunted more than once. Evidence suggests whales from Canadian stocks have a low risk of being harvested in West Greenland. Similarly Greenlandic stocks also have a low risk of being harvested in Canada. The apparent stock delineation may be maintained through a combination of reproductive isolation at the spring mating season and matrilineally inherited site fidelity.

Discussion

The JWG concluded in 2004 that the model for apportioning of catches to putative stocks presented in the previous version of this paper (see Fig. 1) was acceptable based on the available evidence. This general conclusion was unchanged given the rather limited new information available. However the existence of summer stock of narwhal in Cumberland Sound was disputed, given that harvests are relatively low there during the summer and narwhal have not been seen in any significant numbers in extensive surveys of Cumberland Sound. The model presented in JWG/16 is qualitative in nature, using information from all available sources to identify stock units useful for management. The JWG was fully cognizant of the uncertainty of some of these conclusions. It was emphasized that the JWG will remain open to changing its understanding of narwhal stock structure as new information becomes available.

Some of the relationships between summering aggregations of narwhal and wintering areas are based mainly on very low numbers of satellite tracked narwhal. In particular only 2 narwhal from Melville Bay, both males, have been tracked to their wintering area. There was concern that basing stock relationships on such small sample sizes could lead to erroneous conclusions but there was no way to quantify the uncertainty in these conclusions. However in areas where larger numbers of narwhal have been tagged, such as Eclipse Sound, there has been little variance in migratory behaviour, giving greater confidence to conclusions based on small sample sizes. It was also noted that the identification of putative stock units was based on all available evidence, not just that from satellite tracking.

Given the logistical difficulty of deploying satellite tags, and the lack of success in some areas, the idea of using passive tags that would be recovered in the hunt, such as “spaghetti” or Discovery tags, was considered. However it was noted that deploying such tags would likely be no easier than deploying satellite tags and that large numbers would have to be deployed to have a reasonable expectation of a useful number of recoveries. It was considered preferable to maximize the information gain from every tagging opportunity by using tags that actively collect and transmit data. It was also noted that the deployment of passive tags had been tried on beluga in Canada with little success, probably because of tag rejection.

It was emphasized that the mechanism (genetic and/or behavioural) by which independent summer stocks are defined is not relevant to the importance of these stocks as management units and that management advice could be based on these units in either case. There is little evidence to support the contention put forward in JWG-16 that summer stocks of narwhal are in the main reproductively isolated from one another and it was noted in particular that the very low genetic diversity found between narwhal areas does not support this. The observed isolation of summering aggregations from one another could be maintained by maternally directed philopatry, which would not leave a genetic signal if the summer stocks are interbreeding elsewhere. In such a case some separation would be expected in the mitochondrial genetics, as is seen in beluga. That this separation is not seen in narwhal suggests that some mixing is taking place or that there has not been sufficient time since the separation of summering stocks for such differences to develop.

Sharing of stocks between Canada and Greenland
In 2004 the JCNB requested the JWG to look at the recent information and if necessary revise previous statements about the extent of sharing of narwhal between Canada and Greenland. In 2004 the JWG agreed that all available evidence suggests whales from Canadian stocks have a low risk of being harvested in West Greenland and that whales from Greenlandic stocks have a low risk of being harvested in Canada. No new evidence has been presented to change this conclusion. However it was emphasized that this conclusion is preliminary and based on incomplete evidence. The migratory destinations of some summer aggregations in Canada are unknown. These include the East Baffin, Smith Sound, Jones Sound and Parry Island stocks. It is therefore not known if these stocks are at risk of harvest in Greenland. In addition, the lower rate of depletion of the overwintering stock at Disko Bay compared to that of the Inglefield Bredning summer stock suggests that Inglefield Bredning cannot be the sole source of narwhal wintering at Disko Bay, implying that some of the narwhal harvested at Disko Bay must come from stocks summering elsewhere.

The JWG therefore revised its previous statement to conclude that there is a low risk that narwhal summering in the Somerset Island, Admiralty Inlet and Eclipse Sound areas are subject to harvest in Greenland. These groups constitute a large proportion of the total known number of narwhal summering in Canada. The migratory routes and destinations of other Canadian summer stocks, such as the East Baffin, Jones Sound and Parry Island stocks, are unknown and there remains a chance that these stocks are subject to harvest in Greenland, particularly at Uummannaq and Disko Bay during the fall and winter.

Stock structure in East Greenland
No new information has become available on stock structure in East Greenland since the NAMMCO Working Group last considered this in 1999 (NAMMCO 2000). There are summer aggregations at Scoresbysund, Kangerlussuaq, and Ammassalik which are subject to catches. Narwhal also occur north of Scoresbysund but these are likely not harvested. There is genetic evidence that East Greenland narwhal are distinct from those in West Greenland and Canada. However at present there is no basis for further distinguishing East Greenland stocks beyond that of their observed summer distribution.

5.2 Biological parameters

5.2.1 Age estimation

WG-2005-8 Garde, E., Heide-Jørgensen, M. P., Hansen, S. H. and Forchhammer, M. C. Age-specific growth and high longevity in narwhals from West Greenland estimated via aspartic acid racemization.

Age estimation of odontocetes (toothed whales) has traditionally been done by counting of growth layer groups (GLGs) in the teeth or mandible. However, this method has failed to provide reliable results for narwhals and development of a reliable method is needed. Here, we present new results for the age estimation of narwhals using the aspartic acid racemization technique. The technique utilizes the fact that, in metabolically inactive tissues, such as eye lens nuclei and teeth, aspartic acid is converted or racemized from the L-form to the D-form with a constant rate over time. In this study eyeballs and teeth from a total of 75 narwhals taken by Inuit hunters were collected and analyzed. The D/L aspartic acid ratio was measured using High Performance Liquid Chromatography (HPLC). Due to difficulties with the HPLC analysis (aspartic acid peak separation) of the teeth samples, only the results of the eye samples are presented here. Age estimates were successful for all 75 narwhals. The aspartic acid racemization rate (k_{Asp}) was estimated to be 1.045 x 10^{-3} yr^{-1} by regression of D/L ratios to age estimated by length of 15 young narwhals (≤298 cm in length, ≤2.5 years) supplemented with data from 13 fin whales (Nerini 1983) that had been age estimated by counting of earplug laminations. The initial D/L ratio ($(D/L)_0$) was estimated by regression of D/L ratios to estimated age for the 15 young narwhals. The $(D/L)_0$ value was estimated to be 0.02880. About 20% of the whales were older than 50 yrs and there seemed to be a tendency for greater longevity in females than in males. The maximum age obtained was from a 115 year (SE±10 years) old female. The oldest male in the sample was 84 years (SE±9 years). Using the Von Bertalanffy growth model, length at physical maturity was estimated to be 396 (95% CI: 387-404 cm) and 457 cm (95% CI: 443-470 cm) in females and males, respectively. Based on the assumption that cetaceans attain sexual maturity at about 85% of their physical maturity (Laws 1956), length and age at sexual maturity was estimated to be 337 cm and 6-7 yrs for females, respectively, and 388 cm and 9 yrs for males, respectively.

Discussion

The JWG welcomed this important advance in determining the ages of narwhal, for which previously no reliable method was available. It was noted that there were some uncertainties, particularly relating to the lack of studies of known age animals. Such data are mainly available for humans. It was recommended that the method should be applied to other marine mammals, such as some other toothed whales and seals, for which ages are available through other methods, and to captive animals of known age, to verify the reliability of racemization ages. It was also recommended that the method be applied to beluga, in order to resolve the question of whether beluga teeth accrue 1 or 2 growth layer groups per year.

The estimates of age of sexual and physical maturity for male and female narwhal were similar to those from other studies. It was however recommended that the uncertainty in age estimation should be included in the estimation of growth curves.

The JWG found the method very promising and recommended that eyeballs be collected in all future sampling programs for narwhal and beluga. Once sufficient numbers of reliably aged animals have been collected, it should be possible to estimate the survival rate for narwhal stocks, which is an important parameter in stock modelling.

5.2.2 Reproductive rates

In 2004 the JCNB requested that the JWG should consider ways to resolve the issue of the reproductive rate of narwhal. The current scientific view is that narwhal reproduce about every third year. This is based mainly on the observation that roughly 1/3 of mature females in the catch are pregnant. It is also consistent with reproductive rates observed for other toothed whales. Some hunters, based on their own observations, have concluded that narwhal (and beluga) have the capacity to reproduce at a faster rate,

The JWG emphasized that the reproductive rate of one calf every 3 years is an average and does not preclude that some narwhal, at some periods of their lives, may reproduce at faster or slower rates. For example it is entirely possible and likely that younger females may reproduce at a faster rate than older ones: this is observed in other cetacean species.

It was considered that improving the estimate of reproductive rate, or calculating age-specific rates of reproduction, will be difficult. Although a method of ageing narwhal has become available (see 5.2.1), it is not possible to determine the number of pregnancies a female narwhal has had by examination of the reproductive tract, because of the production of accessory *corpora* and resorption of *corpora albicans*. The JWG considered the idea of determining the proportion of females accompanied by calves in aerial photographs, but concluded that this was not feasible because it is often difficult to determine the sex of narwhal from aerial photographs, and because calves are often very difficult to spot. Another possibility is through repeated observations of known individuals, identified through external markings or genetics. In this way individual females could be followed throughout their lives to determine their reproductive output. However, given the large numbers of narwhal in most areas and the lack of readily identifiable external markings, it is likely that a very large sampling effort would be required to achieve this.

While recognizing that the question of the reproductive rates of narwhal and beluga is important, the JWG emphasized that the assessment models that have been developed and used are not very sensitive to changes in the reproductive rate. A wide range of rates of increase are commonly used in these models. In all cases better information on stock structure, abundance and catch history is of far greater importance than a precise estimate of reproductive rate.

5.3 Catch statistics

JWG-2005-6. Heide-Jørgensen, M.P. Reconstructing catch statistics for narwhals in Greenland 1862 to 2005: A preliminary compilation.

Information and statistics including some trade statistics on catches of narwhals in West Greenland since 1862 are reviewed. Detailed statistics split by hunting grounds are missing for most of the years. For the northernmost area, the municipality of Qaanaaq, only sporadic reporting exists. Based on statistics from the most recent three decades a time series is constructed with catches split into hunting grounds and corrected for under-reporting estimated from purchases of mattak (*low option*), for periods without catch records (*medium option*) and from rates of killed and lost (K/L) whales (*high option*). This reveals a time series of somewhat realistic catch levels from 1862 through 2004. Since 1993 catches have declined in West Greenland especially in Uummannaq where the decline is significant. In East Greenland there has been an increase of 8% per year since 1993.

Discussion
There was a discussion on the correction factors used for struck and lost and they were considered appropriate. The correction for underreporting and stuck and lost adds an average of 42% to the harvest statistics for 1954-1998.

Sex ratio is available for some of the years and there is no apparent bias. It is believed that there has been no bias toward males as females also have a high monetary value because of meat/maktak sale.

A new narwhal harvest-monitoring system has been in place since 2004. Information on the date and location of harvest and the sex of harvested animals is collected under this system. Since 2004, it has been forbidden to hunt females accompanied by a calf; this may lead to a bias toward males in the sex ratio as was observed in 2004.

According to the catch statistics provided, there has been an increase in narwhal catches in East Greenland of 8% per year since 1993. The harvest reporting system changed in 1993 and the impacts of this change on the catch statistics are unknown. There should be a better analysis of the reason for this apparent increase in harvest.

JWG-2005-9. Romberg, S. and Richard, P. Seasonal distribution and sex ratio of narwhal catches in Baffin region of Nunavut territory, Canada.

The distribution of seasonal catches and sex ratio of narwhals in the Baffin region of Nunavut Territory, Canada, was studied using hunter tag information archived at the Department of Fisheries and Oceans (DFO) from 1990 to 2004. Histograms of catches by calendar date and a breakdown of catches pre-calendar day 205, between calendar days 205 (roughly floe edge season) and 274 (roughly summer open water season) and post calendar day 274 (later than 30 September) are given to estimate the proportion of animals taken during these periods. The results indicate that, in many communities, there is more than one season of hunting. Many communities hunt mostly in summer but several communities take a substantial proportion of their catch in spring or autumn. These results are used in allocating the catch to different putative sub-stocks, either local summering sub-stocks or spring or autumn migrating sub-stocks. The distribution of catch by sex shows that the majority of the communities take a greater proportion of males than females throughout the seasons.

Discussion
Underreporting of female in catch statistics may have happened in the past, when harvest was recorded under a different reporting system. However, the authors are confident that the present reporting system is working well.

In Canada, regulations forbid the harvest of female accompanied of a calf. This, as well as the high monetary value of the tusk, leads to bias towards males in the sex ratio of the harvest.

Fisheries officers and biologists carry out hunt observation in various communities each year. However, there is no observer program in place to provide consistent hunt observation or to verify information on struck-and-lost.

JWG-2005-10. Romberg. S. Catch Statistics (1996-2004) for narwhal and beluga in selected communities in the eastern Canadian arctic.

Catch statistics for narwhal in Canadian High Arctic region (Nunavut) for the period 1996-2004 are presented. In general, it is believed that the catch reports are accurate as a tag system is in place. Communities receive a specific number of tags and hunters are required to fill in specific information on the catch, report the sex of the animal, and attach a portion of the tag to the tusk when present. The other portion of the tag is returned to DFO which records the information. For communities participating in Community-Based Management, there is the possibility to transfer up to 50% of the annual harvest limit to the following year or to “borrow” up to 15% from the following year’s harvest limit.

Igloolik and Hall Beach have been included however it is not clear on what proportion of narwhals are taken from the Somerset Island s and Northern Hudson Bay stocks.

The average reported landed catch for the period is 373 which does not include Igloolik and Hall Beach.

Struck and lost includes the two categories ‘killed and lost’ and ‘wounded and escaped’.

In the communities which are part of a Community-Based Management program, total hunting mortality is reported. The struck and lost information is based on self-reported data by the hunters. Systems of reporting vary from community to community. In general, hunters are required to report animals that are wounded (wounded and escaped) and animals that have been killed but not retrieved (sunk and lost). Estimates of hunting mortality are calculated based on minima and maxima (min = landed + killed and lost; max = landed + killed and lost + wounded and escaped). Not all wounds result in latent mortality. Many hunting wounds are superficial and heal leaving the scars that are sometimes observed on narwhals. In some cases hunters report scars and whether animals that they have wounded are likely to survive or not.

Discussion:

There was discussion on the variation of the struck and lost rate between years within some communities. There is a need for a more consistent monitoring of struck and lost to provide better information on total removal due to hunting.

There is conflicting information on the lost rate in the narwhal hunts. While the data provided in document JWG-2005-10 indicate a somewhat low level of struck and lost in most communities and years, some anecdotal information suggests that higher loss rates are possible. To address this, and to improve our knowledge on total removal at various hunting sites and using various hunting methods, the JWG recommended the development of a program to collect struck and lost information from direct observation of hunts in Greenland and Canada. This may also assist in improving hunting techniques and efficiency and minimizing hunting losses.

NAMMCO informed the group that it will be holding a workshop on struck and lost in November 2006. The workshop will include participation from hunters, scientists and managers.

5.4 Abundance

5.4.1 Recent estimates

JWG-2005-5. Heide-Jørgensen, M.P. An attempt to survey narwhals and belugas in West Greenland March 2004.

A digital aerial photographic survey for belugas and narwhals was attempted in West Greenland during 19-30 March 2004. The survey aircraft was a twin engine Piper Aztec equipped with two Hasselblad cameras with digital databacks (Phase One) that downloaded images every 3rd second to onboard hard disks together with information on altitude, speed and position. Due to inclement weather with constant wind and/or fog the survey effort proved to be very low with only an insignificant proportion of the total area being covered. The survey was designed to cover the traditional strata used for estimating the winter abundance of belugas in West Greenland. Following advice from the hunters organisation, KNAPK, the survey was extended to cover Vaigat as well as the ofshore parts of Uummannaq. This extension, that was conducted under favorable conditions, did not reveal any observations of whales. However, on the 20 March pods of up to 25 belugas were seen in the northern part of Vaigat where it is known that some belugas winter. No other sightings of belugas or narwhals were made during the survey but one bowhead whale was seen on 18 March outside Ilulissat and prior to the beginning of the survey. Unusual light ice conditions were experienced in West Greenland during spring 2004. The low ice coverage created relatively unstable weather conditions with more wind (average 5.4 m/s) than usually encountered at this time of the year (<3 m/s). The wind over the wide open water fields made it impossible to complete the survey.

Discussion
Although weather often makes it difficult to complete a spring survey in West Greenland waters, the JWG reiterated its recommendation of the previous two meetings that a survey of west Greenland beluga should be conducted. It is planned to conduct a survey in March 2006.

JWG-2005-17. Heide-Jørgensen, M.P., K.L. Laidre and M.J. Simon. Video recordings of narwhal pods in the Melville Bay, northwest Greenland, 2004-2005

Digital aerial photographic surveys of Melville Bay in 2002 resulted in no sightings of whales despite 990 km of transect effort covered resulting 4.558 km^2 digital images. Hunters utilizing the Melville Bay for hunting were not satisfied with the recommendation for a zero catch quota so they proposed to make video recordings of some of the large pods that they frequently encounter in the Melville Bay to demonstrate the occurrence and perhaps numbers of whales in the area. This study reports on the results of hunter-based video recordings of narwhal pods in Melville Bay in August 2004 and 2005. Recordings of narwhal pods were collected on two days in 2004: the 21 and 23 August. On 21 August, 141 whales were estimated to be swimming to the right of the promontory and 34 were estimated to be swimming to the left. Since it is possible that the same whales were recorded on both days the highest minimum count from 21 August is the safest estimate of the minimum number of whales recorded in 2004. In 2005, video recordings were made between 2 - 15 August at Balgoni Islands in central Melville Bay. The largest number of whales was observed on the 12 August where 147 whales were counted from which 35 should be subtracted to account for possible double observations. The achieved number of 112 whales is in the same magnitude as the number from 2004. There are evidently narwhals consistently present in Melville Bay during summer, which is also obvious from the catch statistics. However the low number of narwhals spread over a very large area makes traditional surveys prohibitively expensive and generally unsuccessful.

Discussion
This study confirms that narwhal occur in some numbers in Melville Bay during the summer. Neither survey effort nor coverage could be estimated based on the results presented in this study. The height of the observer can significantly affect detectability, but the height from which each video recording was made was not indicated. For these reasons these results cannot be expanded into an estimate of density. Only a minimum estimate of the numbers seen in the video can be determined.

There is no intention to repeat this study.

JWG-2005-04. Richard, P., Laake, J.L., N. Asselin, and H. Cleator. Baffin Bay narwhal population distribution and numbers: aerial surveys in the Canadian high arctic, 2002-2004.

Narwhals were surveyed in Eclipse Sound, Admiralty Inlet, Prince Regent Inlet, Barrow Strait, Gulf of Boothia, and in fiords and bays along the eastern coast of Baffin island during the month of August of 2002 to 2004 with visual line transect aerial surveys. The visual survey estimates were based on the number of narwhals visible to the observers using systematic line transect methods, corrected for whales that were missed by the observers, and adjusted to account for observations without distance measurements. Using data from narwhals tagged with time-depth recorders, the estimates were further adjusted for individuals that were diving when the survey plane flew by. This correction gave estimates of 20,788 (SE: 24,132) for the Eclipse Sound area in 2002 and 18,733 (SE 6,437) in 2004 , 25,809 (SE: 14,972) for the sum of the Prince Regent and Gulf of Boothia strata in 2002 and 28,346 (SE: 15,015) for that number added to the Barrow Strait strata in 2004, and 14,957 (SE: 6,437) in the east Baffin Island bay stratum in 2003. The estimates from Admiralty Inlet should be considered biased due to extreme clumping of the animals off transects in both 2003 and 2004 and the poor weather conditions in 2004, which halted the survey of southern end of the Inlet. Considering the bias in the Admiralty Inlet survey and the lack of survey in known areas of occupation, such as Peel Sound, Viscount Melville Sound and channels north of Resolute, we conclude that the narwhal population in the Canadian High Arctic is very large. It probably numbers in excess of 70,000 animals, with a large proportion of the animals in the western end of its summer range. It is also probable that over ten thousand narwhals summer in the bays and fiords along the previously un-surveyed East Baffin coastline. Survey estimates had large standard errors due to clumping on certain transects within each stratum. Attempts to reduce the sampling error by stratifying new surveys and increasing survey coverage were successful in the 2004 Eclipse Sound survey but not in the 2004 Admiralty Inlet survey. More dive data is required to refine the availability correction factor used in expanding the surface estimates.

Discussion:
Preliminary results of these aerial surveys were presented at the last JWG meeting in February 2004 and several recommendations to improve the analysis were made (see 2004 JWG report). The JWG noted that some of the recommendations provided in the 2004 meeting were not addressed due to logistical constraints.

The clumped distribution of narwhal and the unexpected high abundance of narwhal in eastern Baffin fiords were problems for the survey design and subsequent analyses.

Several areas known to contain narwhal (Peel Sound, Viscount Melville Sound, channels north of Resolute and east Baffin coastline) were not surveyed due to weather conditions so this survey could not provide a complete abundance estimate of the entire summer range in Canada.

The analysis of the survey data from fiord areas (most of which were at least 2000 meters wide) was discussed at length. In this part of the survey, a single line was flown up the centre of each fiord due to constraints of flying in the fiord environment, with the results extrapolated to the entire area of the fjord. This survey design resulted in uneven coverage probability; not all areas in a fiord had the same probability of being surveyed, possibly causing a bias depending on how the whales are distributed in the fiord. It was agreed that a sub-committee, coordinated by the lead author, would meet by email to try to resolve this issue.

There was some discussion as to the appropriateness of the application of an instantaneous correction for diving whales to a sighting process that is not instantaneous. It was argued that the duration of the chance of seeing a narwhal at the surface is very short such that it might be considered nearly instantaneous, especially for high-density areas where observers are busy with declination measurements. The surface intervals (or rather, the time at depths where they could be detected by an aerial survey crew) for some narwhals have been measured as 2-3 minutes for tagged individuals, but the actual time available to see a whale from a Twin Otter may be less than 3 seconds.

A separate issue is how widely the limitied tag data can be extrapolated. The surface interval used is based on a limited number of tagged narwhal and may not apply to all narwhal in all areas. The JWG agreed that the correction was appropriate given the available data on narwhal diving behaviour, but recommended that more such data be collected.

The serial difference method of variance estimation was suggested in 2004 but results to date have not indicated an improvement using this approach.

In 2004 it was recommended that the criteria for assigning duplicate sightings should be clarified and this recommendation was reiterated.

Although the paper combined the "best" estimates from different areas and years into single estimates, this approach could confound variance estimation (the true variance is likely larger than estimated). In addition the JWG suggested providing a more detailed description of what is defined as "best".

There were extensive discussions of how to address large groups observed off-transect such as the large groups observed in Admiralty Inlet during the survey. While there was disagreement on this issue, it was decided not to include these sightings in the Admiralty Inlet survey estimate because they were seen off-transect. Other approaches, including adaptive sampling, greater survey effort or changes in stratification, were suggested for future surveys.

Reconnaissance survey in Davis Strait/Baffin Bay
Gosselin presented the preliminary results of an aerial survey conducted in March 2005 of the area from 60° to 65° N to search for the hooded seal whelping patch. The survey was conducted at an altitude of 300 ft and a speed of 200 kts, which is lower and faster than is normal for cetacean surveys. While the target species were seals, observers also noted marine mammals in open water. A total of 55 narwhal were sighted and 1 beluga whale was sighted at the southern end of the area.

5.4.2 Estimates by management units
Abundance estimates that have been accepted for use in assessments by the JWG are presented in Table 1.

5.4.3 Recent changes in distribution in Canada

In 2004 the JCNB was informed that recent changes have been observed in the distribution of narwhal in Canada. For instance in Pelly Bay, hundreds of narwhal now regularly occur where they seldom occurred in the past. The JCNB therefore requested that the JWG look into this matter.

There was no document presented on this topic to the JWG. It was reported that lighter ice conditions had prevailed in this area in recent years, although no quantitative data were presented. It is therefore possible that narwhal are able to penetrate into areas that were not usually available to them previously because of heavier ice cover. The JWG was also informed that narwhal sometimes use the track of an icebreaker to enter the area and that icebreakers began coming to Pelly Bay quite recently. In addition, local people have reported an increased frequency of killer whale sightings in the area, which might also change the distribution of narwhal.

The JWG could not provide any firm explanation as to why more narwhal are coming to this and other areas where previously they were seen infrequently. As a first step to addressing this question, trends in the extent and duration of ice cover in the area should be quantified. These data should be available from satellite and aerial ice reconnaissance. It was also suggested that the use by narwhal of icebreaker tracks should be studied and that the frequency of sightings of killer whales should be monitored.

5.4.4 Future survey plans

It is planned to conduct a narwhal survey in West Greenland in March 2006 .Currently, there are no plans for narwhal surveys in Canadian areas.

5.5 Assessment

5.5.1 Update of West Greenland assessment

JWG-2005-15 Witting, L. A model selection based assessment for West Greenland narwhals with uncertain stock structure.

This paper uses a density regulated population dynamic model in a model selection framework to identify the more likely stock structure hypotheses for West Greenland narwhals. The framework performs Bayesian assessments on 28 of the most likely three, two and one stock hypotheses, and it uses Akaike weights to determine the relative probabilities of the different models, given four time series of abundance data and historical catches from 1862 to 2004. The analysis discards 12 of the original hypotheses as being unlikely, it agrees with other information on the most likely stock structure hypotheses, and it integrates the 16 most likely hypotheses into estimates of sustainable harvest levels.

Discussion

There was disagreement within the JWG about the appropriateness of using apparent stock dynamics as a method of selection between stock hypotheses. One view was that stock identification should be by means independent of the stock dynamics. Harvest history and abundance may be correlated in 2 areas for indirect reasons, for example the economic situation in West Greenland, that have nothing to do with the relatedness of the animals in the 2 areas. Therefore using stock dynamics as a means of assigning probabilities to stock structures could be erroneous because of spurious correlations. Another view held that, given a set of stock hypotheses, it was only reasonable to give greatest weight to those that provided the best fit to the catch and abundance/trend information at hand, unless there was other information that made them unlikely. However it was recognized that this disagreement did not preclude the JWG from itself reaching conclusions about the most likely stock structures in the area and selecting assessment models appropriately.

The models presented in JWG-15 used, as input, the data on abundance, catch history, and biological parameters that have been agreed in the past by this committee. Nevertheless there was concern about possible biases in some of the input data, particularly abundance estimates and indices. For Inglefield Bredning, the 1986 and 2001/2 estimates were produced using different survey methodologies that have not been directly calibrated against one another. There was concern that this might have influenced the apparent negative trend in the estimates between 1986 and 2001/2. The JWG therefore recommended modelling that incorporated only the later surveys and options that considered them as index rather than absolute estimates.

For Disko Bay, the index surveys conducted in the early 1980's were done by a somewhat different methodology than those done in the 1990's and it has been recognized by this Committee that, for beluga, the two sets require different treatment. Specifically, different bias correction factors were used in beluga modelling for the two index sets. There is no reason to suppose that the situation should be different for narwhal, but in the modelling reported in JWG-15 a single bias correction factor was used for all the index surveys. The JWG therefore recommended modelling that incorporated separate bias correction factors for surveys conducted in the 1980's and 1990's.

While past harvesting of narwhal in West Greenland has not been sex-selective, it was expected that the new regulatory structure will lead to a selection for male narwhal. The JWG therefore recommended that the sensitivity of the results to selection for males be examined.

The greatest difficulty in providing advice for sustainable harvest of West Greenland narwhal is the uncertainty in stock structure. The models using the stock structures considered most likely by the JWG were examined further. A probability of 70% of some stock increase within 5 years was considered an appropriate objective. To meet this objective, depending on the model, a total annual removal ranging from 15 to 75 narwhals is allowed for the entire area This strengthens the conclusion reached in 2004, that West Greenland narwhal are heavily depleted and substantial reductions in catch are required immediately to arrest the decline in numbers However the JWG could not agree on the quantitative results of the model presented in JWG-15 because of the above noted uncertainties in stock structure and input parameters. There was no general agreement within the JWG on which model scenarios should be used in a final assessment. However, the JWG agreed that the recommendation provided in 2004, that the total removal in West Greenland should be reduced to no more than 135 individuals, should be provided again and with greater emphasis. This greater emphasis is due to the fact that all models reviewed by the JWG allowed total annual removals lower than 135.

The JWG recognized that the new information presented in JWG-17 confirmed that narwhal do occur in Melville Bay, but without an abundance estimate the JWG was unable to recommend a sustainable removal level for this stock.

The JWG recommends the following research to provide more specific advice on sustainable catches:

1) Modeling:
The model described in JWG 15 should be revised and used with the M|IUD as the base case and M|IU|D, M|I|UD, and M|I|U|D as alternate cases. MSYR will be limited to a range of 0.01 to 0.04, and survey data from Inglefield Bredning should be included as index estimates when combined with harvest data from other areas. As the 1986 estimate for Inglefield Bredning may not be directly comparable with the later estimates, it should be included with a doubling of the CV or excluded from the runs. Also for the survey estimates from Disko Bay, the effect of treating the 1982 and 1981 estimates as a separate index series independent of the earlier estimates (as done for beluga) should be investigated. Trials should also be conducted with pseudo-data sets to determine to what degree the model can identify the true stock structure. Alternate runs could be conducted to determine to what extent new data or independent biological data will improve the performance. These runs should include testing for the existence of an unidentified stock contributing to the harvest at one or more locations, new survey and tagging data and sex ratios in the harvest other than 50:50. (Time frame:1 year)

2) Stock Structure:

a. Reanalysis of existing genetics and contaminants data from harvested samples to account for season of take. (Time frame: 1 year)
b. Satellite tracking from harvest areas beginning with Uummannaq and Inglefield Bredning. (Time frame: 2-5 years)
c. Satellite tracking from areas in northern Canada (East Baffin, Smith Sound, Jones Sound, Kane Basin, Parry Islands) that are poorly known and may contribute to these harvests.

3) Abundance Estimates:

New surveys to extend the current abundance time series and estimate abundance in areas with no distribution or abundance surveys (E. Baffin, Parry Islands, Smith Sound, Jones Sound, Kane Basin). Priorities are a beluga/narwhal survey in Disko Bay and a survey of Melville Bay/ Inglefield Bredning. (Time frame: 2-10 years)

5.5.2 Canadian summer stocks

JWG-2005-11 Richard, P. A risk analysis of narwhal hunting in the Canadian High Arctic.

A simple stochastic dynamic growth model was used to determine the risk of change (-5% and -10%) over a period of ten years. The model runs either assumed no stock structure, a single panmictic stock, or a metapopulation structure with 4 different sub-stocks (Somerset, Admiralty, Eclipse, East Baffin). The structured model runs consider the summer hunting on local sub-stocks and the hunting of these sub-stocks by all communities during migration to or from the wintering areas. Results indicate little or no risk of decline over the time span in all but one case, the Admiralty Inlet sub-stock. The model runs pertaining to the Admiralty Inlet sub-stock assume a population size based on surveys which are considered biased because of extreme clumping of narwhals in the area. Therefore the risk analysis results for this sub-stock are questionable. Finally, risk probabilities are based on a simple model with no density dependent effects. It is conceivable that the decline of a large population will trigger increased productivity and that the real risk is smaller than estimated here.

Discussion

The JWG welcomed this contribution as an important first step in the quantitative assessment of Canadian summering stocks of narwhal.

The range of rates of increase from 1.01 to 1.03 did not include the maximum rate that is likely for narwhal. However the JWG agreed with the author of JWG-11 that this was appropriate given that the relative depletion status of these stocks was unknown, and only stocks that are at or below the maximum sustainable yield level could be expected to exhibit a higher rate of increase. The effect of a higher rate of increase would be to decrease the probability of a stock decline, so in this sense the model is conservative.

The mean loss rates used to estimate total removals were themselves estimated using recent data collected under the Community Based Management system in Canada. However the JWG had already expressed concern that these data may not be reliable and might underestimate true loss rates (see 5.3.1).

For communities taking narwhal in the spring and the fall, the catch may be composed of a mixture of animals from 2 or more summer stocks. In the model it is assumed that the relative proportion of animals from each stock in the catch is proportional to the abundance of each stock. It was considered that, for spring hunts in particular, animals from stocks that summer near to the spring hunting location might be taken in a higher proportion than that of their relative abundance. This was considered especially important for Arctic Bay, for which the spring catch constitutes over half the total.

Given these concerns, it was considered that the model could be improved by including a wider range of some parameters in sensitivity analyses. Specifically the JWG requested that that the following sensitivity analyses be conducted:

i. Higher struck and lost rates, of up to 2x those used initially;
This sensitivity analysis was performed at the meeting. The effect of doubling the loss rate was to increase the probability of a decline at Admiralty Inlet but not substantially so at Eclipse Sound except under the lowest examined rate of population increase.
ii. Higher probability that Admiralty Inlet narwhal are taken at the Arctic Bay ice edge.
There was insufficient time to perform this sensitivity analysis, but it could be expected to result in an increased probability of a decline at Admiralty Inlet.

The model used only recent average catches to project hunting mortality in the future. As yet an historical analysis of Canadian narwhal catches has not been developed, but published figures are available as far back as 1979. In 2004 the JWG concluded that it would be feasible to develop a set of annual removal estimates (*e.g.* low, best, high) for the Canadian Arctic, based on what is presently available in the literature, and it was recommended that the possibility of a longer catch series, spanning at least the time period of the survey estimates, be investigated.

The model incorporated only recent abundance estimates and did not use earlier estimates from Admiralty Inlet and Eclipse Sound from 1984. For Admiralty Inlet, the estimate for 1984 was nearly 3 times that for 2003 although the difference in point estimates is not statistically significant. In contrast the estimate for Eclipse Sound for 1984 was significantly lower than that for 2004.

The JWG therefore recommended that a model incorporating all abundance estimates considered useable for assessment, with an historical catch series, be developed, as has been done for West Greenland beluga and narwhal. Such a model would show the trajectories of the stocks over time and provide estimates of yield that would be useful in assessing stock status and determining sustainable removal levels.

In the interim and until a new modelling framework is developed, the JWG decided to use the model provided in JWG-11 to arrive at some preliminary conclusions about the status of Canadian summer stocks.

Somerset Island
This stock is the largest of the Canadian summer stocks. It is subject to a low level of harvesting in the summer but may be hunted by several communities in the spring and fall. However, even under the most pessimistic scenarios of stock size, hunting loss rates, and rate of increase, there is a negligible chance that the stock will be depleted in the next 10 years. The JWG therefore concluded that present catch levels were sustainable for this stock.

Admiralty Inlet
Under scenarios of high loss rate and/or low rate of population increase, the model predicts that there is a high probability that this stock will decline in the next 10 years. In addition the survey estimate for 2003 is substantially lower than that for 1984, indicating that there may have been a population decline over that period. However it was recognized that the recent estimate may be biased because of the extreme clumping of narwhal in the area. The JWG concluded that there is a risk that present catch levels are not sustainable for this stock and recommended thata new modelling framework as described above be developed to provide estimates of sustainable removals.

Eclipse Sound
Under all but the most pessimistic scenarios of high loss rates combined with low rates of increase, the model indicated that there is a very low risk that this stock will decline in the next 10 years with present catch levels. The JWG therefore concluded that present catch levels were likely sustainable for this stock but, again, recommended that a new modelling framework as described above be developed to provide estimates of sustainable removals.

East Baffin

Because the abundance estimate for this area was not accepted (see 5.4), the JWG could not provide advice on the sustainability of catch levels in this area. It was also noted that there was no information about the seasonal distribution of this stock so it was not known if it was subject to harvesting outside of the East Baffin area. The JWG therefore recommended that a new abundance estimate be developed for this area and that studies be conducted to determine the seasonal distribution of this stock.

5.5.3 East Greenland
The JWG considered that, given that almost nothing is known about the stock structure and seasonal migrations of East Greenland narwhal (see 5.1.4), and that the abundance estimate for Scoresbysund is more than 20 years old, a reliable assessment will not be possible without new information. Nevertheless *ad hoc* modelling carried out at the meeting indicated that, under the assumption of an independent stock at Scoresbysund with a present abundance similar to that in 1983, present harvest levels are not sustainable. However the validity of these assumptions cannot be assessed without further research.

Insufficient information was available to carry out assessments for other areas of East Greenland.

5.6 Ecology

JWG-2005-13: Laidre, K.L. and Heide-Jørgensen, M.P. The behavior of narwhals (*Monodon monoceros*) before, during, and after an attack by killer whales (*Orcinus orca*) in the Eastern Canadian Arctic

On the 19 and 20 of August, 2005 a predation event by killer whales on narwhals was witnessed at Kakiak Point, in Admiralty Inlet, Canada. Approximately 12-15 killer whales (group structure consisted of one adult male, 7-10 adult females and rest were juveniles) were observed attacking narwhals approximately 0.3 - 1 nm off the coast of Kakiak Point. Two explicit attacks were documented on the same day, one occurred at approximately 12 noon and the second occurred at approximately 4 pm. At least 4 narwhals (or 4 independent kill events) occurred over a 6 hour period based on direct counts of observations of oil/blubber slicks at the surface, congregations of fulmars in the center of the slicks, and killer whales moving and diving in the center of oiled areas. When the killer whales entered the vicinity of Kakiak Point, the narwhals were observed to immediately move very close to the coast (<2-3 m). Some narwhals formed tight groups near the shore and lay very still at the surface. One whale was observed to strand itself on a flat gravel beach and violently thrash it tail for >30 seconds. Within hours after the attack, narwhals were observed to resume their pre-attack behavior and distance from the shoreline, and narwhals were no longer observed in extreme proximity to the coast. Narwhals instrumented with satellite tags moved offshore and utilized a wider section of the coastline after the attack. Whether this dispersal is an effect of the killer whale occurrence or a seasonal change in behavior remains unresolved.

5.7 Future research requirements

Research recommendations specific to refining assessments for West Greenland narwhal are listed under 5.5.1.

The JWG supported and reiterated the recommendations from previous meetings. The following were identified as most important at this meeting:

All areas

- Better estimates of struck and loss rates are required from all areas.
- There should be a coordinated effort between Canada and Greenland to collect samples from the catch and from animals of known age, and to conduct analyses to determine the age structure of narwhal stocks using the amino acid racemization technique.
- large-scale effort to obtain dive time data for survey correction, from different areas and seasons;

West Greenland

- The West Greenland index area should be surveyed in 2006 in a manner consistent with previous surveys. If a new survey methodology is used, experiments should be conducted to calibrate the new method with the old.
- Development of a monitoring plan, including survey intervals;
- Stock structure: investigate movements from Inglefield Bredning, Uummannaq and from the wintering grounds.

Canada

- Provide a revised abundance estimate for East Baffin narwhal.
- Conduct a new survey of Admiralty Inlet.
- Develop a longer catch series (at least a series that spans the time period of the survey estimates) incorporating options for high, low and medium catches as has been done for West Greenland.
- Develop assessment models for the next meeting for each stock component, incorporating the catch series (above) and all abundance estimates for each area that have been accepted for use in assessment by this committee (Table 1).
- Provide an abundance estimate from winter surveys in Cumberland Sound.

East Greenland

- Studies of the stock structure of narwhal, through satellite tagging, genetics, contaminants or other means;
- Determination of the seasonal distribution of narwhal, through satellite tagging;
- Abundance surveys for all summer stocks that are harvested;

6 BELUGA

6.1 Stock structure

There was no new information tabled on this subject.

6.2 Recent catch statistics

Greenland

WG-2005-07 Heide-Jørgensen, M.P. Catch statistics for belugas in Greenland 1862 to 2004.

Information and statistics including trade statistics on catches of white whales or belugas in West Greenland since 1862 are presented. The period before 1952 was dominated by large catches south of 66^{o} N that peaked with 1380 reported kills in 1922. Catch levels in the past 5 decades are evaluated on the basis of official catch statistics, trade in mattak (whale skin), sampling of jaws and reports from local residents and other observers. Options are given for corrections of catch statistics based upon auxiliary statistics on trade of mattak, catches in previous decades for areas without reporting and on likely levels of loss rates in different hunting operations. The fractions of the reported catches that are caused by ice entrapments of whales are estimated. During 1954-1999 total reported catches ranged from 216 to 1874 and they peaked around 1970. Correcting for underreporting and killed-but-lost whales increases the catch reports by 42% on average for 1954-1998. If the whales killed in ice entrapments are removed then the corrected catch estimate is on average 28% larger than the reported catches. Catches declined at about 2% per year during 1979-2004. Reported catches in East Greenland are suspected to be erroneous and should perhaps be added to the narwhal catches.

Discussion

It was noted that the harvest in 2004 had been very low because of the introduction of the quota system and bad weather in some areas.

The JWG recommended that the occurrence of beluga in East Greenland be investigated, perhaps through a traditional knowledge study, to determine if they do occur there or if the reported harvests are erroneous.

Canada

JWG-2005-10: Romberg, S. Catch Statistics (1996-2004) for Narwhal and Beluga in Selected Communities in the Eastern Canadian Arctic.

Catch statistics for beluga in Nunavut for the period 1996-2004 are presented. In general it is believed that the reports for beluga are accurate. The Hunters and Trappers Organizations (HTO) for each community are contacted by phone by DFO throughout the hunting season and are asked to report catch statistics. In some cases the HTO requires their hunters to report and in other cases the HTO will give an estimate of hunting that has occurred.

In some communities which are part of a Community-Based Management Program, hunting mortality is required to be reported. Systems of reporting vary from community to community but in general they are required to report animals that are wounded (wounded and escaped) and animals that have been killed but not retrieved (sunk and lost). Estimates of hunting mortality are calculated based as minima and maxima (min = landed + wounded and escaped; max = landed + sunk and lost + wounded and escaped).

The average reported landed catch from communities hunting from the Baffin Bay beluga stock for the period is 42.

Discussion

The JWG noted that, as in the case for narwhal, reporting of struck and lost is variable between years and communities and may be unreliable for some communities. It was recommended that the harvest figures in this compilation be compared to the figures from the Nunavut Wildlife Harvest Study, which examined the period 1996-2001.

6.3 Abundance

6.3.1 Recent and future estimates

West Greenland

JWG-5 described an attempt to survey the West Greenland index area in March 2004, which was not successful due to inclement weather (see 5.4.1). The survey will likely be attempted again in 2006. The JWG noted that a digital photographic survey was attempted, whereas all previous surveys have been visual. The index used to monitor trends abundance since 1982 is based on a visual strip transect, and could not be produced from a photographic survey. The JWG therefore recommended that either a visual survey be conducted, or that experiments be conducted to calibrate the two survey methodologies.

Canada

In 2004 the JWG recommended that the abundance of beluga be estimated from the survey carried out between 2002 and 2004 described in JWG-4 (see 5.4.1). However it was recognized that because the survey did not cover Peel Sound, where beluga are concentrated at this time of year, and did not cover estuaries used by beluga, it could not provide an estimate of abundance for beluga.

6.4 Assessment update

6.4.1 West Greenland

JWG-2005-14 Witting, L. An assessment for West Greenland beluga.

This study combined historical catches from 1862 and 3 time series of abundance estimates with density regulated population models to update the assessments for belugas in West Greenland. Given models and data, the population was projected under the influence of historical catches, to estimate the current status and the probabilities of fulfilling management objectives for different levels of future harvest. Seven model combinations were applied to test for sensitivity of the assessment to i) variation in the prior on the MSYR, ii) the presence versus absence of additional variance in abundance estimates, iii) the presence versus absence of an absolute abundance estimate, iv) high versus low catch histories, and v) the effects of choosing an age-structured or a discrete population dynamic model. All models estimate similar dynamics, where West Greenland beluga are severely depleted, with median depletion ratios in 2005 varying between 16 and 42 percent of the carrying capacity. The median of the current replacement yield was estimated to lie between 248 and 494 beluga, with the lower 2.5th percentile between 40 and 104 beluga.

Discussion
The new assessment produced results that are very similar to those from previous assessments, all of which indicate that the stock is substantially depleted.

The JWG considered that the "low MSYR" case provided the most realistic assessment based on presently available information on the rates of increase of beluga and other odontocetes. The assessment can be updated if new information on rates of increase or other parameters is provided. Table 2 provides the probability of halting the decline in beluga numbers in the next 5 years for a range of catch options for this case. Reduction of catches to 100 per year will have an 80% chance of meeting this objective by 2010. Maintaining higher catches reduces the probability of halting the decline, and delay in implementing harvest reductions will increase the risk of continued stock decline.

The JWG also reiterated recommendations made by the NAMMCO Working Group in 2000 (NAMMCO 2001) pertaining to other measures that would improve the conservation status of beluga in this area.

It was recommended that catch limits be distributed over 3 hunting areas to avoid possible local depletions, as per previous advice (NAMMCO 2001): Northern – N of 72° N; Central – 67.30° to 72° N; Southern - 65° to 67.30° N.

<u>Seasonal Closures</u>
Beluga occurred seasonally in large numbers in Southwest and South Greenland before 1930, and probably disappeared because of overharvesting (JWG-7). Beluga are however occasionally sighted during the summer in S and SW Greenland and other areas of West Greenland. Few beluga are normally caught during these periods, and the occasional stragglers seen at these times should be allowed to establish themselves. The following seasonal closures are recommended:
Northern: June through August
Central: June through October
Southern: May through October.
For the area south of 65° N, it is recommended that no harvesting of beluga be allowed at any time.

6.4.2 Other stocks
Canada
Reported harvests by communities hunting Baffin Bay beluga continue to be low, averaging 42 annually over the last 9 years (see JWG-10, section 6.2). Given that this harvest is very low relative to the summer abundance of beluga in the area (Innes *et al.* 2002), stock assessment in this area is not considered a priority at present. However some proportion of animals summering in Canada migrate to West Greenland and are at risk of harvest there. It was considered important to determine where in Canada these animals can be found in the summer, to determine if they are harvested in Canada.

6.5 Future research requirements
All stocks
- Better estimates of struck and lost rates are required from all areas.

- There should be a coordinated effort between Canada and Greenland to collect samples from the catch and from animals of known age and compare racemization age estimates to tooth layer age estimates.

In 2001 the JWG supported a proposal for a new effort to elucidate the origin of the large number of whales presently being harvested in West Greenland. It was proposed that a two-year field period should be launched to tag a large number of belugas and to track them through the winter. Areas that have not previously been sampled would be given priority and samples for genetic analyses would be taken as well. The results of the tracking will be used to develop a model for the dispersal of the belugas that can be tested by the genetic studies. If possible long-term tag attachments and/or passive tags should be used to find out whether individual animals use the same summer and winter areas repeatedly. The JWG reiterated its support for this proposal and recommended that the research be carried out as a high priority.

West Greenland

- The West Greenland index area should be surveyed in 2006 in a manner consistent with previous surveys. If a new survey methodology is used, experiments should be conducted to calibrate the new method with the old.
- The assessment of West Greenland beluga should be updated once a new abundance estimate has been produced.
- Determine if beluga occur in East Greenland, perhaps through a traditional knowledge study, and attempt to determine if reports of beluga harvest there are correct.

Canada

- Harvest records from DFO should be compared with those from the Nunavut Wildlife Harvest Study.

7. IMPLEMENTATION OF EARLIER ADVICE

On February 12, 2004, Greenland Ministry of Fisheries and Wildlife introduced quotas for narwhal and beluga for the season 1 July 2004 to 30 June 2005. The quotas were set at 300 narwhal and 320 beluga to be divided among municipalities of West Greenland (Table 3). Preliminary catches of beluga reported for the 2004-2005 season were lower than the established quota due to weather conditions. The 2004-2005 narwhal catches had a skewed sex ratio favouring males.

For the hunting season 1 July 2005 to 30 June 2006, the quotas have been established at 260[2] narwhal and 220 beluga, to be divided among the municipalities of West Greenland.

It was noted that the reported catches include whales that are struck and lost. The reporting of catches to management authorities in Greenland is functioning well.

There was a discussion on the management system in place in Canada and Greenland to monitor harvest level and struck and lost animals. There is a need to share information on the reporting system that is in place in Greenland and Canada. This discussion should take place at the JCNB and reported in their proceedings so that there is a better understanding of the reporting system in place in both areas. Information on catches and struck and lost is critical to the assessment of narwhal and beluga.

8. TRADITIONAL KNOWLEDGE

There was no information provided under this item.

9. IMPACT OF HUMAN-MADE NOISE

[2] After the meeting the narwhal quota for 2005/2006 was raised by 50 to a total of 310. See Table 3.

JWG-2005-18: Lawson, J. Overviews: Beluga whale and noise.
Beluga whales have their best hearing sensitivity in the 40-100 KHz frequency range, with poorer hearing at lower and higher frequencies. Natural and man-made noise in the environment has the potential to reduce the probability of detecting biologically relevant signals; this process is termed masking. Beluga whales can detect echolocation signals when they are as little as 1 dB above the level of ambient noise. In studies of ice breaker noise, bubbler noise appeared to be most effective at masking beluga calls, followed by ramming noise, and lastly, ice-cracking noise. Models predicted ice breaker noise would be audible to belugas at distances as great as 35-78 km, cause masking of beluga calls at 14-71 km, and possibly cause temporary changes in hearing sensitivity if belugas stayed within 1-4 km of a large ice breaker for at least 20 minutes. Beluga responses to manmade noise areare highly variable and dependent on a variety of factors which include: local habitat, age, prior experience with the noise, the beluga's activity, resource availability, sound transmission characteristics of the location OR the noise of interest, behavioural state of the whale, and individual variability in beluga behaviour. Reported responses of beluga whales to manmade noise range from the most sensitive reported for any marine mammal to ignoring intentional harassment by boats. Beluga responses include altering their swim direction and speed, changing their dive, surfacing, and respiration patterns, and/or changing their vocalization patterns. There have been few studies of non-auditory physiological effects of exposure to noise in belugas, but several suggest that there are few if any measurable effects.

Discussion
The JWG welcomed this information which addresses a recommendation made in 2001 by JCNB.

10. OTHER BUSINESS

10.1 Implications of the inclusion of other species (*e.g.* walrus) in the work of the SWG
The cooperation between the JCNB SWG and NAMMCO WG has been very productive in providing scientific advice on narwhal and beluga.

The provision of advice on species other than beluga and narwhal from the SWG would be challenging. The addition of other species to this WG would require additional national and external expertise, take more time, may require the SWG to deal with species on a rotational basis or through independent meetings, and may require the establishment of a secretariat to deal with the additional workload.

It was noted that NAMMCO has alreadyworking groups to address issues specific to walrus and other species. Greenland being a member of NAMMCO, already participates in these working groups. Canada could also participate through the Walrus WG. This would avoid duplication of work at the scientific level and the JCNB would obtain its scientific advice through NAMMCO.

An obvious approach would be to carry out scientific activities related to walrus and other marine mammals within the existing NAMMCO structure. Alternatively, scientific advice related to other marine mammals needed by JCNB could be directed to scientists in Canada or Greenland who would examine existing literature or set up the appropriate peer review structure to provide the advice. This however might result in duplication of effort.

11 ADOPTION OF REPORT

A draft version of the Report was adopted at the meeting, and the final version was approved by correspondence. The Chairmen thanked all members for their valuable input, the Greenland Institute of Natural Resources for hosting the meeting, and the hard-working rapporteurs for so ably summarizing the discussions. Noting that Lars Witting and Øystein Wiig would be leaving their posts as chairmen, the members of the JWG thanked them for their efforts over the years.

REFERENCES

Born, E. W. 1986. Observations of narwhals (*Monodon monoceros*) in the Thule area (NW Greenland), August 1984. *Rep. int. Whal. Commn* 36: 387-392.

Heide-Jørgensen, M.P. 2003. Status for knowledge about narwhals in the Melville Bay, Northwest Greenland. Working paper NAMMCO/SC/12-JCNB/SWG/2004-JWG/23 for the NAMMCO Scientific Committee.

Heide-Jørgensen, M.P. 2004. Aerial digital photographic surveys of narwhals, *Monodon monoceros*, in northwest Greenland. *Mar. Mammal Sci.* 20:246-261.

Heide-Jørgensen, M. P. and Acquarone, M. 2002. Size and trends of the bowhead whale, beluga and narwhal stocks wintering off West Greenland. *NAMMCO Scientific Publications* 4:191-210.

Innes, S. and Stewart, R.E.A. 2002. Population size and yield of Baffin Bay beluga (*Delphinapterus leucas*) stocks. *NAMMCO Scientific Publications* 4:225-238.

Koski, W.R. and Davis, R.A. 1994. Distribution and numbers of narwhals (*Monodon monoceros*) in Baffin Bay and Davis Strait. *Meddr Grønland, Bioscience* 39:15-40.

Laws, R. M. 1956. Growth and sexual maturity in aquatic mammals. *Nature* 178:193-194.

[NAMMCO] North Atlantic Marine Mammal Commission 2000. Report of the NAMMCO Scientific Committee Working Group on the Population Status of Narwhal and Beluga in the North Atlantic. In: *NAMMCO Annual Report 1999.* NAMMCO, Tromsø, Norway, pp. 153-188.

[NAMMCO] North Atlantic Marine Mammal Commission 2001. Report of the NAMMCO Scientific Committee Working Group on the Population Status of Narwhal and Beluga in the North Atlantic. In: *NAMMCO Annual Report 2000.* NAMMCO, Tromsø, Norway, pp. 252-273.

Nerini, M. K. 1983. Age determination of Fin Whales (Balaenoptera physalus) based upon Aspartic Acid Racemization in the Lens Nucleus. *Rep. int. Whal. Commn* 33:447-448.

Richard, P.R., Weaver, P., Dueck, L. and Barber, D. 1994. Distribution and numbers of Canadian high Arctic narwhals (*Monodon monoceros*) in August 1984. *Meddr Grønland, Bioscience* 39:41-50.

Putative stock	Year and ref.	Method	Estimate (cv)	Perception bias	Availability bias	Fully corrected stock size estimate	Reservations
BAFFIN BAY							
Inglefield Bredning Stock surveyed in Inglefield Bredning	1984 a)	Land	4000-8000	-	-	-	Covering ~1/3 of the area
	1985 b)	Line t.	1,091 (0.12)	-	-	-	Late in the season, 27 August -3 September
	1986 b)	Line t.	3,002 (0.25)	0.75 (0.25) *	0.38 (0.06) *	10,533 (0.36)	Perception biased assumed
	2001 b)	Photo	873 (0.35)	0	0.38 (0.06)	2,297 (0.35)	
	2002 b)	Photo	562 (0.24)	0	0.38 (0.06)	1,478 (0.25)	
Central West Greenland or Inglefield Bredning Stock wintering in central West Greenland	1981 c)	Strip	358 (0.31)			Index	
	1982 c)	Strip	440 (0.20)			Index	
	1990 c)	Strip	252 (0.34)			Index	Late in the season: 9-14April
	1991 c)	Strip	273 (0.28)			Index	
	1993 c)	Strip	63 (0.48)			Index	
	1994 c)	Strip	263 (0.36)			Index	
	1998 c)	Strip	213 (0.60)			Index	
	1999 c)	Strip	206 (0.32)			Index	
	1998-99 c)	Line t.	524 (0.51)	0.5 (0.25)	0.35 (0.23)	2,861 (0.61)	
Melville Bay	2002 d)	Photo	-	-	-	Low numbers	
Eclipse Sound	1984 e)	Photo	1,218 (0.59)	0	0.38 (0.06) *	3,205 (0.59)	Partial coverage
Eclipse Sound	2004 i)	Line t.			0.38 (0.25)	18,733 (0.41)	
Admiralty Inlet	1984 f)	Photo	5,556 (0.22)	0	0.38 (0.06) *	14,621 (0.23)	
Admiralty Inlet	2003 i)	Line t.			0.38 (0.25)	5,332 (0.76)	
Somerset Island	1981 f)	Strip	11,142 (0.09)		-	-	Partial coverage
Somerset Island	1996 g)	Line t.			0.38 (0.25)	45,358 (0.35)	Partial coverage
Somerset Island	2002 i)	Line t.			0.38 (0.25)	25,809 (0.58)	Partial coverage
Cumberland Sound	-	-	No data	-	-	-	
Jones Sound	-	-	No data	-	-	-	
Parry Islands	-	-	No data	-	-	-	

Putative stock	Year and ref.	Method	Estimate (cv)	Perception bias	Availability bias	Fully corrected stock size estimate	Reservations
Smith Sound	1978 h)	Total	>1,500	-	-	-	
Mixed stock surveyed in Baffin Bay	1979 h)	Strip	34,363 (0.24)	-	-	-	
EAST GREENLAND							
Scoresby Sund	1983	Line t.	300 (0.31)	0.75 (0.25) *	0.38 (0.06) *	1,053 (0.40)	Late in season, probably neg. bias.
Kangerlussuaq			No data				
Tasiilaq			No data				

Table 1. Estimates and indices of stock sizes of narwhals in Baffin Bay and adjacent waters adopted for by NAMMCO/JCNB Scientific Working Group to be used for stock assessment. * indicate that corrections were applied by the NAMMCO/JCNB Working Group.
a) Born 1986, b) Heide-Jørgensen 2004, c) Heide-Jørgensen and Acquarone 2002, d) Heide-Jørgensen 2003, f) Richard *et al*. 1994, g) Innes *et al*. 2002, h) Koski and Davis 1994, i) NAMMCO/SC/13-JCNB/SWG/2005-JWG/4

CATCH	PROB	CATCH	PROB
0	0	250	0.42
50	0.96	300	0.32
100	0.81	350	0.26
150	0.68	400	0.19
200	0.55		

Table 2. Probability of halting the decline in West Greenland beluga numbers in the next 5 years for a range of catch options for the chosen assessment model (see .6.4.1).

BELUGA			
Municipality	**Quota 04/05**	**Catch 04/05**	**Quota 05/06**
Maniitsoq	7	7	7
Sisimiut	32	18	23
Kangaatsiaq	12	10	10
Aasiaat	3	1	3
Qasigiannguit	9	0	3
Ilulissat	78	14	54
Qeqertarsuaq	15	12	14
Uummannaq	10	8	8
Upernavik	134	19	88
Qaanaaq	20	2	10
Total	**320**	**91**	**220**
NARWHAL			
Kangaatsiaq	5	0	
Aasiaat	23	21	16
Qeqertarsuaq	21	21	16
Uummannaq	88	78	68
Upernavik-Savissivik	63	46	60 + 15
Qaanaaq-Savissivik	100	128	85
Total	**300**	**294**	**260**

Table 3. Quotas and catches of beluga and narwhal in West Greenland, 2004 to 2006. The quota year runs from July 1 to June 30. Qaanaaq including Savissivik, Melville Bay has a five year quota of 100 beluga and 500 narwhal. [NOTE: Since the meeting these quotas have been raised by 50, with the following distribution: 35 to Uummannaq, 5 to Qeqertarsuaq, 5 to Assiaat, 5 to Kangaatsiaq. The total quota for 2005/2006 will be 310.]

APPENDIX 1

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APPENDIX 2

AGENDA

1 OPENING REMARKS
2 ADOPTION OF JOINT AGENDA
3 APPOINTMENT OF RAPPORTEURS
4 REVIEW OF AVAILABLE DOCUMENTS
5 NARWHALS
    5.1 Stock structure
        5.1.1 Genetic information
        5.1.2 Satellite tracking
        5.1.3 Other information
        5.1.4 Management units
    5.2 Biological parameters
        5.2.1 Age estimation
        5.2.2 Reproductive rates
        5.2.3 Other information
    5.3 Catch statistics
        5.3.1 Struck and lost
        5.3.2 Ice entrapments
        5.3.3 Histories by management units
        5.3.4 Other information
    5.4 Abundance
        5.4.1 Recent estimates
        5.4.2 Estimates by management units
        5.4.3 Future survey plans
        5.4.5 Recent changes in distribution in Canada
    5.5 Assessment
        5.5.1 Update of West Greenland assessment
        5.5.2 Canadian summer stocks
        5.5.3 East Greenland
    5.6 Future research requirements

6 BELUGA
    6.1 Stock structure
    6.2 Recent catch statistics
    6.3 Abundance
        6.3.1 Recent and future estimates
    6.4 Assessment update
        6.4.1 West Greenland
        6.4.2 Other stocks
    6.5 Other information
    6.6 Future research requirements
7 IMPLEMENTATION OF EARLIER ADVICE
8 TRADITIONAL KNOWLEDGE
9 IMPACT OF HUMAN-MADE-NOISE
10 OTHER BUSINESS
    10.1 Implications of the inclusion of other species (e.g.walrus) in the work of the SWG.
11 ADOPTION OF REPORT

APPENDIX 3

LIST OF DOCUMENTS

Document No.	
NAMMCO/SC/13-JCNB/SWG/2005-JWG/1	List of participants.
NAMMCO/SC/13-JCNB/SWG/2005-JWG/2	Agenda.
NAMMCO/SC/13-JCNB/SWG/2005-JWG/3	Draft list of documents.
NAMMCO/SC/13-JCNB/SWG/2005-JWG/4	Richard, P. , Laake, J.L., Asselin, N. , and Cleator, H. Baffin Bay narwhal population distribution and numbers: aerial surveys in the Canadian High Arctic, 2002-2004
NAMMCO/SC/13-JCNB/SWG/2005-JWG/5	Heide-Jørgensen, M.P. An attempt to survey narwhals and belugas in West Greenland March 2004
NAMMCO/SC/13-JCNB/SWG/2005-JWG/6	Heide-Jørgensen, M.P. Reconstructing catch statistics for narwhals in Greenland 1862 to 2005**:** A preliminary compilation
NAMMCO/SC/13-JCNB/SWG/2005-JWG/7	Heide-Jørgensen, M.P. Catch statistics for belugas in Greenland 1862 to 2004.
NAMMCO/SC/13-JCNB/SWG/2005-JWG/8	Garde, E., Heide-Jørgensen, M.P., Hansen, S.H. and Forchhammer, M.C. Age-specific growth and high longevity in narwhals (*Monodon monoceros*) from West Greenland estimated via aspartic acid racemization.
NAMMCO/SC/13-JCNB/SWG/2005-JWG/9	Romberg, S. and Richard, P. Seasonal distribution and sex ratio of narwhal catches in the Baffin region of Nunavut Territory, Canada.
NAMMCO/SC/13-JCNB/SWG/2005-JWG/10	Romberg, S. Catch Statistics (1996-2004) for Narwhal and Beluga in Selected Communities in the Eastern Canadian Arctic.
NAMMCO/SC/13-JCNB/SWG/2005-JWG/11	Richard, P. A risk analysis of narwhal hunting in the Canadian High Arctic
NAMMCO/SC/13-JCNB/SWG/2005-JWG/12	Laidre, K. and Heide-Jørgensen, M.P. Late summer and early fall movements of narwhals in Inglefield Bredning, Northwest Greenland

NAMMCO/SC/13-JCNB/SWG/2005-JWG/13	Laidre, K.L. and Heide-Jørgensen, M.P. The behavior of narwhals (*Monodon monoceros*) before, during, and after an attack by killer whales (*Orcinus orca*) in the Eastern Canadian Arctic
NAMMCO/SC/13-JCNB/SWG/2005-JWG/14	Witting, L. An assessment for West Greenland beluga.
NAMMCO/SC/13-JCNB/SWG/2005-JWG/15	Witting, L. A model selection based assessment for West Greenland narwhals with uncertain stock structure.
NAMMCO/SC/13-JCNB/SWG/2005-JWG/16	Heide-Jørgensen, M.P., Dietz, R. and Laidre, K. Metapopulation structure and hunt allocation of narwhals in Baffin Bay
NAMMCO/SC/13-JCNB/SWG/2005-JWG/17	Heide-Jørgensen, M.P. and Laidre, K. Video recordings of narwhal pods in Melville Bay, West Greenland
NAMMCO/SC/13-JCNB/SWG/2005-JWG/18	Lawson, J. Overviews: Beluga whale and noise.

ANNEX 2

Fangstrapport for en hvid- eller narhval

Catch report for beluga and narwhal

Rapportering om fangst ☐ **anskydning/mistet** ☐ **bifangst** ☐ **(sæt x)**

Catch **Struck and lost** **By-catch**

Der bruges et skema for hver fanget eller anskudt/mistet hvid- eller narhval (undtagen ved sassat)

Ved fællesfangst er det kun kaptajnen eller lederen af fangsten, som skal indsende

1 SKEMA PR. HVAL

1 form per whale

1. Navn: **Name of hunter**			**2. Cpr. nr.:** **Social security number**		
3. Hjemsted (By/Bygd): **Town**			**4. Fangstdato og år:** **Date and year**		
5. Licens nr.: **Licence number**					
6. Jagtbevis (sæt x)	Erhvervsjagtbevis: Full time hunter		Fritidsjagtbevis: Poor time hunter		
7. Art (sæt x)	Hvidhval: Beluga		Narhval: Narval		
8. Fangststed/anskydningssted (stednavn og hvis muligt position): **Place of catch** (position if possible)					
9. Køn: (sæt x) **Sex**	Han: Male Hun: Female		Hvis hun, er der foster: If female: Ja: Nej: With or without fetus		
10. Alder: (sæt x) **Age**	Unge / ungdyr: Young	Voksen: Adult	Gammel:		
11. Er der sender på? With transmitter?			Ja: Yes	Nr. Number	Nej: No
Er der mærke? With tag?			Ja: Yes	Nr. Number	Nej: No
Sender/mærke afleveres sammen med skemaet					
12. Fangstmetode: (sæt x) **Method**	Riffel: Rifle	Håndharpun: Hand harpoon	Garn: Net	Sassat: Ice entrapment	Andet: (Angiv): Other
12. Fartøj/størrelse : **Vessel**	Fartøj: Vessel		Qajaq: Kajak	Hundeslæde: Dog sledge	
13. Øvrige deltagers navne (udfyldes kun i forbindelse med fællesfangst) **Names of associated hunters**					
Navne og cpr.nr.			**Navne og cpr.nr.**		

Udfyldt skema skal, umiddelbart efter fangsten afleveres til kommune- eller bygdekontoret. Modtagne kemaer sender kommunen til Direktoratet for Fiskeri og Fangst hurtigst muligt efter fangst eller anskydning er foretaget, jf. § 20, stk. 3.

GREENLAND, NARWHAL (*MONODON MONOCEROS*)

AUTHORS
Lars Witting, Fernando Ugarte, Mads Peter and Heide-Jørgensen

Narwhals are distributed in the North Atlantic Arctic, with the largest populations in Arctic Canada and Greenland. Subsistence hunting takes place in Greenland, with the meat and skin being consumed locally or distributed within Greenland. Tusks are generally sold and resold by a number of intermediaries. Tusks reach the final consumer both as whole tusks and pieces used for artwork. Export of narwhal products was banned in 2006 due to a negative NDF, but products are legally traded within Greenland.

Before 2005 there was an unregulated hunt on narwhals in West and East Greenland with approximately 700 narwhals taken per year. Continuing from 2005 a quota system came in place with a current annual quota of 385 narwhals in West Greenland. No quota system is in place in East Greenland, with an average reported take of 95 narwhals per year from 1997 to 2006.

The procedure used for the NDF of narwhal and other species in Greenland is not based on the IUCN checklist. It follows instead a protocol that was developed by the Greenland Scientific Authority in 2005. Many of the species that require NDFs in Greenland are subject to scientific recommendations on sustainable harvest levels through international bodies like the North Atlantic Marine Mammal Commission (NAMMCO) and the Canada/Greenland Joint Commission on the Conservation and Management of Narwhal and Beluga (JCNB). The Greenland protocol provides guidelines to make NDFs relatively easily and consistently with basis in the scientific recommendations from the relevant international bodies. For narwhals we were unable to provide a positive NDF because the catches in the west are larger than what was recommended by the Scientific Working Group of the JCNB. A limitation of our method is that NDFs are based entirely on available knowledge about the sustainability of the catches, and do not consider the effects of international trade on the harvest.

Narwhal NDF Greenland

Lars Witting, Fernando Ugarte, and
Mads Peter Heide-Jørgensen

Greenland Institute of Natural Resources

Background

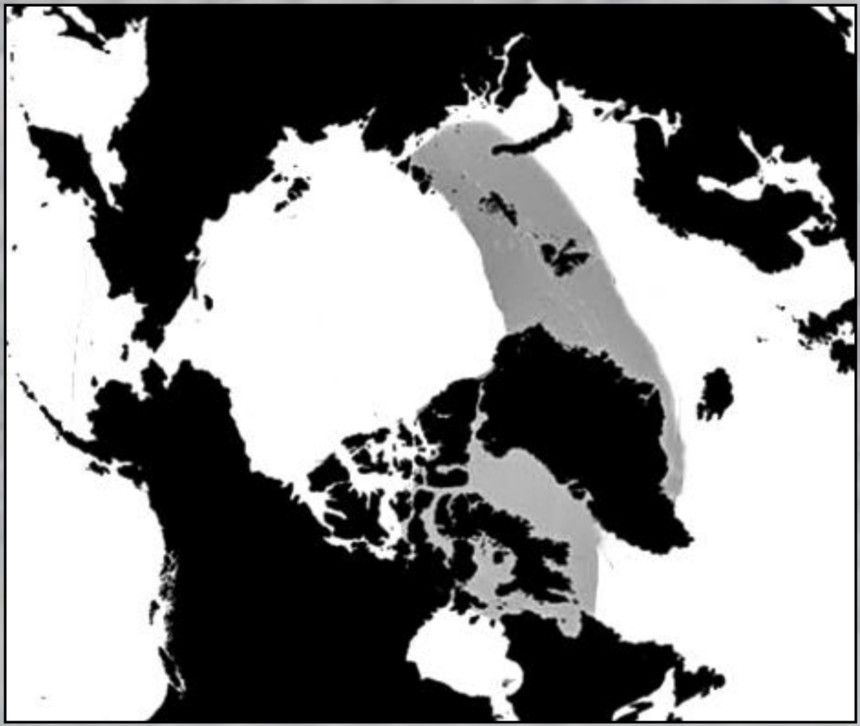
- CITES formally adopted in 2004 by the Greenland Home Rule Government
- Greenland Institute of Natural Resources became the Scientific Authority
- First NDF in 2005 for narwhal
- Later NDFs for polar bear, beluga and walrus
  (so far only NDF for beluga positive)

Internal NDF guidelines

- Integrate NDF in our traditional work on sustainable use of living resources
- NDF do not evaluate sustainable use directly
- It relies instead on scientific recommendations of international organizations like NAMMCO, JCNB, IWC and IUCN PBTC

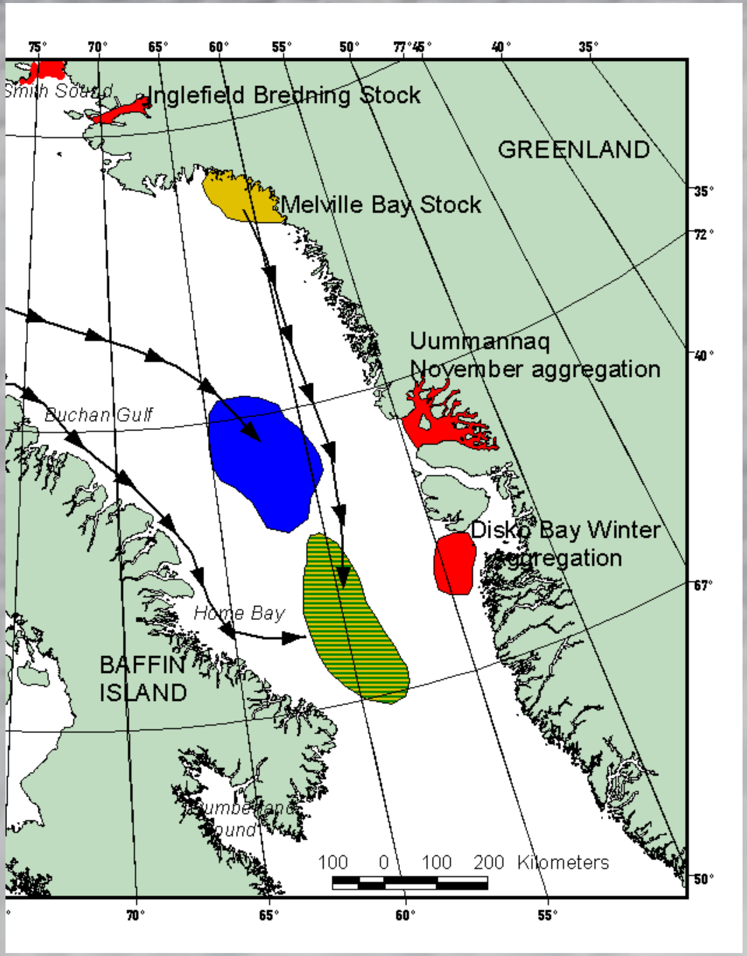
Narwhal distribution

- Arctic North Atlantic
- Mainly Arctic Canada and Greenland
- Summer: site fidelity to fjord systems
- Winter: in drift ice



Stock structure

- Separate summer areas (3 NW Greenland + East Greenland + several in Canada)
- More common but apparent separate wintering grounds
- Winter/fall areas with animals of unknown origin



Abundance

- Global abundance unknown
- Canada
  - 1996: 45,000 (cv:35%); 2002: 26,000 (cv:58%)
- Inglefield Bredning; NW Greenland
  - 2001: 2,300 (cv:35%); 2002: 1,500 (cv:25%)
- West Greenland winter
  - 1999: 2,900 (cv:61%) + 8 index est. (1981-99)
- + West 2006 and East 2008

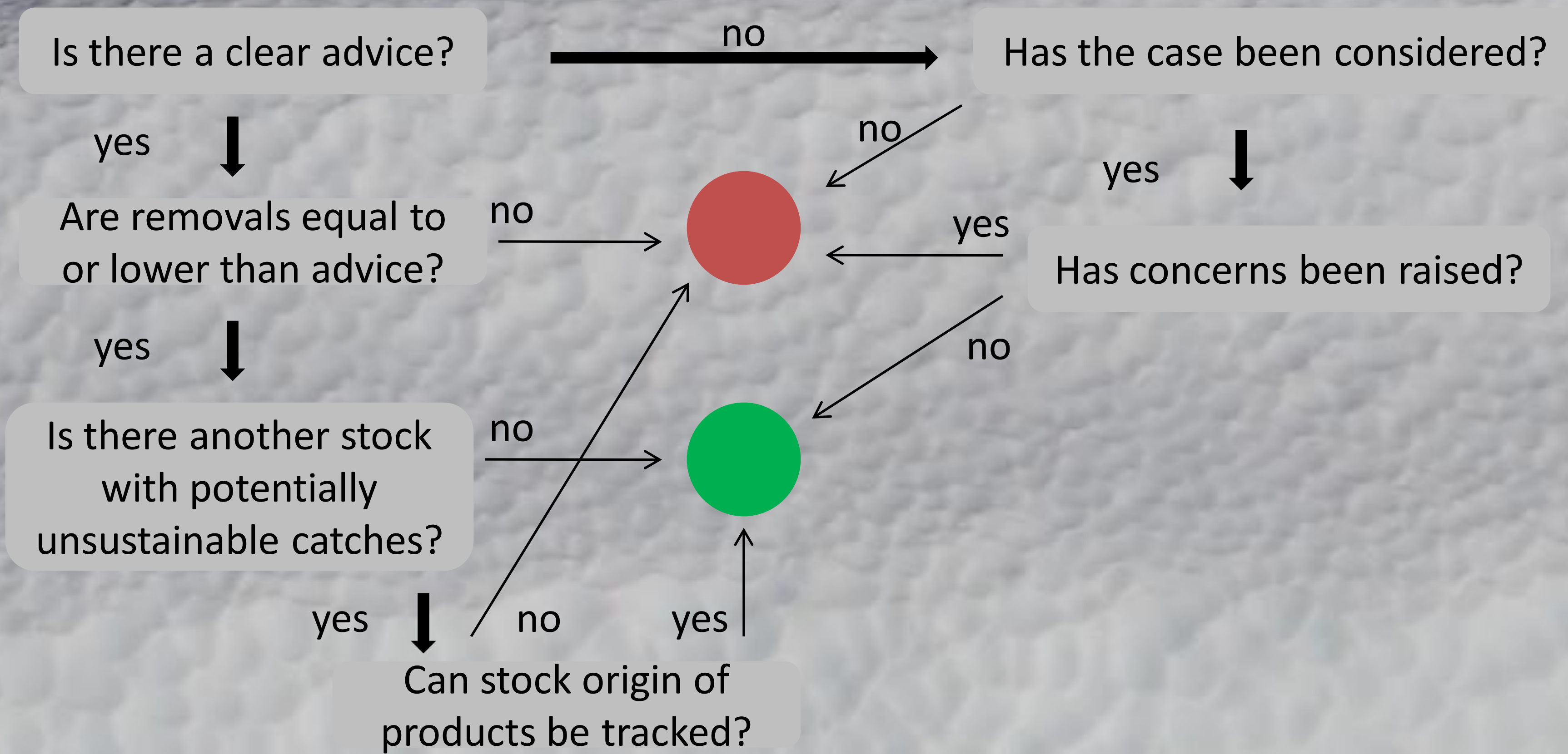
Subsistence hunt

- Meat and skin are consumed locally or distributed within Greenland. Tusks are often sold and resold a number of times before they reach the final consumer
- Prior to 2005 unregulated: 700 /year
- Since 2005 quota system in West Greenland, free hunt in East Greenland
- 2008-9 quota 300 narwhals in west
- Average catch 95 /year in east

Bayesian assessment

- Density-regulated population model (age-structured & discrete)
- Projected over the known catch history
- Some correction for underreporting and struck & lost
- All accepted abundance estimates (relative/absolute)
- Prior knowledge on life history and growth rate
- Uncertainty in stock structure
- Probability of population increase for given catches (5-10 years)

NDF decision guideline



Export impact analysis

- Hunt unsustainable but independent of export

- Is not considered for species where exported products have an important economical value
  - Impossible to prove

- In such cases export analysis is redundant
  - Green light depends on sustainability

Critique

- Several hunters, politicians, and administrators express mistrust in our advice

- They argue that exports should be allowed
  - Hunt is driven by local demands
  - Limited by quotas
  - Thus, export has no significant impact

CONSERVATION AND CURRENT USE OF THE VICUÑA (*VICUGNA VICUGNA MENSALIS*) IN PERU

AUTHOR:
Domingo Hoces Roque

I. BACKGROUND INFORMATION ON THE TAXA

1. BIOLOGICAL INFORMATION

1.1. Scientific and common names

Class:	Mammalia
Order:	Artyodactila
Family:	Camelidae
Genus:	Vicugna
Species:	*Vicugna vicugna*, (Molina, 1872)
Subspecies:	*Vicugna vicugna mensalis*
	Vicugna vicugna vicugna
Scientific synonyms:	None

Common names:

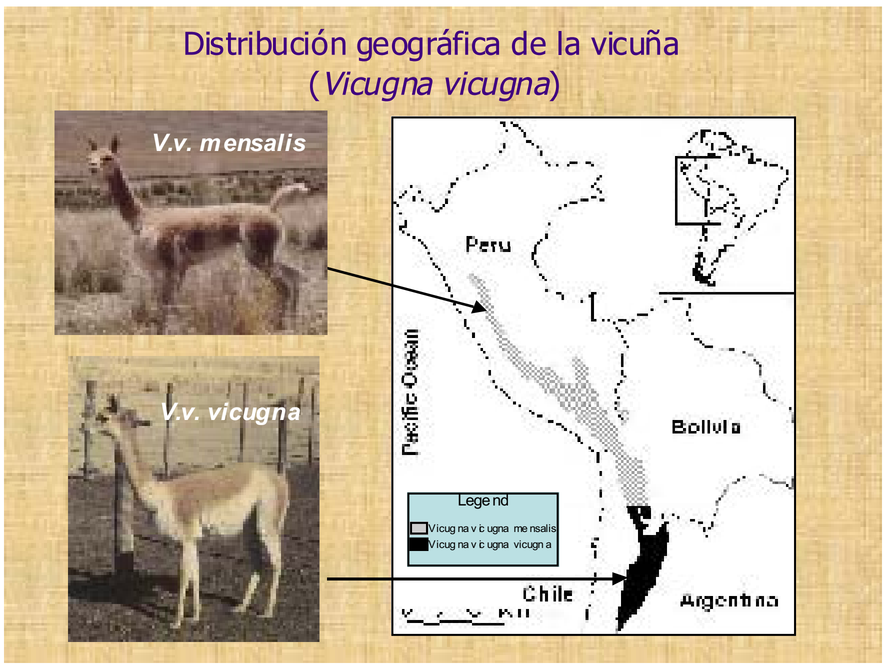
Quechua:	Vicuña
Aymara:	Huari
Spanish:	Vicuña
French:	Vigogne
English:	Vicuña, vicuna
German:	Vikunja

Code number: CITES A.119.004.002.002 (CITES Identification Manual)

Listing in CITES: Appendix II (18/09/1997)

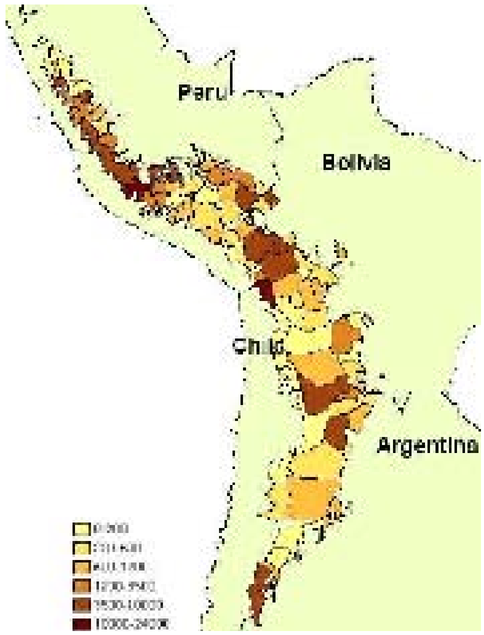
1.2 Distribution

The current natural distribution of the Vicuña comprises the Puna and high Andean ecosystems in Argentina, Bolivia, Chile and Peru. Since 1988, the species has been reintroduced in Ecuador, with specimens from the other range States. In these countries, the species occurs in the Andean Altiplano, normally at elevations higher than 3,300 m, in areas where the vegetation is formed by shrub steppes, grasses and herbs adapted to harsh climatic conditions.

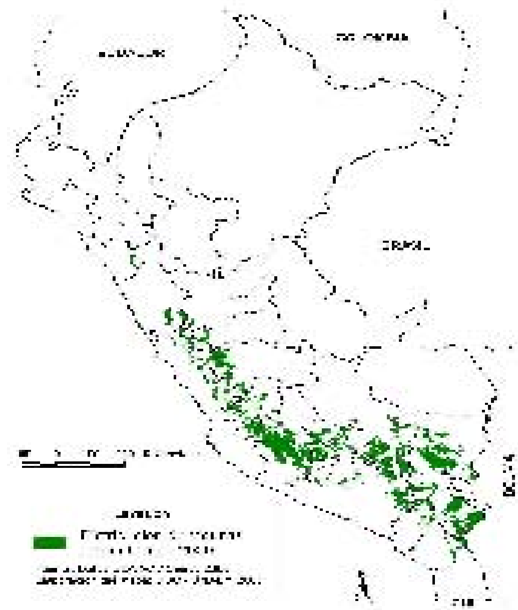


In Peru, the known populations of vicuña are distributed along the high Andes above 3,800 m in approximately 7 million hectares out of the 15 to 18 million hectares of potentially suitable habitat estimated for the country. Vicuña populations are found from 8.14’ south latitu-de in the North until the border with Bolivia and Chile (18 00' south latitude) in the South, in 16 Departments (large administrative regions) of the country. The largest populations are found in the Departments of Ayacu¬cho, Puno and Lima.

The great majority of vicuñas recorded so far occur on land that belongs to rural communities and peasant cooperatives. There are about 8,000 of such organizations in Peru, out of which more than 700 are organized into local committees called “Comités Comunales de la Vicuña.”



Distribution of the Species in South America (Laker 2007).

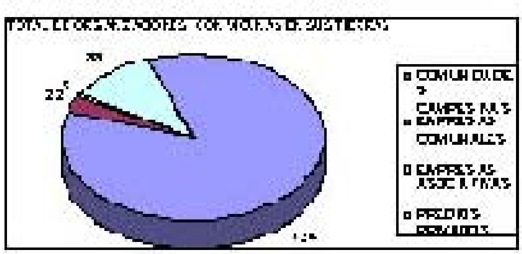


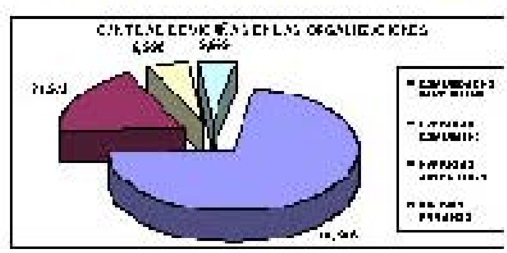
Distribution of the Vicuña in Peru (Veliz and Hoces 2007)

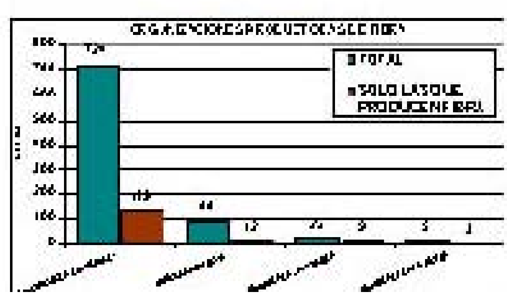
DISTRIBUCION NACIONAL DE LA POBLACION DE VICUÑAS Y DE LA PRODUCCION DE FIBRA SEGÚN CENSO Y CAMPAÑA DE PRODUCCION AÑO 2000

[illegible] Tipo de Organización	[illegible] NACIONAL	%	[illegible] SEGÚN CENSO 200[illegible]	%	[illegible] FIBRA	%	KG. DE FIBRA [illegible]	%
COMUNIDADES CAMPESINAS	734	85.28	84,810	71.55	128	84.21	1,681,858	45.54
EMPRESAS COMUNALES	22	2.61	21,625	18.14	8	5.26	1,678,038	46.06
EMPRESAS ASOCIATIVAS	8	1.07	6,680	5.55	3	1.96	200,020	5.83
PREDIO PRIVADO	80	10.44	6,066	4.73	12	7.84	67,030	2.52
TOTAL NACIONAL	848	100.00	118,875	100.00	152	100.00	3,428,218	100.00

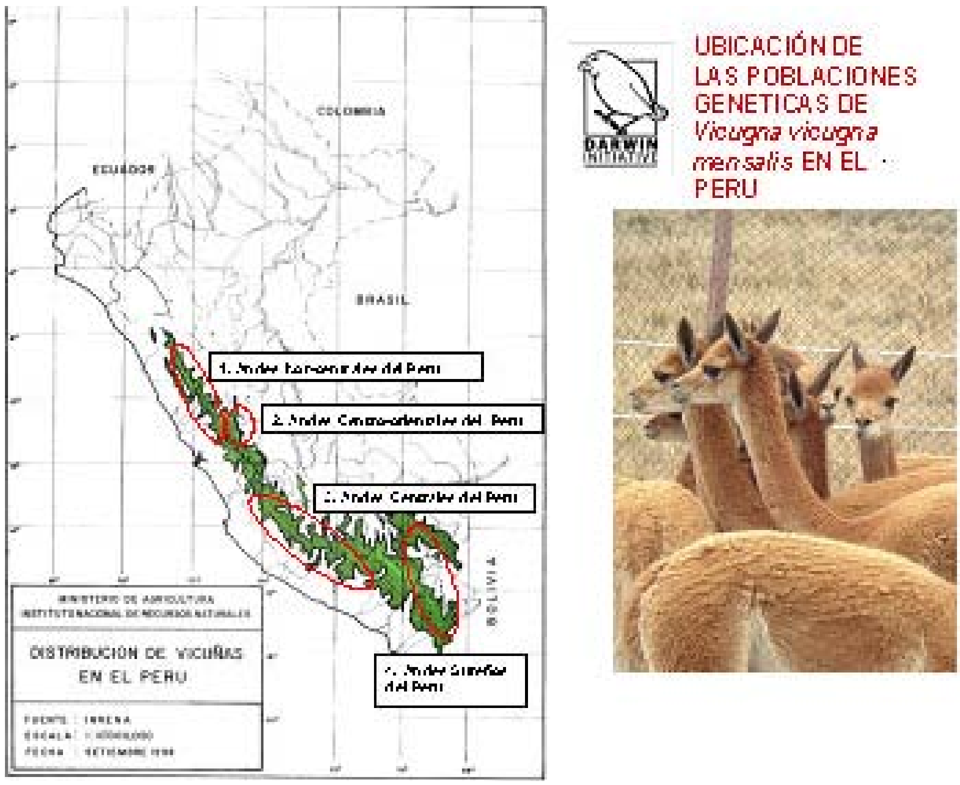
[illegible]







In 2001, four demographically and genetically distinct groups were identified among the vicuñas in Peru: northwestern Junín, southern Junín, central Andes and Puno. Given their differences, it has been recommended that these groups be dealt with in separate management units in the future.



Translation of heading: Location of the genetic populations of *Vicugna vicugna mensalis* in Peru

1.3. Biological characteristics

1.3.1 *Biological characteristics and life history of the species*

SOCIAL ORGANIZATION

Vicuñas usually live in family groups dominated by an adult male or only-male-groups, although there are also solitary males besides these groups. The average size of the families is very stable in comparisons between populations and between both subspecies (one male, tree or four males and two or three young). The male establishes and maintains a permanent territory throughout its reproductive life. The territory usually has a sleeping area in the highest sector, feeding grounds lower down, and a source of water. The boundaries of the territory are delimited by dung heaps, which help orient the members of the family group and are used by the dominant males to threaten vicuñas that do not belong to their group. The territory boundaries are reinforced by the "ritual" defecation of these males. The dominant males control the size of the family group, defending their territory against any vicuñas not belonging to the group, and expelling their own male and female offspring when they reach 4-9 months and 10-11 months of age respectively before parturition starts in February. Expelled males form non-territorial groups made up of 20-60 animals on average, and females join other family groups. Some males eventually separate from these groups and live alone until they establish their own territory.

REPRODUCTION

Gestation of the vicuña lasts 330 to 350 days. In Peru, parturition starts in the second half of February and finishes in the first week of April, reaching a peak in March. In southern populations, however, most births take place in February. Parturition always takes place in the morning. At birth, the young weigh 4-6 kg, about 15% of their mother's live weight. Mating takes place a few weeks after parturition. Some vicuñas are ready for mating at one year, but most reach reproductive maturity at two years and produce their first offspring at the age of three. In Pampa Galeras, pregnancy rates – determined on the basis of external observation in the last month of gestation – were 85% to 95% before the population crisis of 1976, and 58% after the crisis. In a vicuña population of Puno, pregnancy rates of 99% were determined by rectal palpation.

1.3.2. *Type of habitat:*

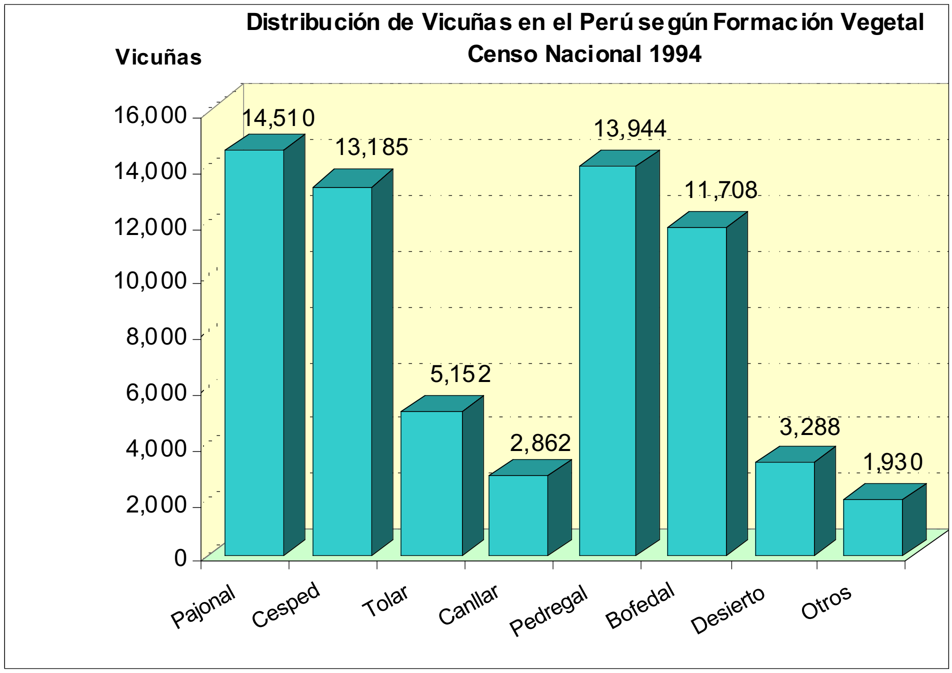
The Puna and high Andean ecological formations of Peru are distributed from the Department of La Liber¬tad in the north (8 south latitude) to the border with Bolivia and Chile in the south (18 south latitude). Such areas feature greater humidity in the north, which is connected to the high plateau, than the south, which is drier. Elevation ranges between 3,800 and 5,000 m, with a mean temperature of 6 – 8ºC and rainfall between 400 and 700 mm.

The dominant vegetation is formed by grasses, which alternate with low plants and scarce forests with plants of the genera *Polylepis, Buddleia* and *Puya*.

These habitats occupy a stretch of land which is narrow in the north and broad towards the south, with a total surface just under 18 million hectares in Peru.

Translation of text in image above: Habitat of the vicuña in Peru; Puna ecoregion (above 3,800 m); Steppe mountain ecoregion (1,000 to 3,800 m); Pacific desert ecoregion (sea level to 1,000 m);

In order to carry out surveys or population assessments, the general habitat of the species has been classified into plant formations. Some of them where vicuña groups have been recorded are considered specific habitats for the species. They are the following: *Pajonal* (scrubland), *Césped de puna* (Puna grassland), *Tolar or Canllar* (spiny shrubland), *Bofedal* (wetlands), *Pedregal or Roquedal* (rocky areas) and Desert. The 1994 vicuña survey made it possible to record vicuña populations on a national level based on these formations.



SOURCE: 1994 NATIONAL SURVEY (INRENA), Author: Domingo Hoces

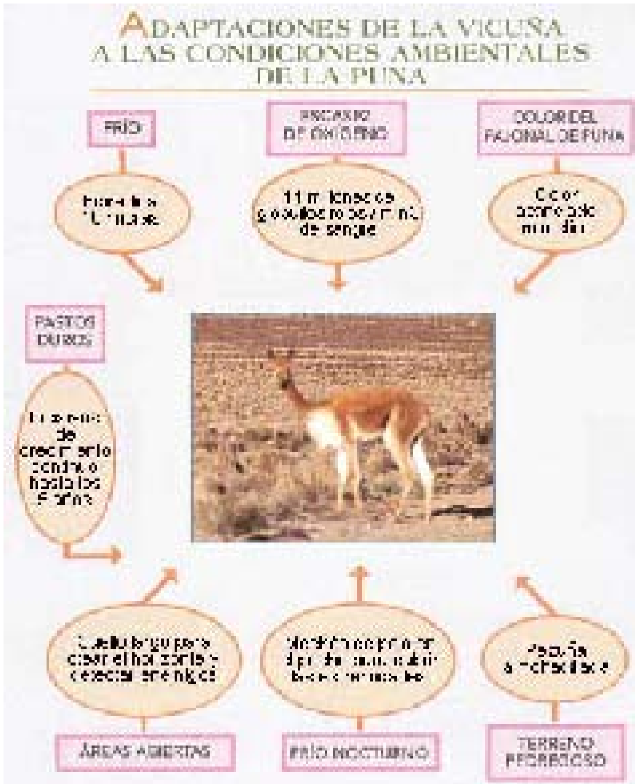
Translation of the text in the table: Distribution of vicuñas in Peru based on plant formations. 1994 National Census

1.3.3. *Role of the species in its ecosystem*

As a wild animal, the vicuña is a key species of the Puna and the high Andes because it is native, adapted to the climate of the region, and especially because of the high economic value of its fiber; the species coexists with extremely poor human populations, for whom it is an alternative way to obtain efficient production from the land, given that other traditional agricultural activities are not successful above 4,000 m. Because of their adaptation and origin, vicuñas have greater productivity and yield than introduced animal species.

TRANSLATION OF TEXT IN THE IMAGE:

Adaptations of the vicuña to environmental conditions in the Puna. Cold – fine fiber, 10 microns; lack of oxygen – 14 million red blood cells / mm3 of blood; color of the Puna scrubland – mimetic light brown color; hard plants to forage – incisors grow continuously until the age of 5; open areas – long neck to see predators easily from a distance; cold nights – longer hair on chest to cover limbs; rocky terrain – cushioned hooves;



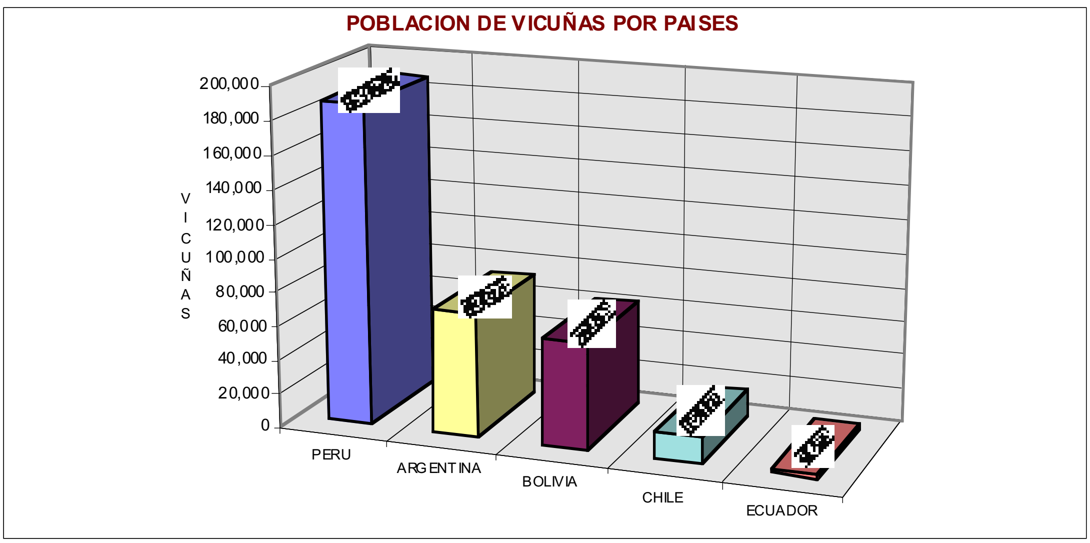
1.4. Population:

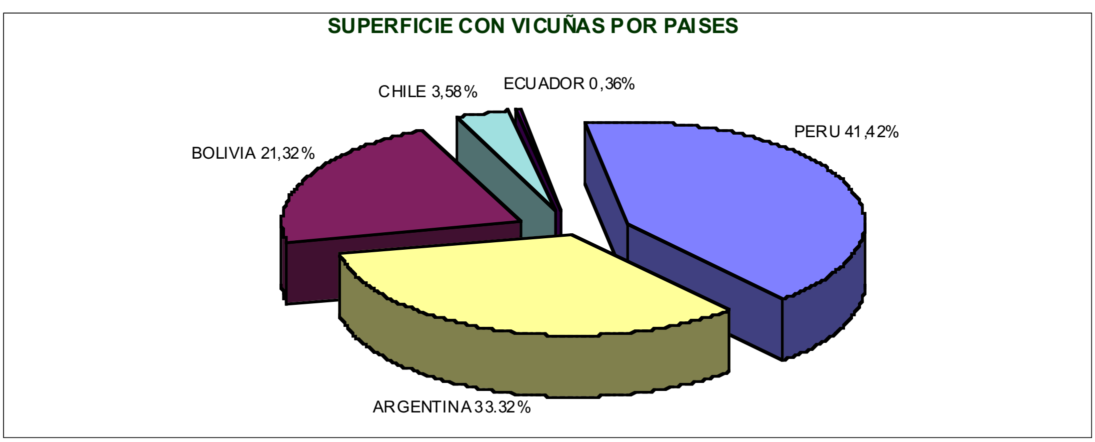
1.4.1. *Global population size:*

The current vicuña population (in 2006) in its whole range (Peru, Argentina, Bolivia, Chile and Ecuador) is around 340,000 individuals, distributed in over 16 million hectares of natural habitat. According to the estimates, Peru has the largest population – over 188,000 individuals – and area of distribution – close to 7 million hectares.

POBLACION DE VICUÑAS POR PAISES DE ORIGEN

PAIS	VICUÑAS		SUPERFICIE		AÑO DE CENSO O PROYECCIÓN	FUENTE
	Población	%	Hectáreas	%		
PERU	188,327	54.95	6,661,498	41.42	2006	Convenio Vicuña 2007
ARGENTINA	72,678	21.21	5,357,800	33.32	2006	Convenio Vicuña 2007
BOLIVIA	62,869	18.34	3,428,356	21.32	2006	Convenio Vicuña 2007
CHILE	16,170	4.72	575,250	3.58	2006	Convenio Vicuña 2007
ECUADOR	2,683	0.78	58,560	0.36	2006	Convenio Vicuña 2007
TOTAL	342,727		16,081,464		2006	





Fuente: Convenio Vicuña. Elaboración: Domingo Hoces.

Translation of text in tables and charts above: Vicuña population by countries of origin;
Three official national surveys have been made in Peru (1994, 1997 and 2000) with an average frequency of 4 years, using the Direct Count Method. The results are shown in the table below:

DEPARTAMENTO	CENSO 1994 (INRENA)			CENSO 1997 (INRENA-CONACS)			CENSO 2000 (CONACS)		
	Vicuñas Censadas	Ha	% Poblac	Vicuñas Censadas	Ha	% Poblac	Vicuñas Censadas	Ha	% Poblac
1.- Ayacucho	18.455	753.000	27.73	33.377	753.000	32.35	40.390	753.000	34.03
2.- Puno	8.618	1.700.783	12.95	14.307	1.732.935	13.87	18.107	1.732.935	15.26
3.- Lima	12,286	281,765	18.46	16,961	281,765	16.44	17.689	281,765	14.91
4.-Junín	7,106	233,929	10.66	10,515	292,369	10.19	11,408	292,369	9.61
5.- Apurimac	10.578	832,182	15.89	11.561	330.400	11.20	10.020	330.400	8.44
6.- Huancavelica	1,902	27.424	2.86	6,750	679,657	6.54	8,745	679,657	7.37
7.- Cusco	1,849	966,304	2.70	2,817	307,330	2.73	4,209	307,330	3.55
8.- Arequipa	2,079	774,180	3.12	2,898	774,180	2.81	3,681	774,180	3.10
9.- Ica				1,905	70,171	1.85	1,583	70,171	1.33
10.- Tacna	487	293.728	0.73	720	288.728	0.70	1.214	288.728	1.02
11.- Ancash	661	263,136	0.99	594	709,795	0.58	684	709,795	0.58
12.- Pasco	248	48.592	0.37	55	48.592	0.05	343	48.592	0.29
13.- Moquegua	1,305	224,408	1.96	294	227,711	0.28	293	227,711	0.25
14.- Cajamarca				72	100	0.07	235	600	0.20
15.- Huanuco	865	32.820	1.30	316	32.820	0.31	51	32.820	0.04
16.- La Libertad	120	165,886	0.18	29	51,445	0.03	26	51,445	0.02
TOTAL	66,559	6,598,137	100.00	103,161	6,660,998	100.00	118,678	6,661,498	100.00

Source: CONACS

Translation of the text in the table above, from top to bottom and left to right: Survey; department; vicuñas surveyed; ha; % of population;

In the latest national survey made in 2000 in Peru, 118,676 individuals were directly counted. Along with an estimation of a few populations that had not been surveyed, the total figure estimated for Peru was of about 130,000 individuals. In spite of the poaching outbreaks that occur every few years, estimates of population increases have led to projecting a population of 188,327 individuals in 2006 in Peru. Such estimates are based on direct reports from vicuña rural management units, fiber production volumes and reports from the field officials of CONACS (National Council of South American Camelids) supervising the fiber harvest operations.

Projection of vicuña populations in Peru, 2001–2006 period

N°	DEPARTMENT	SURFACE Ha.	2000 Survey	2001 Project.	2002 Project	2003 Project.	2004 Project	2005 Project	2006 Project
1	AYACUCHO	753 000	40 390	43 621	47 111	50 880	54 959	59,346	64,094
2	PUNO	1 732 935	18 107	19 556	21 120	22 810	24 634	26,605	28,733
3	LIMA	281 765	17 689	19 104	20 632	22 283	24 066	25,991	28,071
4	JUNIN	292 369	11 408	12 321	13 306	14 371	15 520	16,762	18,103
5	APURIMAC	330 400	10 020	10 822	11 687	12 622	13 632	14,723	15,900
6	HUANCAVELICA	679 657	8 745	9 445	10 200	11 016	11 897	12,849	13,877
7	CUZCO	387 330	4 209	4 546	4 909	5 302	5 726	6,184	6,679
8	AREQUIPA	774 180	3 681	3 975	4 294	4 637	5 008	5,409	5,841
9	ICA	70 171	1 583	1 710	1 846	1 994	2 154	2,326	2,512
10	TACNA	288 728	1 214	1 311	1 416	1 529	1 652	1,784	1,927
11	ANCASH	709 795	684	739	798	862	931	1,005	1,086
12	PASCO	48 592	343	370	400	432	467	504	545
13	MOQUEGUA	227 711	293	316	342	369	399	431	465
14	CAJAMARCA	600	235	254	274	296	320	346	373
15	HUANUCO	32 820	51	55	59	64	69	75	80
16	LA LIBERTAD	51 445	26	28	30	33	35	38	41
	TOTAL	**6 661 498**	**118 678**	**128 172**	**138 426**	**149 500**	**161 460**	**174,378**	**188,327**

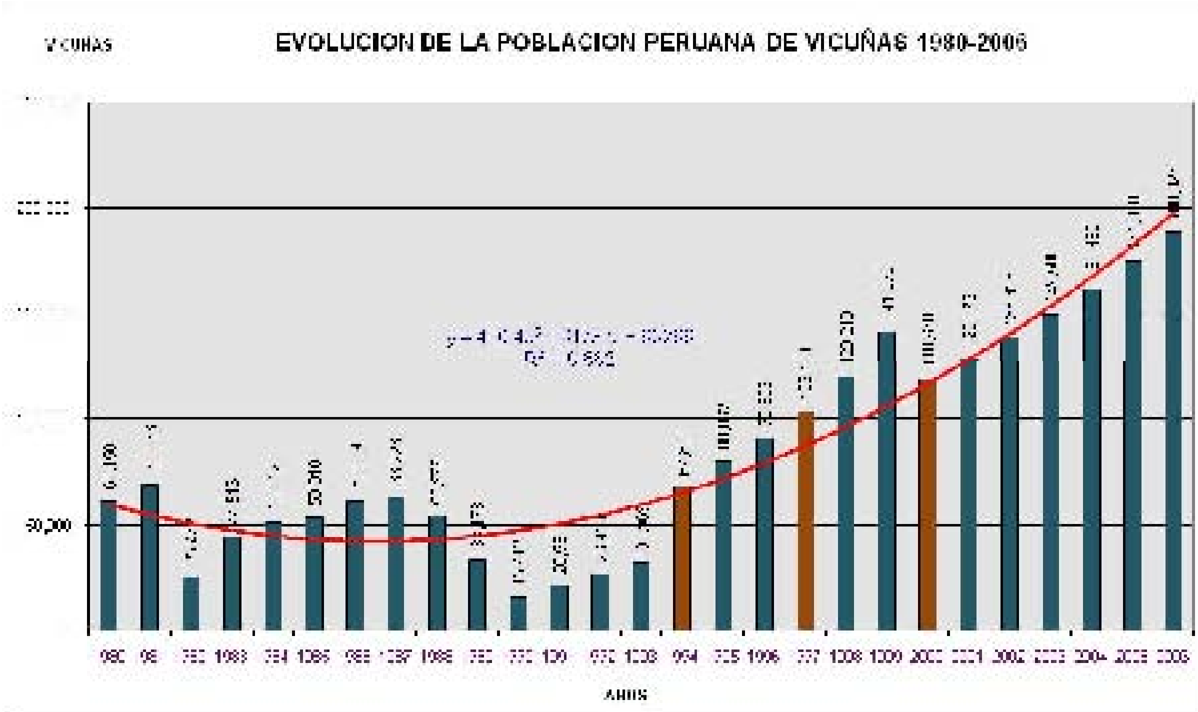
Source: National Survey 2000 and Projections by CONACS. Adaptation: Domingo Hoces

1.4.2. *Current global population trends:*

_X__ Increasing ____Decreasing ____ Stable ___Unknown

According to the population data provided by the countries of origin every year, the population has been experiencing a gradual increase over the last 10 years. The trend seems to be approaching its turning point before starting to get closer to the natural asymptote determined by the species' population carrying capacity as well as the intrinsic limitations of the other activities that take place in the habitat it occupies.

To appreciate the trend of the Peruvian vicuña population, it is necessary to start by looking at the period from the 1980s to 1993, when close to 3 million hectares were controlled by the *Proyecto Especial Utilización Racional de la Vicuña* (Special Project for the Rational Use of Vicuña). A critical period began in 1987 with the influence of subversive actions in Peru, which led to the virtual disappearance of the vicuña program until 1993. Another stage began in 1994 with the gradual decline of the subversion, the opening of the legal fiber market due to the change in the CITES Appendices and favorable agreements reached in the Vicuña Convention. This was the stage of population recovery, which still continues. The positive change is reflected in the difference between the population figures in the surveys made in 1994 and 1997.



Translation of the text in the table above: Evolution of the vicuña population of Peru 1980-2006; years

1.5. Conservation status

1.5.1. *Global conservation status* (according to the IUCN Red List):

___Critically endangered _X_Least concern
___Endangered ___Near threatened
___Vulnerable ___Data deficient

1.5.2. *Conservation status in the country for which the case study is presented*

The classification of endangered wild animals in Peru (*Categorización de las Especies amenazadas de Fauna Silvestre*) was updated and approved by Supreme Decree No. 034-2004-AG of 17 September 2004. The vicuña is included in the category NEAR THREATENED in this classification.

1.5.3. *Main threats in the country for which the case study is presented*

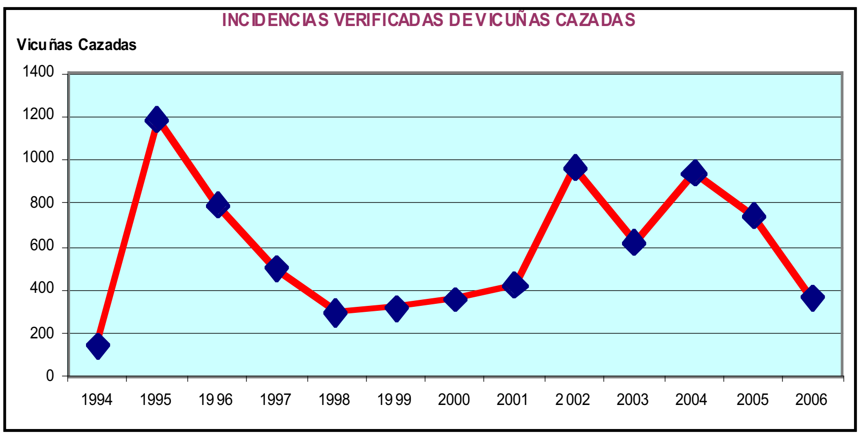
___No threats
___Habitat loss / degradation (human induced)
___Invasive Alien Species (that directly affect the species)
_X_ Direct exploitation (hunting / harvesting)
___Incidental mortality (e.g., due to manipulation)
___Persecution (e.g., pest control)

___Pollution (affecting the habitat and/or the species)
_X_Other: _ Farming interests, hybridization__
___Unknown

INCIDENCIAS DE CACERIA FURTIVA DE VICUÑAS 1994 - 2006

Nº	DEPARTAMENTO	VICUÑAS CAZADAS													TOTAL	%
		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006		
1	AYACUCHO	46	415	281	190	86	35	19	217	389	287	189	149	192	**2,495**	32.64
2	LIMA	0	104	166	41	0	47	29	46	345	138	426	34	14	**1,390**	18.18
3	APURIMAC	0	219	219	151	98	61	19	19	72	93	0	0	58	**1,009**	13.20
4	HUANCAVELICA	0	51	0	0	0	81	174	75	22	29	292	59	100	**883**	11.55
5	PUNO	98	179	68	92	112	16	31	12	0	7	0	107	0	**722**	9.45
6	ICA	0	98	0	0	0	0	0	0	0	0	0	260	0	**358**	4.68
7	JUNIN	1	3	2	18	0	9	13	7	132	59	14	98	0	**356**	4.66
8	CUSCO	0	115	55	0	0	45	20	27	0	2	12	0	0	**276**	3.61
9	AREQUIPA	0	2	0	9	0	25	52	20	0	5	5	37	0	**155**	2.03
	TOTAL	**145**	**1,186**	**791**	**501**	**296**	**319**	**357**	**423**	**960**	**620**	**938**	**744**	**364**	**7,644**	100.00

Fuente: Oficinas Regionales del CONACS. Elaboración Domingo Hoces



Translation of the text in the table and chart above: Table: Incidence of Vicuña Poaching 1994-2006; Department; vicuñas hunted; Chart: Verified Incidence of Vicuñas Hunted; vicuñas hunted.

In 1995, the verified number of vicuñas killed by poachers in Peru exceeded 1,100 individuals yearly; these figures were reduced to an average of 300 individuals in the following 3 years. Overall, the average number was slightly over 600 animals killed by poaching (see the table and chart above). However, this figure increased again to 1,305 individuals between 2002 and 2004. These numbers are still far from the levels that really endangered the Peruvian population of vicuña in the years before 1995, when annual levels of vicuñas killed may well have reached a number close to 18,000 individuals.

Since the improvements made in the construction of the road linking Arequipa and Juliaca in the south of Peru, started by the Ministry of Transport in 1999 and involving 80 km in the Reserva Nacional de

Salinas and Aguada Blanca, a protected area, frequent deaths of vicuñas due to road accidents have been reported. Corrective measures have been taken to reduce such incidents by signaling animal crossings and speed limits in critical stretches. A video has also been prepared to raise awareness about the problem of vicuñas killed in road accidents among drivers and passengers at the Arequipa bus station.

Since 2006, a number of public officials and academics specialized in animal husbandry have promoted the hybridization of vicuñas —crossing vicuñas and alpacas— with great insistence and political scope. They argue that the hybrids would bring about greater technical and commercial advantages than vicuñas and alpacas in alleviating the poverty of the Peruvian Andes. This has been rejected by the Peruvian scientific community and specialized press, international conservation organizations and the Vicuña Convention.


ESPECIAL SEMANA DE BANDERA

Especial ESCUDO NACIONAL

Nuestro segundo ícono del escudo es la grácil y delicada vicuña. La fibra que la cubre la convierte en la especie más valiosa de los camélidos y a la vez la más vulnerable

La eterna lucha de la vicuña

La reina de los camélidos

Translation of the heading of the article: The eternal struggle of the vicuña

2. MANAGEMENT OF THE SPECIES IN THE COUNTRY FOR WHICH THE CASE STUDY IS PRESENTED

2.1. Management measures

The management measures mainly aim at maintaining a minimum sustainable population for the use of the vicuña's valuable fiber. However, there are other indirect uses for vicuñas such as ecotourism. For this purpose, it is necessary to protect the populations from illegal trade, periodically monitor the population groups, carry out research on management technology and develop the results, implement appropriate legislation and promote a controlled and fair market for the farmers' economic interests.

2.1.1. *Management history*

POLICIES IMPLEMENTED

In times of the Incas:

- Practice of the "CHACCU"
- Fiber for nobility only
- Meat of vicuñas and other species for the people

In present times:

- Until 1978: Protection, dissemination
- 1980 – 1990: Development of technology (Vicuña Project)
- 1994 – 2000: Participation of rural communities and opening of the international market, association with the other camelids (Creation of CONACS)
- 2001 – Present: Commercial use with little interference by the State

2.1.2. *Purpose of the management plan*

Conserve the species by reducing poaching, increase the population and maintain sustainable levels, use the fiber obtained through the shearing of live animals, sell the fiber in the best possible conditions to benefit the people in the high Andes.

2.1.3. *General elements of the management plan*

- Conservation of the species, guaranteeing its sustainability
- Role of the State, through appropriate legislation and policies
- Participation of local people in management decisions and benefits

2.1.4. *Restoration or mitigation measures*

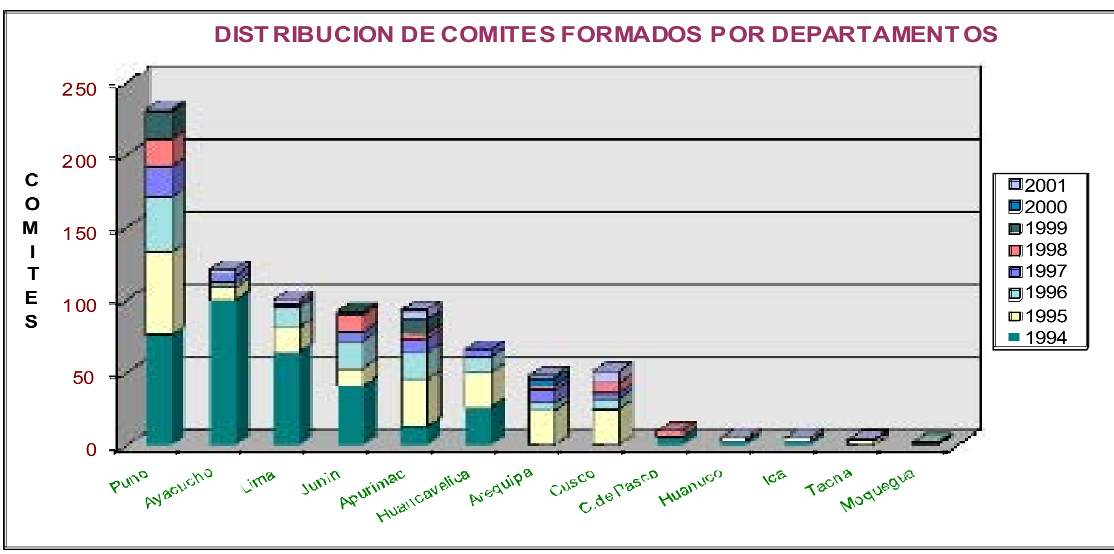
One of the alleviating or reinforcing measures for the conservation of vicuñas has been to promote the active and direct participation of rural people in the conservation and benefits of the use of vicuñas.

This was first done through the membership of the so-called VICUÑA COMMITTEES and later through restocking programs in the country.

COMITES COMUNALES DE VICUÑAS FORMADOS Y RECONOCIDOS POR EL CONACS

DEPARTAMENTO	1994		1995		1996		1997		1998		1999		2000		2001		TOTAL 1994 - 2001			
	F.	R.	F.	R.	F.	R.	F.	R.	F.	R.	F.	R.	F.	R.	F.	R.	F.	%	R.	%
1.- Puno	79	79	67	61	55	57	21	0	16	45	19	0	1	0	5	5	230	[illegible]	211	[illegible]
2.- Ayacucho	105	100	8	5	3	7	2	0	0	5	0	0	0	0	4	3	120	14.50	117	15.41
3.- Lima	64	66	17	5	14	4	3	0	0	16	0	0	3	0	5	3	102	12.33	[illegible]	11.48
4.- Junin	41	41	13	3	18	45	8	0	12	13	3	0	0	0	3	3	97	11.09	64	[illegible]
5.- Apurimac	13	13	35	17	18	17	8	0	4	28	10	0	0	0	8	3	96	11.20	79	10.34
6.- Huancavelica	28	28	24	14	11	11	5	0	0	8	0	0	0	0	3	3	66	7.85	64	[illegible]
7.- Arequipa	0	0	24	7	8	16	9	0	9	18	0	0	8	0	3	3	49	5.78	39	5.47
8.- Cusco	0	0	26	8	7	13	4	0	7	5	0	0	0	0	8	3	51	6.14	36	5.06
9.- C.de Pasco	0	0	0	0	0	0	2	0	4	4	0	0	0	0	2	2	[illegible]	1.20	[illegible]	1.48
10.- Huanuco	3	3	2	2	0	0	0	0	0	0	0	0	0	0	3	3	[illegible]	[illegible]	[illegible]	[illegible]
11.- Ica	3	3	3	0	0	0	0	0	0	1	0	0	0	0	3	3	[illegible]	[illegible]	4	[illegible]
12.- Tacna	0	0	3	0	0	3	0	0	0	1	1	0	0	0	3	3	4	[illegible]	4	[illegible]
13.- Moquegua	0	0	1	0	1	1	0	0	0	1	0	0	0	0	2	2	3	0.24	3	[illegible]
TOTAL	332	330	[illegible]	[illegible]	147	[illegible]	61	0	49	148	32	0	8	0	[illegible]	[illegible]	[illegible]		[illegible]	

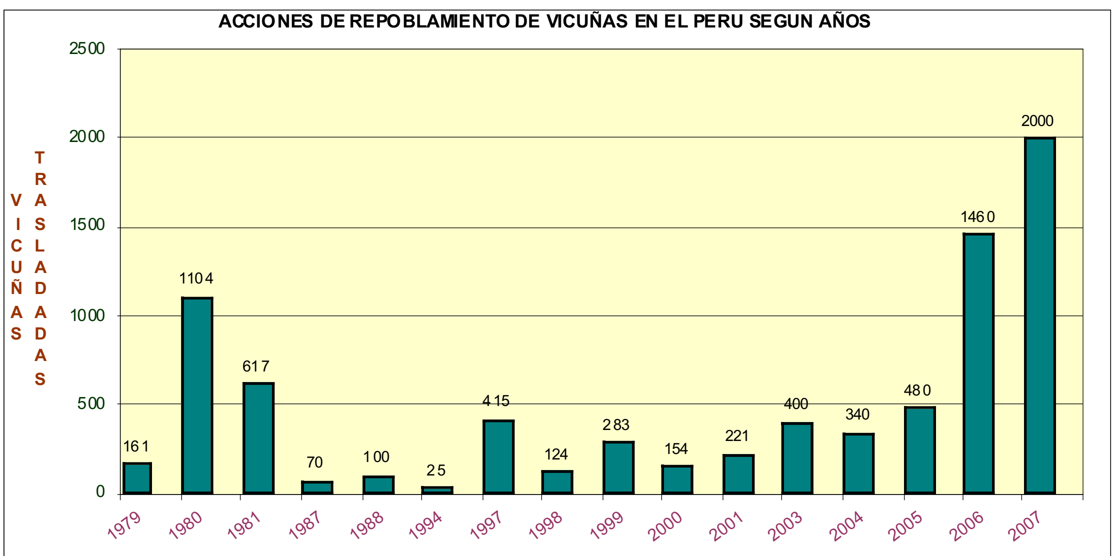
Fuente: Oficinas Regionales CONACS. Elaborado: [illegible]
F. = Comités formados
R. = Comités reconocidos por el CONACS



ACCIONES DE REPOBLAMIENTO DE VICUÑAS EN EL PERU 1979 - 2007

LOCALIDAD ORIGEN	LOCALIDAD DESTINO	1979	1980	1981	1987	1988	1994	1997	1998	1999	2000	2001	2003	2004	2005	2006	2007	TOTAL VICUÑAS	%
Pampa Galeras	1.- Junin		395	617														1,012	12.72
Pampa Galeras	2.-Huancavelica	121	601										400			500		1,622	20.39
Andamarca	Huancavelica														120			120	1.51
Pampa Galeras	3.- Arequipa	40						95										135	1.70
Arequipa	Arequipa										74	78						152	1.91
Pampa Galeras	4.- Ancash		108					100										208	2.62
Junin	Ancash											50		53				103	1.29
Pampa Galeras	5.-ECUADOR					100				100								200	2.51
Pampa Galeras	6.- Cajamarca						25	170								240		435	5.47
Pampa Galeras	7.-C.de Pasco							50		72								122	1.53
Junin	C.de Pasco										29							29	0.36
Apurimac	8.-Cusco								100									100	1.26
Puno	9.-Puno									74				47				121	1.52
Pampa Galeras	10.-La Libertad				70									240		240		550	6.91
Puno	La Libertad																2000	2,000	25.14
Pampa Galeras	11.-Pampa Galeras									37	51	69			120			277	3.48
Apurimac	12.-Apurimac								24			24						48	0.60
Pampa Galeras	Apurimac															480		480	6.03
Cabana	Apurimac														240			240	3.02
TOTAL	TOTAL	161	1104	617	70	100	25	415	124	283	154	221	400	340	480	1460	2000	7954	

Fuente: Ex Proyecto Especial Vicuña, Proyecto Barbara D¨Achile, Of.regionales CONACS. Elaboracion: Domingo Hoces



Translation of the text in the tables and charts above: Table 1: Vicuña committees formed and recognized by CONACS; F: committees formed; R: committees recognized by CONACS; Chart 1: Distribution of committees formed by Department; Table 2: Restocking of vicuñas in Peru 1979-2007; origin; destination; Chart 2: Restocking of vicuñas in Peru by year;

2.2. Monitoring system

2.2.1. *Methods used to monitor the harvest*

Given the broad territorial distribution of the vicuña in Peru as well as its numerous beneficiaries, direct control of the fiber harvest in the field was very limited. Consequently, the Single Register of Wild South American Camelids (*Registro Único de Camélidos Sudamericanos Silvestres*) was established by the legislation on the Vicuña (*Reglamento de la Ley de la Vicuña*) to control the conservation, management and use of the vicuña in Peru. The Certificate of the Single Register of Wild South American Camelids – RUCSSP is issued for this purpose. Although 430 RUCSSP certificates were programmed for the period between July 2006 and June 2007, 522 certificates were actually issued, exceeding the estimations for the period by 121.40%.

Summary of RUCSS certificates issued in the July 2006-June 2007 period

Mes	Producción de Procedencia					Transformación	Prendas de Vestir		Evaluación del Proyecto		
	Fibra Sucia	Fibra Predescerdada	Fibra Descerdada	Fibra Lavada	Fibra Carda	Hilo	Tela	Prendas	Programado	Ejecutado	Avance Porcentual (%)
Periodo Julio - Diciembre 2006											
Julio	18	0	0	1	0	0	2	1	35	22	62.86
Agosto	22	0	0	0	2	0	5	7	25	36	144.00
Setiembre	4	17	0	0	0	0	0	0	55	21	38.18
Octubre	14	42	10	0	0	0	2	1	25	19	276.00
Noviem	26	4	4	0	0	0	0	0	50	33	66.00
Diciem	7	0	0	0	0	4	6	6	40	21	62.50
Periodo Enero - Junio 2007											
Enero	46	0	0	0	0	0	11	7	50	53	106.00
Febrero	41	13	0	0	0	2	3	14	50	73	146.00
Marzo	44	22	6	0	0	2	0	0	40	84	210.00
Abril	12	8	2	0	0	0	0	0	30	22	73.33
Mayo	6	22	25	0	0	4	4	18	10	73	730.00
Junio	2	0	0	0	0	1	0	2	10	6	60.00
TOTAL:	249	128	47	1	2	13	32	60	430	522	121.40

Fuente: [illegible]

2.2.2. *Confidence in monitoring*

Confidence is based on the fact that the successive records correspon-ding to the various stages of the harvest, processing and marketing of vicuña fiber are related to one another and to their origin, which makes it difficult to falsify information.

2.3. Legal framework and law enforcement

In Peru, several national laws protect vicuñas and regulate their mana-gement and use. The most important and directly applied example is

Act 26495 of 23 June 1995 and its Regulation adopted by Supreme Decree No. 007-96 -AG of 7 June 1996. This Act establishes the ownership and marketing regime, as well as sanctions for hunting vicuñas, guanacos and their hybrids. The Forest and Wildlife Act (*Ley Forestal y de Fauna Silvestre*) of 13 May 1975 and its Regulation on Wildlife Conservation (*Reglamento de Conservación de Fauna y Flora Silvestre*) adopted by Supreme Decree No. 158-77- AA of March 1977 are still valid. They apply to vicuñas as a wildlife species by regulating authorizations for scientific and commercial use and establishing sanctions for infringements. Legislative Decree No. 653 (Act on the Promotion on Investments in the Agricultural Sector) of 1991 and its Regulation adopted by Supreme Decree No. 048-91-AG authorizes the harvest (i.e. slaughter) of vicuñas when it is technically justified and endorsed by a Ministerial Resolution, among other aspects currently covered by Act 26496.

Until Act 26496 entered into force, the Penal Code established very limited penalties for illegal vicuña hunters (considering the slaughter of vicuñas as a crime against the environment and natural resources). Such penalties have been increased with Act 26496.

Since 1995, there have been no significant changes in legislation regarding vicuñas to reduce their protection. Supreme Decree No. 007-96-AG was readjusted in 2004 regarding the gathering of fiber, trade in the products and the use of the official brand in their trade (Supreme Decree No. 008-2004-AG and Supreme Decree No. 006-2005-AG of January 2005, which modifies Art. 30 of Supreme Decree No. 008-2005-AG regarding the granting of the brands VICUÑA PERU and VICUÑA PERU ARTESANIA). Several recently issued regulations are favorable for the management of the species. One of them is the issuance of Supreme Decree No. 034-2004-AG of 17 September 2004, which approves the Classification of Endangered Species of Wild Animals, according to which the vicuña is NEAR THREATENED (NT). On 9 February 2005, Supreme Decree No. 010-2005-AG was issued, "designating the National Council of South American Camelids – CONACS as the CITES Management Authority regarding Wild South American Camelids (CITES-CONACS)."

Another legal instrument that benefits the vicuña is the Vicuña Convention signed by Peru, Bolivia, Chile and Ecuador in 1979.

Peru has participated continuously and actively in the 26 regular annual meetings and 5 extraordinary meetings held so far. Through this instrument, the vicuña has benefited from a general management with important results: first, the vicuña was saved from extinction throughout its range with a joint protection strategy applied in all the range States simultaneously. Technology for the management of the species was later developed by exchanging experiences with each Government through the meetings of the Convention and special technical meetings. Since 1987, the Vicuña Convention has had a decisive participation in the achievements reached in vicuña conservation, especially the populations of Peru and Chile. Indeed, the international trade in fabric made of vicuña fiber was first opened during the VI Conference of the Parties using the brands "VICUÑANDES" and "PRE-CITES". Vicuñas from Peru, Chile and Bolivia were reintroduced in Ecuador between 1988 and 1993 thanks to the support and the agreements reached in the Convention. In the 1992-1994 period, the proposal to downlist the Peruvian vicuña population from Appendix I to Appendix II of the CITES Convention was successful. Since then, the use of the Peruvian vicuña population has directly benefited more than 700 rural communities of the high Andes, protecting the species from a resurgence of poaching. The fabric can now be manufactured anywhere in the world, which provides access to the best textile manufacturing techniques and therefore leads to the best quality and prices for finished products; an authorization was also obtained to process and market over three tons of fiber from dead animals from seized materials and authorized slaughters since 1980.

In the X Conference of the Parties to the CITES Convention in 1997, the support of the member countries of the Vicuña Convention led to downlisting most of the vicuña populations of Bolivia and Argentina to CITES Appendix II and allow the processing and international trade of luxury crafts and knitted articles made of vicuña fiber, changing the brand from "VICUÑANDES" to "VICUÑA." In 1998, on occasion of its 25th anniversary, the CITES Convention granted the Vicuña Convention a Certificate of Recognition for its outstanding contribution to the conservation of wildlife in the world. As the depositary of the Convention, Peru officially received the recognition.

3. UTILIZATION AND TRADE

3.1. *Type of use* (origin) *and purposes*

In Peru, since the legal market was opened in 1994, use of vicuñas involves only the fiber obtained from the shearing of live animals, supervised by the State for its international trade under CITES controls to directly benefit rural communities in the high Andes that manage vicuñas on their land. However, management of vicuñas in semi-captivity was introduced in 1996. It involves the use of 1,000 ha enclosures with metallic fences (sustainable use modules) housing 250-300 individuals. This system currently applies to 27,000 vicuñas, which amount to 80% of the annual production of fiber.

Módulos de Uso Sustentable para la Crianza de Vicuñas En Semicautiverio

Nº	DPTO.	Nº DE CERCOS	Nº VICUÑAS AL 2003	%
1	Ayacucho	75	5,183	19.39
2	Apurimac	30	3,740	13.99
3	Arequipa	14	915	3.42
4	Junin	25	4,646	17.38
5	Ica - Huancavelica	24	1,494	5.59
6	Cusco	8	726	2.72
7	Puno	65	9,036	33.90
8	Lima	26	997	3.73
		267	26,737	100.00

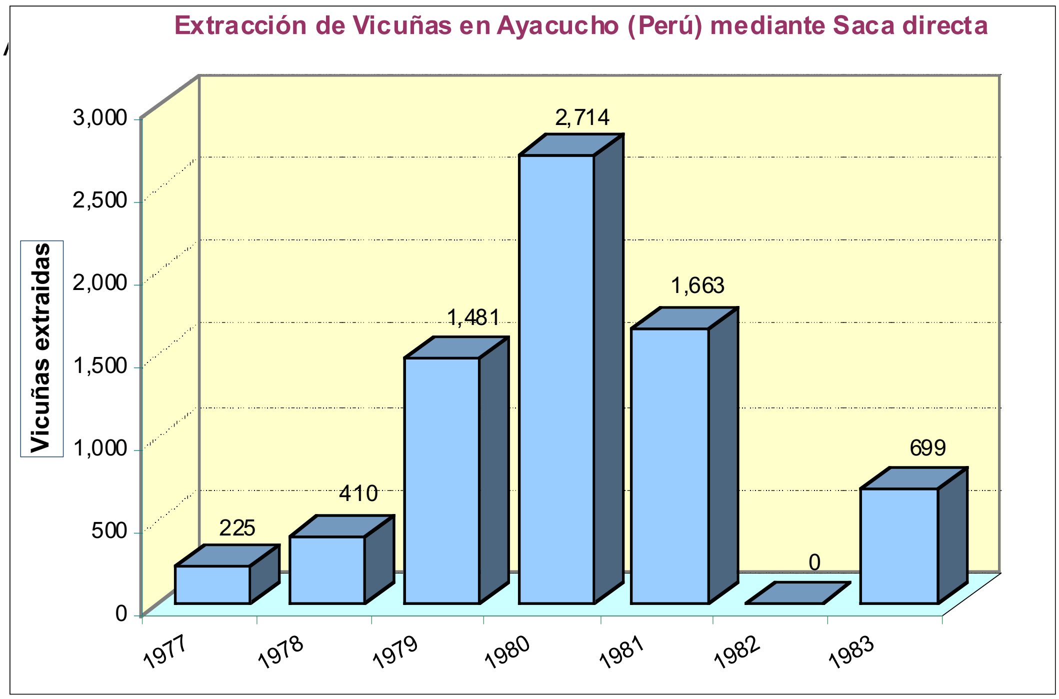
Fuente: Programa de Camélidos Silvestres CONACS (2004)

Translation of the text in the table above: Sustainable Use Modules for the Breeding of Vicuñas in Semi-captivity. Number; Department; number of enclosures; number of vicuñas in 2003;

3.2. Harvest

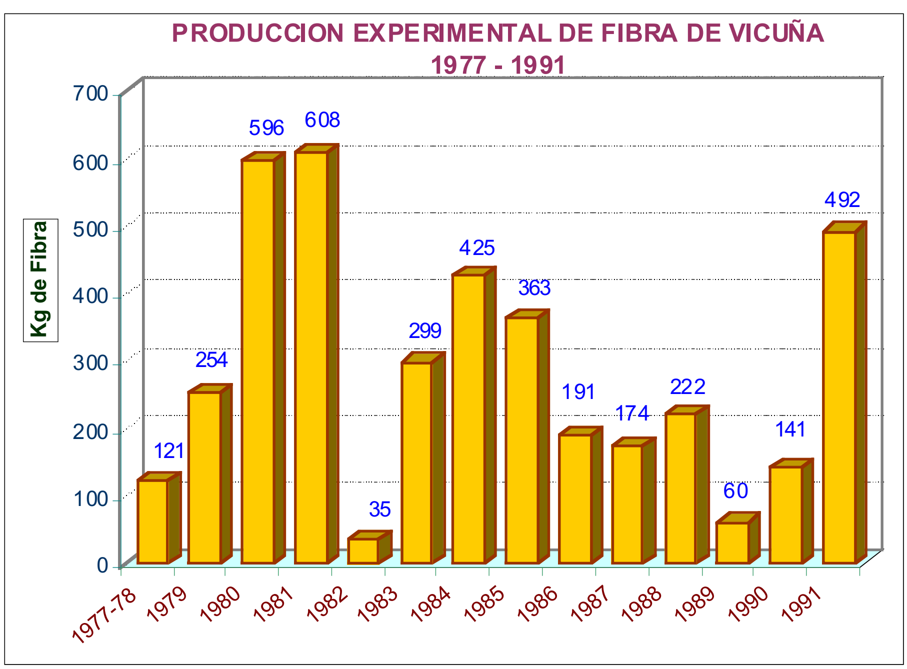
3.2.1. *Harvesting regime*

The harvesting regime refers exclusively to the use of the fiber obtained from the shearing of live animals. No fiber is harvested from hunted or dead animals, except in one single case in Pampa Galeras in the first years of management, when the culling of over 7,000 individuals was authorized between 1977 and 1983 because of overpopulation. Between 1977 and 1981, there was also an experimental production of fiber.



FUENTE: Estadisticas del ex Proyecto Especial Vicuña. Elaboración: Domingo Hoces

Translation of the text of the chart above: Slaughter of vicuñas in Ayacucho (Peru)



FUENTE: Estadisticas del ex Proyecto Especial Vicuña. Elaboración: Domingo Hoces

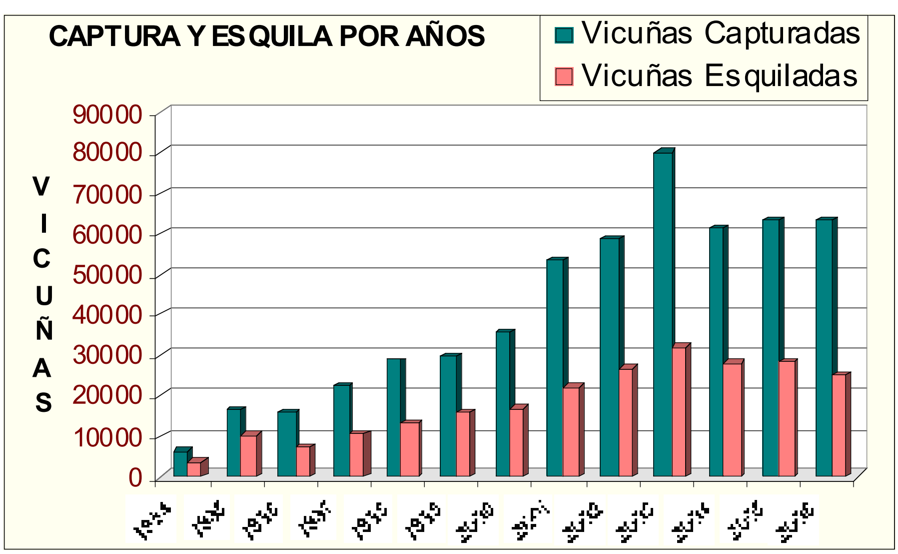
Translation of the text in the chart above: Experimental production of vicuña fiber 1977-1991; kg of fiber

Commercial use of fiber began in 1994 with the opening of the legal market, with the direct and active participation of the rural organizations involved. Until 2006, about 46,000 kg of fiber had been produced.

Captura y Esquila		
Año	Vicuñas Capturadas	Vicuñas Esquiladas
1994	6128	3278
1995	16204	9616
1996	15683	7145
1997	22118	10352
1998	28612	13083
1999	29859	15462
2000	35637	16956
2001	53273	21711
2002	58542	26385
2003	80317	32058
2004	61455	27698
2005	63124	28450
2006	63203	24969

Produccion Fibra		
Año	Kg de Fibra	Acum Fibra
1994	832	832
1995	2,223	3,055
1996	1,478	4,533
1997	2,008	6,541
1998	2,543	9,084
1999	3,052	12,136
2000	3,427	13,411
2001	4,257	19,819
2002	5,149	24,968
2003	6,093	31,061
2004	5,083	36,144
2005	5,221	41,365
2006	4,635	46,000

Fuente: Ex Proyecto Vicuña y CONACS. Elaboración: Domingo Hoces



PRODUCCIÓN PRELIMINAR DE FIBRA EN EL AÑO 2002				
Nº	Departamento	Producción de fibra (kg) dentro de cercos	Producción de fibra (kg) fuera de cercos	TOTAL Kg
1	Ayacucho	2.908,390		2.908,390
2	Puno	473,573		473,573
3	Junín	335,514	454,410	789,924
4	Lima	176,110		176,110
5	Apurimac	178,908	43,074	221,982
6	Huancavelica	51,350	90,960	142,310
7	Ica	36,000	69,400	105,400
8	Arequipa	72,320	40,587	113,007
9	Cusco	31,652	69,044	100,696
10	Tacna	21,367		21,367
11	Pasco	24,045		24,045
	TOTAL	**4.309,219**	**767,575**	**5.076,794**
	%	84,88	15,12	100,00

Fuente: CONACS Elaboración: domingo Hoces

Translation of the text in the tables and charts shown above: Table 1: Capture and shearing; vicuñas captured; vicuñas shorn; Fiber production; year; kg of fiber; fiber accumulated; Chart 1: Capture and shearing by year; vicuñas captured; vicuñas shorn; Chart 2: Fiber production by year; kg fiber; Table 2: Preliminary fiber yield in the year 2002; Number; Department; fiber yield (kg) in enclosures; fiber yield (kg) outside enclosures; total kg

3.2.2. *Harvest management / control*

The use of the fiber is controlled by the State through the following legal and institutional instruments:

— The Single Registry of Wild South American Camelids - RUCSS
— The control of the shearing season. Capture and shearing are only authorized in Peru between
May and November every year.

Controls are reinforced through the so-called Technical Committee for Trade in Fiber (*Comité Técnico Comercializacion de Fibra* – CTN). The CTN was established on 2 September 2004, and its Technical Secretariat is held by CONACS. The CTN is formed by three Sectors (the Production, Technical and Consumer Sectors) that represent the diverse players involved in the capture and shearing of vicuñas, research, processing, marketing and monitoring vicuña fiber. The Production Sector has 9 members who represent producer organizations (Rural Communities, Cooperatives, and Associations of Producers, among others) and service providers.

The Technical Sector is formed by 7 members that belong to public institutions devoted to research on vicuñas or wild South American camelids and a private researcher.

The Consumer Sector is formed by 5 members from companies linked to the processing and marketing of vicuña fiber. So far, the CTN has generated the NTP (Peruvian Technical Standard) *Fibra de Vicuña en Vellón: Definición y Determinación de la longitud de mecha* (NTP 231.350.2006) (Vicuña fiber in fleece. Definitions and determination of wick length), adopted by INDECOPI Resolution No. 0001-2006/CRT-INDECOPI, published on 30 January 2006 (INDECOPI is the Peruvian Consumer Protection Commission). The discussion and formulation of such regulations required 9 meetings of the CTN, which concluded on 6 September 2005.

The Draft Peruvian Technical Standard (PNTP) on the mechanical shearing of vicuña was concluded and adopted in 2007. It is the first standard proposed and adopted by the Technical and Commercial Regulation Commission of INDECOPI.

3.3. Legal and illegal trade levels:

Legal trade of fiber in Peru represents an annual production of around 5,000 kg, 20% of which is produced in Peru, while the rest is directly exported by the regional groups of beneficiary communities under the supervision of the State through the CITES Authority and the RUCSS register. Illegal trade is probably proportional to the number of animals killed by poachers, although its incidence levels are currently under control.

II. NON-DETRIMENT FINDING PROCEDURE (NDFS)

1. IS THE METHOD USED BASED ON THAT PROPOSED BY THE IUCN?

__Yes   _X_No

2. CRITERIA, PARAMETERS AND/OR INDICATORS USED

Direct information from activities devoted to the conservation, management and use of the vicuña in Peru.

3. MAIN SOURCES OF INFORMATION, INCLUDING FIELD SURVEYS, SAMPLING METHODS AND ANALYSIS USED

— The focal institutions of the Peruvian State (Proyecto Vicuña, CONACS, INRENA, CITES Authority, Sociedad Nacional de la Vicuña)
— Reports from the regular meetings of the Vicuña Convention
— Agreements of the CITES Convention and IUCN data

4. QUANTITATIVE AND QUALITATIVE ASSESSMENT OF THE INFORMATION USED IN THE EVALUATION

Direct processing and use of national and international statistics on the species

5. MAIN PROBLEMS, DIFFICULTIES AND CHALLENGES FOUND IN MAKING THE NDF

— Scattered and outdated data
— Discontinuous information
— Data lost or not directly accessible
— Use of different names and concepts to refer to the same parameters
— Incorrect use of some zootechnical or animal husbandry concepts and schemes in data or statistics on vicuñas.

6. RECOMMENDATIONS

— Manage the specific concepts, definitions, work schemes and policies that correspond to the vicuña as a WILD animal, eradicating the use of livestock farming synonyms.
— Not include the vicuña in programs, institutions, projects, laws or policies that refer to the domestic species alpaca and/or llama or in the definitions or concepts that refer to South American camelids in general.

NDF WORKSHOP
WG 5 – Mammals
CASE STUDY 8 SUMMARY
Vicugna vicugna mensalis
Country – **Ecuador**
Original language – Spanish

CONSERVATION AND CURRENT USE OF THE VICUÑA (*VICUGNA VICUGNA MENSALIS*) IN PERU

AUTHOR:
Domingo Hoces Roque

The subspecies of vicuña that occurs in Peru (*Vicugna vicugna mensalis*) is a wild mammal of the family Camelidae. It is of great economic value and has a major ecological and social importance for the country. Vicuñas produce the finest animal fiber in the world, are native to the high Andean regions of South America and coexists with very poor human communities at altitudes above 4,000 m. In recent times, the vicuña experienced its most critical situation between 1988 and 1993, when only 67,000 individuals were left in Peru. The most recent survey, made in 2000, estimated a population of 118,678 individuals occupying just under 7 million hectares. These data were used to make projections for 2006 and yielded an estimate of about 188,000 individuals distributed in 16 Departments (administrative regions) from Cajamarca in the north to Tacna in the south, excluding about 1,000 -1,200 individuals killed by poachers every year. Surveys project an annual population increase of 8.0% to 12.0%. The highest population densities are still recorded in the Departments of Ayacucho (including the Pampa Galeras protected area with 5,500 individuals), Junín, Puno and Lima. There is still an illegal market for the valuable fiber that has always fueled poaching, although it currently has a lower impact and risk. However, it is still a threat to the survival of the species. One of the key measures taken to fight illegal trade and achieve sustainable use was to open the international legal market in 1994 to the trade in fabric and products made with vicuña fiber. This was achieved with the support of the Vicuña Convention and involved downlisting the vicuña population of Peru to Appendix II of the CITES Convention, with the use of the official brand "VICUÑA – PERU." This encouraged the presence of rural people in the field to capture and shear live vicuñas as well as the development of management technology with the support of official and private institutions, thus restricting the illegal market. As regards scientific knowledge of the biological diversity of vicuñas, the existence of two subspecies – *Vicugna vicuna mensalis* and *Vicugna vicugna vicugna* – in the South American continent was determined in 2004. It was also discovered that vicuñas in Peru belong to 4 genetically distinct population groups. About 300 rural organizations are actively and permanently involved in the harvest of vicuña fibre, out of 750 that have vicuñas on their land. About 5,000 kg of fiber – 500 of which are exported to the US – are annually obtained from the shearing of some 25,000 live animals out of about 65,000 animals captured. This generates an annual income of USD 2.5 million. It is also worth mentioning that Peru has been implementing a management system since 1996 which involves enclosing areas of 1,000 ha and a perimeter of 12 km with a metallic fence to house 250-300 vicuñas in semi-captivity. This system is still under discussion, as there is still no conclusive evidence proving its alleged advantages for the commercial management of the species or its negative impacts on the vicuña's behavior, genetics and health, given that it is a wild animal. Although poaching driven by the illegal market of vicuña fiber is still a threat for the species, the survival and conservation of vicuñas is now facing new risks as it is being the object of inadequate criteria and policies for a wildlife resource. This is because some economic sectors are promoting a purely zootechnical or livestock farming perspective for the management of vicuñas and the widespread and uncontrolled use of the hybrid 'pacovicuña' – a crossing between alpaca and vicuña. Such trade would allow the illegal market to easily launder vicuña fiber and live animals, distort the natural identity of the species and negatively affect the income of the rural organizations that are already benefiting from legal trade in vicuña fiber. One way to prevent these new threats or risks to the survival of the vicuña would be to reinstate and/or strengthen the conceptual, institutional and legal treatment the vicuña deserves as a wild species, an important renewable natural resource and a national emblem of Peru present in the country's coat of arms. The national management of the species should be rearranged through a Special National Program in the recently created Ministry of the Environment, as has already been done by the governments of Ecuador, Argentina, Bolivia and Chile with similar ministries. In spite of the limited factors and risks pointed out, the vicuña still has a very significant potential for sustainable use in Peru and the whole continent. Considering the vicuña population of South America in 2006 (340,000 individuals), only 28% of the animals that could potentially be used are being shorn according to the indices obtained. Yet, according to the age structure of vicuña populations, about 40% of the total number of individuals can theoretically be shorn every year. This would yield about 22,000 kg of fiber every year (60 % of the global demand), which would generate an annual income exceeding USD 11.5 million for rural communities in the Andes, considering only sales or raw fiber. However, the potential fiber yield should not only be considered on the basis of the current vicuña population; the optimal range of annual population increase is between 16 % and 22% and there are still natural areas available for the sustainable expansion of the species by occupying land that still empty or replacing alien domestic species that are less profitable for rural people in the Andes on land that is currently in active use.

CONSERVACION Y USO ACTUAL DE LA VICUÑA (*Vicugna vicugna mensalis*) EN EL PERU

La Vicuña peruana (*Vicugna vicugna mensalis*) mamífero silvestre del grupo camelidae, es de gran valor económico e importancia ecológica y social para el país, por poseer la fibra de origen animal más fina del mundo, ser oriunda de los Altos Andes Sudamericanos y convivir con grupos sociales muy pobres, encima de los 4,000 metros sobre el nivel del mar. Después de haber superado su última situación crítica entre 1988 y 1993 con sólo 67,000 ejemplares a nivel nacional, según el último censo del año 2000 se había alcanzado los 118,678 individuos sobre cerca de 7 millones de hectáreas, población que proyectada al año 2006 estima unos 188,000 ejemplares, distribuidas en 16 departamentos desde Cajamarca por el Norte hasta Tacna por el Sur, excluyendo unos 1,000 - 1,200 individuos por año, eliminados por caza furtiva, frente al incremento poblacional proyectado de 8.0% al 12.0 % anual a partir de los censos. Las mayores densidades poblacionales de vicuñas siguen concentrándose en los departamentos de Ayacucho (que incluye la Reserva de Pampa Galeras con 5,500 ejemplares), Junín, Puno y Lima. El mercado ilegal por su valiosa fibra que siempre alentó la caza furtiva, sigue operando, pero con menor impacto y riesgo, sin dejar de ser una amenaza para la supervivencia de la especie. Una de las gestiones decisivas para combatir el mercado ilícito y alcanzar el uso sustentable, fue la apertura, en 1994, del mercado legal internacional al comercio de telas y confecciones con su fibra, logrado con el apoyo del Convenio Andino de la Vicuña, pasando toda la población peruana de vicuñas al Apéndice II de la Convención CITES, con uso de la marca oficial "VICUÑA – PERU"; lo que a su vez promovió la presencia del campesinado en el campo para la captura y esquila de vicuñas vivas y el desarrollo de tecnología de manejo con apoyo de instituciones oficiales y privadas, restringiendo asi al mercado ilegal. Respecto del conocimiento de la diversidad biológica de la Vicuña, al año 2004 se ha determinado la existencia, a nivel continental, de dos sub especies (*Vicugna vicuna mensalis* y *Vicugna vicugna vicugna*) así como de 4 grupos poblacionales genéticos diferentes en el Perú. En cuanto al aprovechamiento de su fibra están involucradas activa y permanentemente cerca de 300 organizaciones campesinas, de una total de 750 con vicuñas en sus tierras, las que anualmente obtienen unos 5,000 Kg de fibra (comercializados internacionalmente a U.S. 500 Kg) de la esquila de unos 25,000 ejemplares vivos y éstos de unos 65,000 individuos capturados con ingresos anuales de U.S. $ 2.500 millones. Asimismo cabe mencionar la adopción en el Perú, a partir de 1996, de la opción de manejo en corrales alambrados de 12 Km de perímetro y 1,000 ha, para albergar unas 250-300 vicuñas en semicautiverio, sistema en debate, pues aun no se demuestra totalmente sus supuestas ventajas para el manejo comercial de la especie ni los impactos desfavorables definitivos contra la etología, genética y sanidad de la vicuña, como animal silvestre. Si bien la caza furtiva alentada por el mercado ilegal de su fibra sigue constituyendo una amenaza para la especie, recientemente y sólo en el Perú, la Vicuña ha empezado a afrontar nuevas situaciones de riesgo para su supervivencia y conservación, al ser objeto de criterios y políticas impropias para su condición de recurso silvestre, como es la promoción, desde ciertos sectores económicos, del enfoque totalmente zootécnico o pecuario que se le pretende aplicar y el uso masivo y sin garantía de control, para producir el hibrido pacovicuña (cruce de alpaca con vicuña), cuyo comercio permitiría al mercado ilegal blanquear fácilmente el trafico de fibra de vicuña y de animales en pie, desnaturalizándose la identidad biológica de la especie y perjudicando económicamente a las organizaciones campesinas que ya se benefician del comercio legal de su fibra. .Una de las formas de evitar este tipo de nuevas amenazas o riesgos para la supervivencia de la Vicuña, seria restituirle y/o reforzarle el tratamiento conceptual, institucional y legal que le corresponde acorde a su naturaleza de especie silvestre y recurso natural renovable importante y emblema nacional del Perú que figura en su escudo; reubicando la gestión estatal de la especie Vicuña, mediante un Programa Especial Nacional, en el reciente creado Ministerio del Ambiente, como ya lo han hecho los gobiernos de Ecuador, Argentina, Bolivia y Chile con ministerios similares. La Vicuña a pesar de los limitantes y riesgos señalados, conserva un potencial de aprovechamiento sostenible muy significativo a nivel del Perú y de su distribución continental. Considerando la población en Sudamérica al 2006 (340,000 ejemplares), la parte que se esquila, de acuerdo a índices alcanzados, esta solo en el 28% del total posible. Sin embargo de acuerdo a las estructuras de edades en una población de vicuñas se puede esquilar teóricamente alrededor del 40% del total cada año, lo cual generaría unos 22,000 Kilogramos de fibra anuales (el 60 % de la demanda mundial) con un ingreso mayor a los U.S.$ 11´500,000 por año en beneficio del campesino del ande, sólo en base a la venta de fibra en crudo. Sin embargo no hay que considerar solamente las posibilidades de producción de fibra en base a la actual población de vicuñas, ya que el rango de incremento poblacional óptimo está entre 16 % y 22% por año y aún quedan áreas naturales para la expansión sostenible de la especie ya sea por ocupación de tierras aún libres ó por uso de tierras activas en reemplazo de especies domésticas exóticas menos rentables para el poblador altoandino.

International Expert Workshop on CITES Non-Detriment Findings

México, November 17th-22nd, 2008

Estudio de caso

CONSERVACION Y USO ACTUAL DE LA VICUÑA (*Vicugna vicugna mensalis*) EN EL PERU

Domingo Hoces R.

Consultor en Camélidos Sud. Silvestres

domingoh2647@yahoo.com

. Información de fondo sobre el taxa

1. Datos biológicos

1.1. Nombre científico y nombre común

Clase:	Mammalia
Orden:	Artyodactila
Familia:	Camelidae
Género:	Vicugna
Especie:	*Vicugna vicugna*, (Molina, 1872)
sub. Especies:	*Vicugna vicugna mensalis*
	Vicugna vicugna vicugna

Sinónimos científicos: No posee.

Nombres comunes:

Quechua :	Vicuña
Aymara :	Huari
Español:	Vicuña
Francés:	Vigogne
Inglés:	Vicuna
Alemán:	Vikunja

Número de código: CITES A.119.004.002.002 (Manual de Identificación CITES)

Inclusión en la CITES: Apéndice II (18/09/1997

SILVESTRIA

GANADERIA

Camélidos Silvestres

Camélidos Domésticos

Vicuña
- Largo de la fibra: 2 - 4 cm
- Finura de la fibra: 10 - 15 micras
- Peso promedio del vellón: 0,2 Kg.

Alpaca
- Largo de la fibra: 7 - 23 cm
- Finura de la fibra: 20 - 30 micras
- Peso promedio del vellón: 1,6 Kg.

Guanaco
- Largo de la fibra: 3 – 4,5 cm
- Finura de la fibra: 15 - 19 micras
- Peso promedio del vellón: 0,4 Kg.

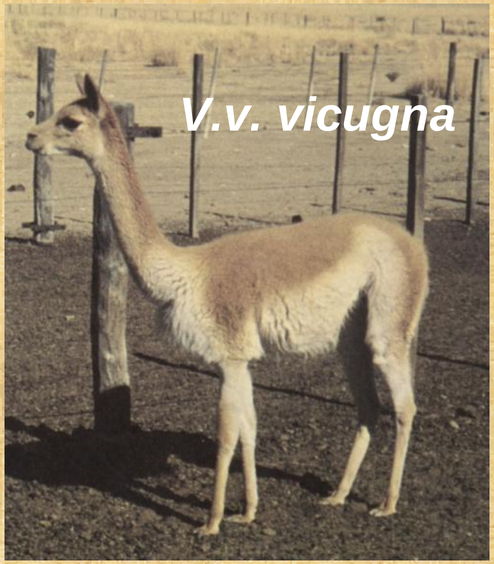
Llama
- Largo de la fibra: 6 - 15 cm
- Finura de la fibra: 25 - 34 micras
- Peso promedio del vellón: 1,7 Kg.

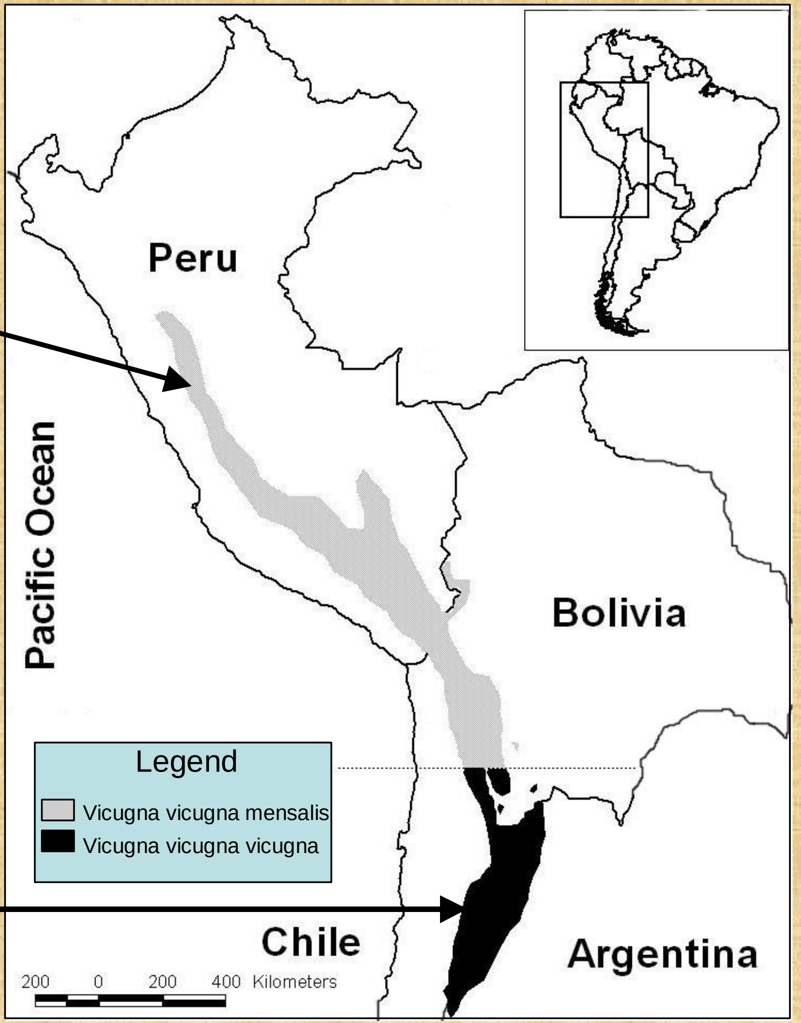
FICHA TECNICA

Longitud del cuerpo	1.25 a 1.50 m
Alzada a la cruz	0.75 a 1.10 m
Peso	33 a 55 kg
Finura de fibra	10 a 15 micras
Longitud de fibra	2 a 4 cm
Peso del vellón	0.165 a 0.220 kg

Vicugna vicugna (Excepto las problaciones de: Argentina [las poblaciones de las provincias de Jujuy y Catamarca y las poblaciones en semicautividad de las provincias de Jujuy, Salta, Catamarca, La Rioja y San Juan]; Bolivia [toda la población]; Chile [la población de la Primera Región]; y Perú [toda la población]; que están incluidas en el Apéndice II)		
	Vicugna vicugna (Sólo las poblaciones de **Argentina**[3] [las poblaciones de las provincias de Jujuy y Catamarca y las poblaciones en semicautividad de las provincias de Jujuy, Salta, Catamarca, La Rioja y San Juan]; **Bolivia**[4] [toda la población]; **Chile**[5] [la población de la Primera Región]; **Perú**[6] [toda la población]; las demás poblaciones están incluidas en el Apéndice I)	

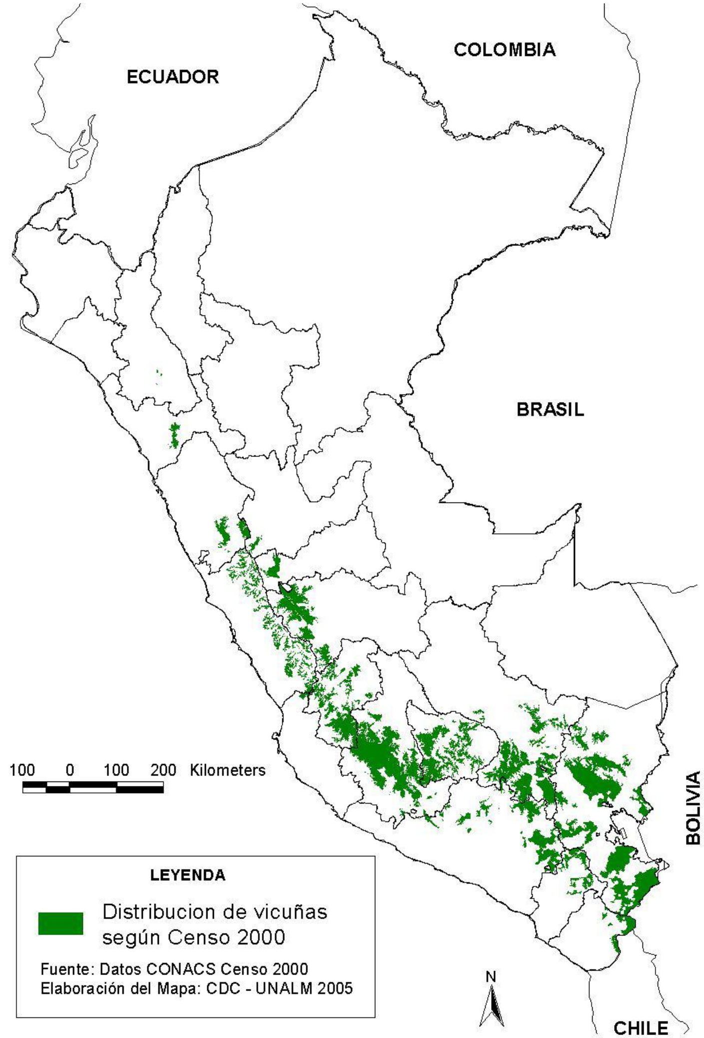
Distribución geográfica de la vicuña
(*Vicugna vicugna*)





HABITAT Y DISTRIBUCION ACTUAL EN EL PAIS

HABITAT (3,800 – 4500 msnm)

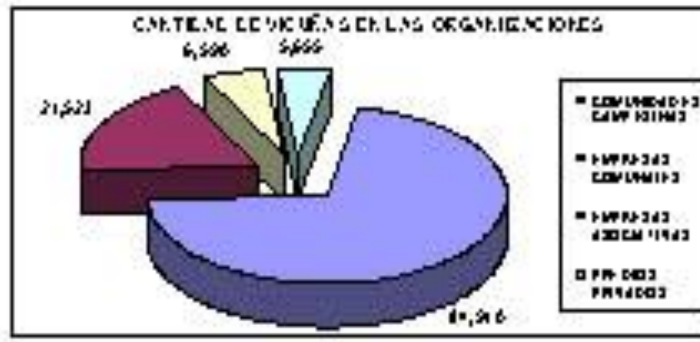


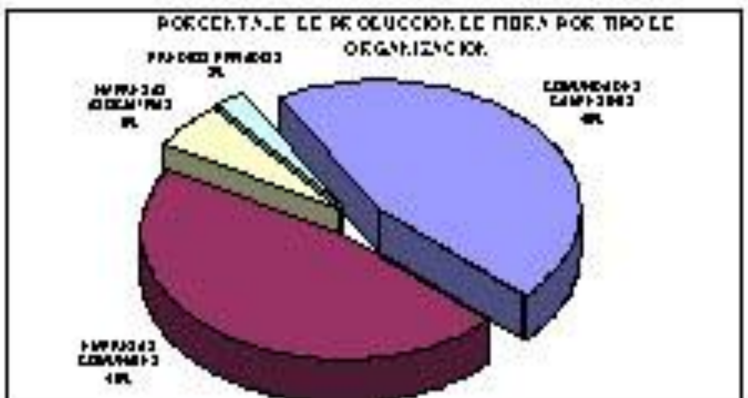
DISTRIBUCIÓN (16 departamentos)

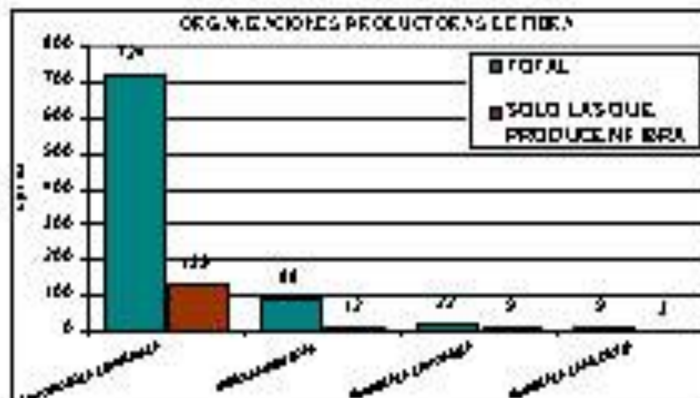
DISTRIBUCION NACIONAL DE LA POBLACION DE VICUÑAS Y DE LA PRODUCCIONA DE FIBRA
SEGÚN CENSO Y CAMPAÑA DE PRODUCCION AÑO 2000

PROPIETARIOS DE LA TIERRA Tipos de Organizacion	ORGANIZACIONES Y POBLACION DE VICUÑAS				PRODUCCION DE FIBRA DE VICUÑAS			
	TOTAL ORGANIZACIONES NACIONAL	%	POBLACION DE VICUÑAS SEGUN CENSO 2000	%	PRODUCTORES DE FIBRA	%	KG. DE FIBRA PRODUCIDO	%
COMUNIDADES CAMPESINAS	724	85.88	84,810	71.55	128	84.31	1,681.868	45.54
EMPRESAS COMUNALES	22	2.61	21,628	18.14	8	5.88	1,678.088	46.06
EMPRESAS ASOCIATIVAS	8	1.07	6,680	5.55	3	1.96	200.020	5.83
PREDIOS PRIVADOS	88	10.44	6,866	4.76	12	7.84	87.308	2.56
TOTAL NACIONAL	842	100.00	118,678	100.00	168	100.00	3,428.278	100.00

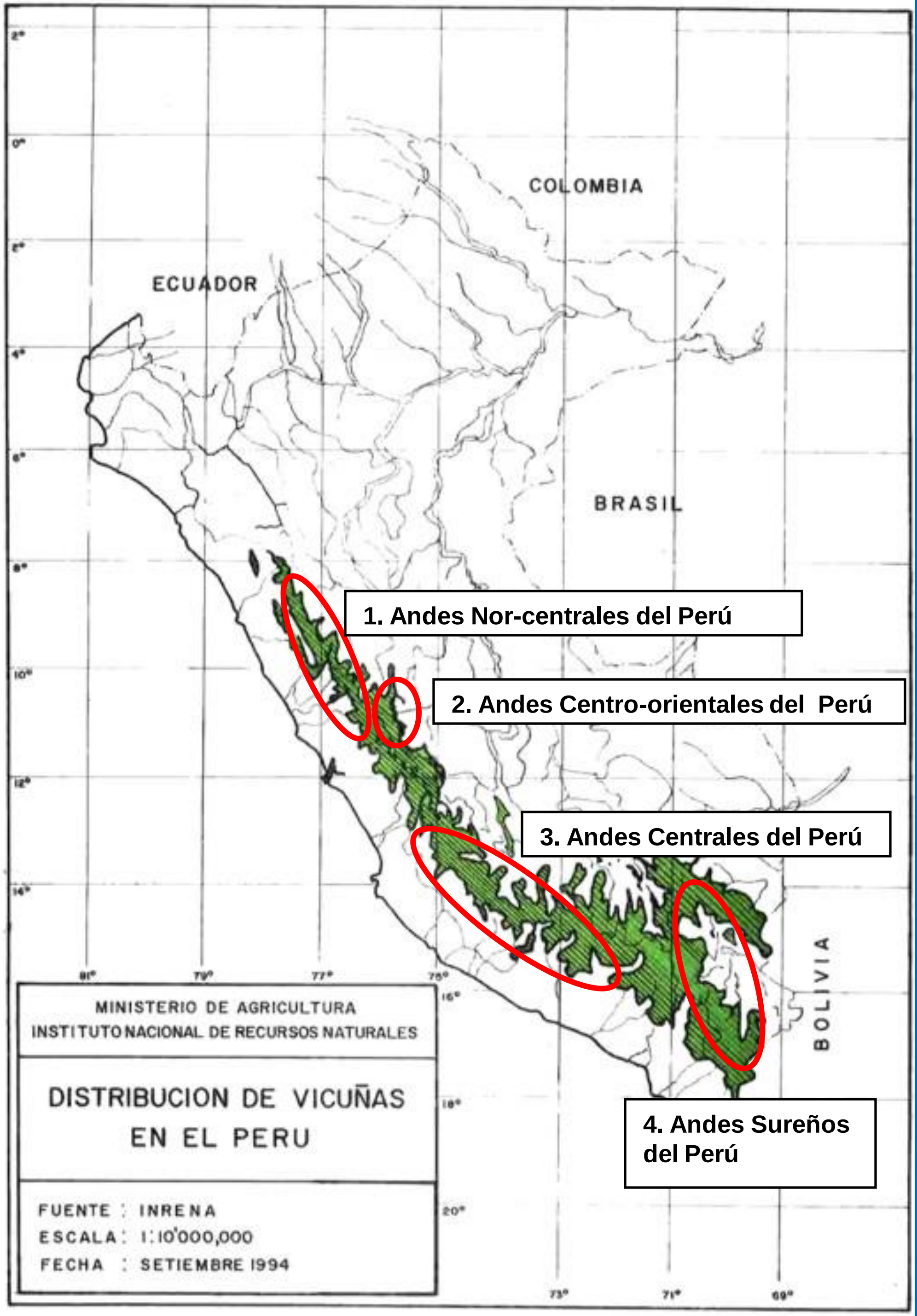
FUENTE: CENSO NACIONAL DE VICUÑAS 2000. Elaborado: CONACS







Ubicación de los cuatro grupos geográfica y genéticamente distintos de vicuñas peruanas.



Vicuñas de Catac

Características biológicas:

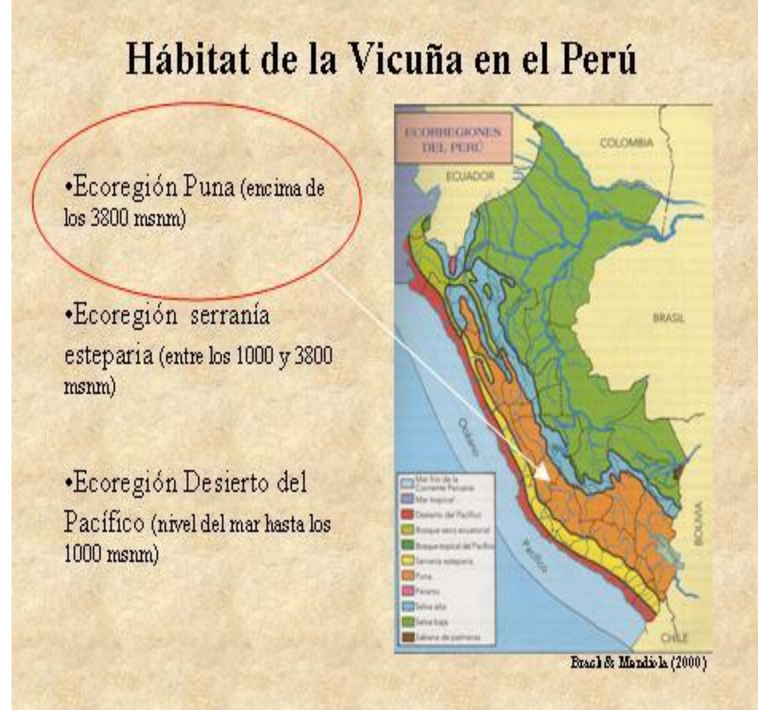
ORGANIZACIÓN SOCIAL:

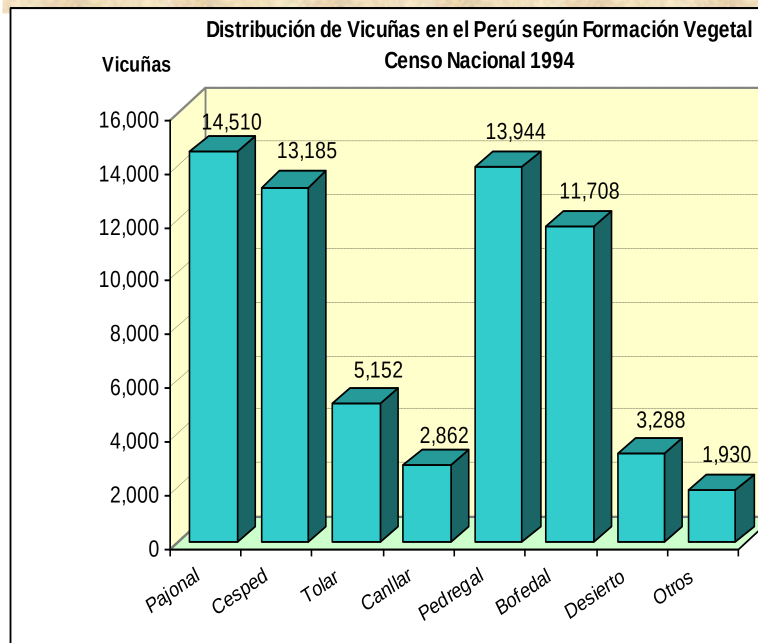
EL GRUPO FAMILIAR

Tropilla de Machos

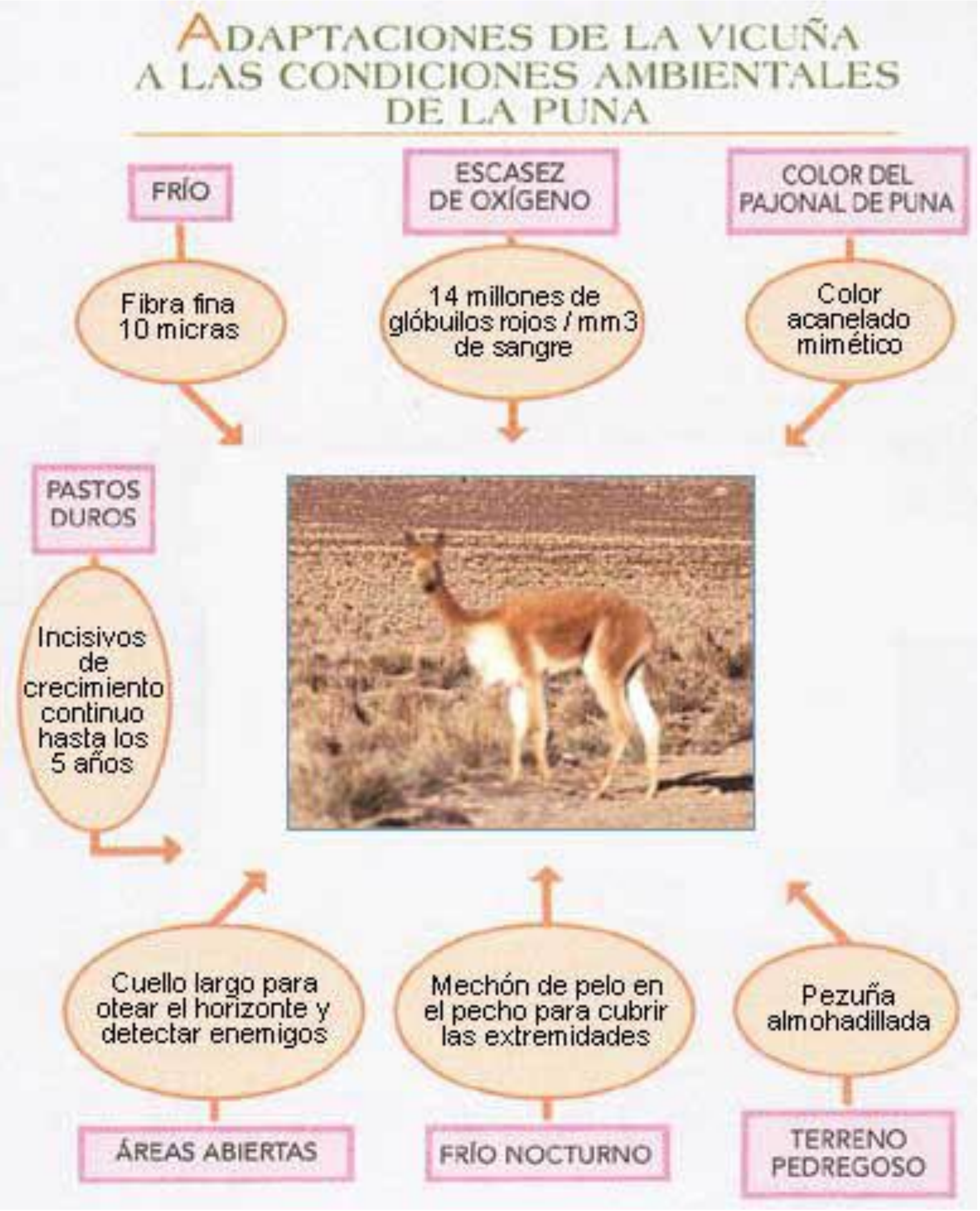
Solitarios

HABITAT Y TIPO DE HABITAT





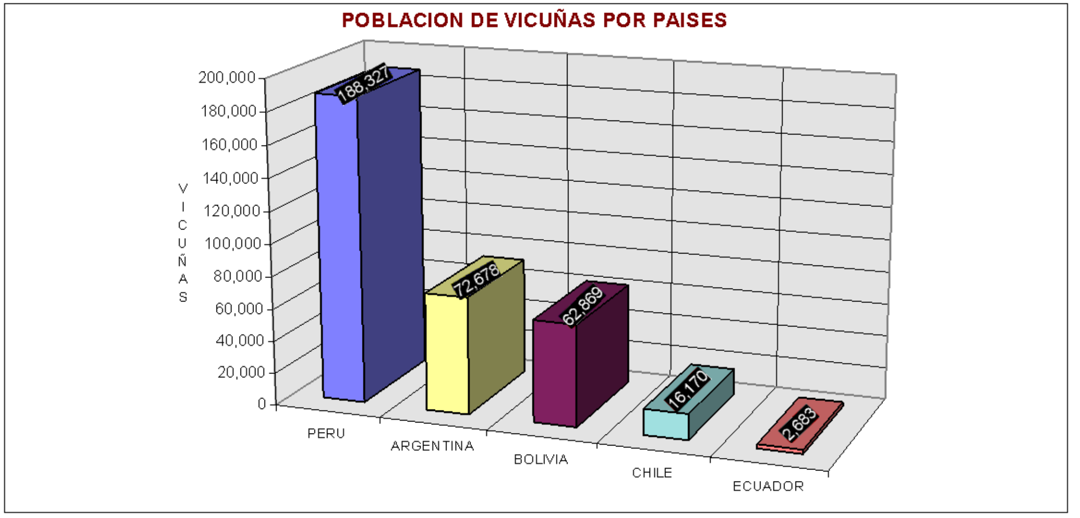
Rol de la especie en su ecosistema

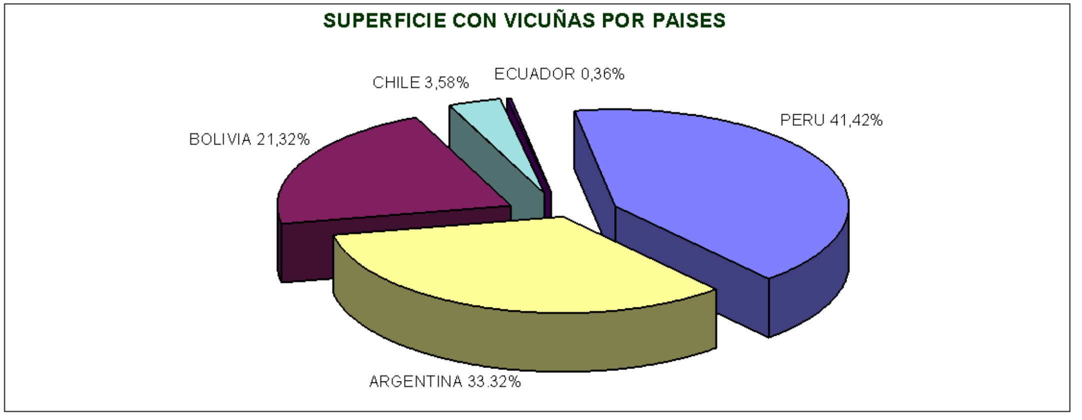


Tamaño de población global

POBLACION DE VICUÑAS POR PAISES DE ORIGEN

PAIS	VICUÑAS		SUPERFICIE		AÑO DE CENSO O PROYECCIÓN	FUENTE
	Población	%	Hectáreas	%		
PERU	188,327	54.95	6,661,498	41.42	2006	Convenio Vicuña 2007
ARGENTINA	72,678	21.21	5,357,800	33.32	2006	Convenio Vicuña 2007
BOLIVIA	62,869	18.34	3,428,356	21.32	2006	Convenio Vicuña 2007
CHILE	16,170	4.72	575,250	3.58	2006	Convenio Vicuña 2007
ECUADOR	2,683	0.78	58,560	0.36	2006	Convenio Vicuña 2007
TOTAL	342,727		16,081,464		2006	





Fuente: Convenio Vicuña. Elaboración: Domingo Hoces

Proyección de las poblaciones de vicuña en el Perú, período 2001–2006

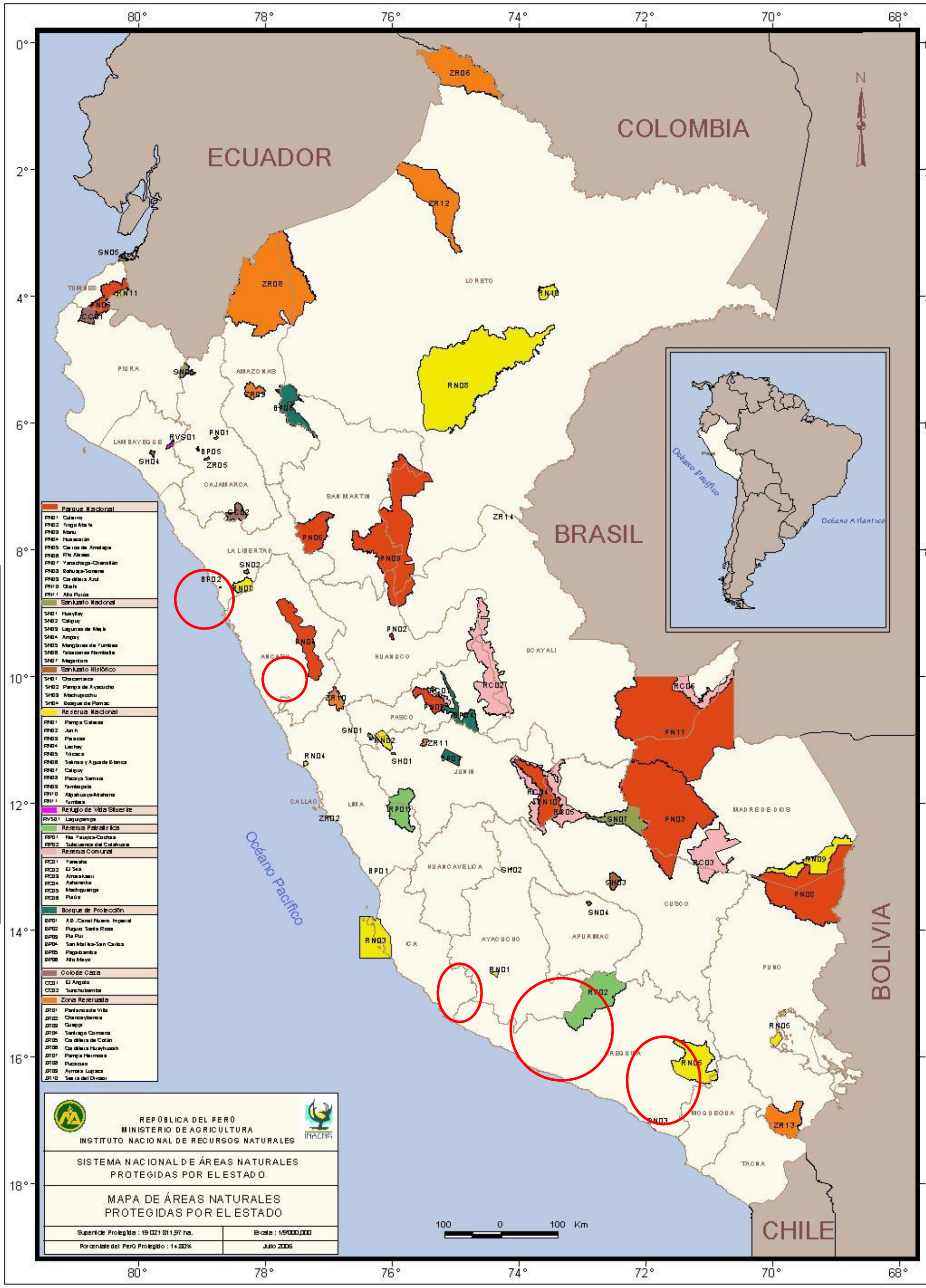
N	DEPARTAMENTO	SUPERFI CIE Ha.	2000	2001	2002	2003	2004	2005	2006
			Censo	Proy	Proy	Proy	Proy	Proy	Proy
1	AYACUCHO	753 000	40 390	43 621	47 111	50 880	54 959	59,346	64,094
2	PUNO	1 732 935	18 107	19 556	21 120	22 810	24 634	26,605	28,733
3	LIMA	281 765	17 689	19 104	20 632	22 283	24 066	25,991	28,071
4	JUNIN	292 369	11 408	12 321	13 306	14 371	15 520	16,762	18,103
5	APURIMAC	330 400	10 020	10 822	11 687	12 622	13 632	14,723	15,900
6	HUANCAVELICA	679 657	8 745	9 445	10 200	11 016	11 897	12,849	13,877
7	CUZCO	387 330	4 209	4 546	4 909	5 302	5 726	6,184	6,679
8	AREQUIPA	774 180	3 681	3 975	4 294	4 637	5 008	5,409	5,841
9	ICA	70 171	1 583	1 710	1 846	1 994	2 154	2,326	2,512
10	TACNA	288 728	1 214	1 311	1 416	1 529	1 652	1,784	1,927
11	ANCASH	709 795	684	739	798	862	931	1,005	1,086
12	PASCO	48 592	343	370	400	432	467	504	545
13	MOQUEGUA	227 711	293	316	342	369	399	431	465
14	CAJAMARCA	600	235	254	274	296	320	346	373
15	HUANUCO	32 820	51	55	59	64	69	75	80
16	LA LIBERTAD	51 445	26	28	30	33	35	38	41
	TOTAL	**6 661 498**	**118 678**	**128 172**	**138 426**	**149 500**	**161 460**	**174,378**	**188,327**

Fuente: Censo Nacional 2000 y Proyecciones del CONACS. Adaptación: Domingo Hoces

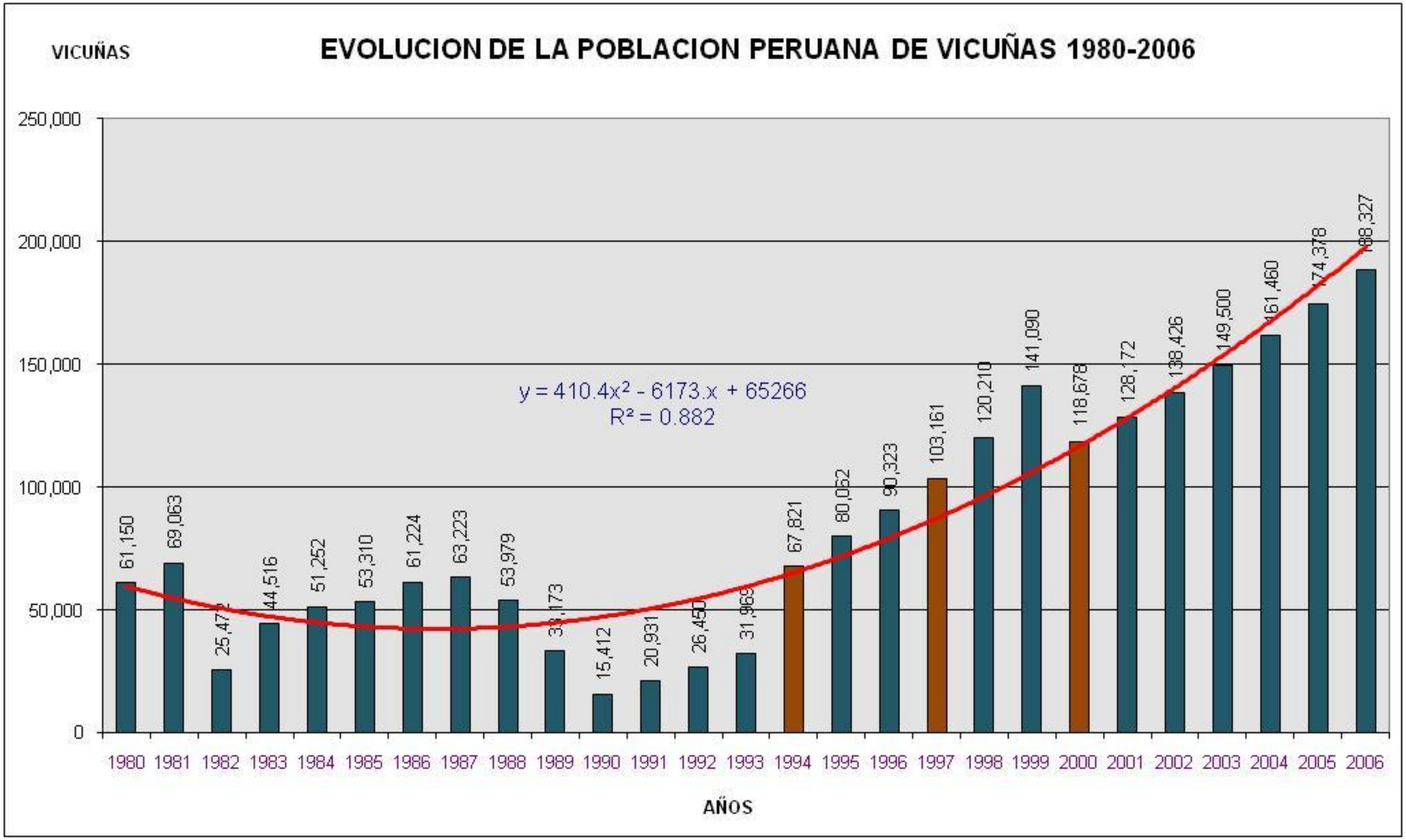
POBLACION DE VICUÑAS Y GUANACOS EN El SISTEMA NACIONAL DE AREAS NATURALES PROTEGIDAS (SINANPE) RES

CAMELIDOS SUDAMERICANOS SILVESTRES EN LAS ANPs

UNIDAD DE CONSERVACION	VICUÑAS	GUANACOS
RESERVA NAC, PAMPA GAILERAS	5135	300
RESERVA NAC. SALINAS Y A. BLANCA	2618	45
PARQUE NACIONAL HUASCARAN	280	0
RESERVA NAC DE CALIPUY	0	500
RESERVA PAISAJISTICA COTAHUASI	0	111
RESERVA PRIVADA DE CHAPARRI	0	12
TOTAL	8033	968



Tendencias de la población global en curso



Estado de Conservación Global (de acuerdo con la Lista Roja de la IUCN):

- **Red List Category & Criteria:** **Least Concern** ver 3.1 **Year Assessed:** 2008 **Assessor/s** Lichtenstein, G., Villalba, L., Hoces, D., Baigún, R. & Laker, J. **Evaluator/s:** Baldi, R.& Wheeler, J. (South American Camelid Red List Authority)
- **Justification:**
  This species is considered to be Least Concern due to an estimated large populations, wide range and occurrence in a number of protected areas. According to the former (1996) classification, Vicunas were Low Risk/conservation dependent. Under the current criteria, this classification does not hold anymore and they should be classified as Least Concern due to the overall population size. It is important to note that conservation programmes and tight control at local, national and international levels are key for the conservation of the species. Given the degree of poaching, the development of captive management schemes, economic interests for hybridizing vicunas and alpacas, uncertainties about the impact of climate change on the already poor vicuna habitat, and the deterioration of grasslands due to overgrazing by domestic livestock, unless conservation actions are in place, the species might decline its numbers again.
- **History:**
- 1996 – Lower Risk/conservation dependent (Baillie and Groombridge 1996)
- 1994 – Vulnerable (Groombridge 1994)
- 1990 – Vulnerable (IUCN 1990)
- 1988 – Vulnerable (IUCN Conservation Monitoring Centre 1988)
- 1986 – Vulnerable (IUCN Conservation Monitoring Centre 1986)
- 1982 – Vulnerable (Thornback and Jenkins 1982)

- **Estado de conservación nacional para Perú:** CASI AMENAZADO (NT) Decreto Supremo N° 034-2004-AG del 17 de Septiembre del 2004

Amenazas principales dentro del país de estudio de caso

___Ninguna amenaza
___Pérdida / degradación de hábitat (inducción humana)
___Especies exóticas invasoras (afectar la especie directamente)
_X_Cosecha [caza / colecta]
___La mortalidad fortuita (por ejemplo. Por manipuleo)
___La persecución (por ejemplo. Control de plaga)
___La contaminación (afecta al hábitat y/o a la especie)
_X_ Otro:_ Intereses pecuarios,
hib
__


Paco-vicuna

Switzer-Land Alpacas

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Paco-Vicuñas

What is a Paco-Vicuña?
A paco-vicuña is a special alpaca that exhibits the phenotypical traits of the vicuña, its Andean ancestor. Paco- vicuñas are a cross between alpacas and vicuñas and have existed for some time in small quantities in Chile, Peru, Bolivia, and Argentina. A very small number are now in the United States. These animals have the super-fine fiber like the wild vicuña but with somewhat longer and denser fleece like the alpaca. Alpacas were originally domesticated from vicuñas over the past 6000 years. Vicuña traits can be observed in the alpaca herds that exist today on the altiplano, the high plateaus of South America.

Why breed for paco-vicuña?
Vicuña fiber is renowned for its softness, fineness, rarity, and color. The vicuña is a wild animal and is difficult to maintain in captivity. Breeding, birthing, shearing, and medical care would be quite a challenge. The vicuña is also a threatened species which makes the animal and its fiber difficult to obtain as the animal is protected by international laws. The solution is the paco-vicuña breeding for the same fiber attributes of the vicuña and the gentle attitude of an alpaca.

Historia del Manejo
POLITICAS APLICADAS

En la Época Incaica:

•Pratica del “CHACCU”

•Fibra, solo para la nobleza

•Carne de vicuña y otras especies para el pueblo

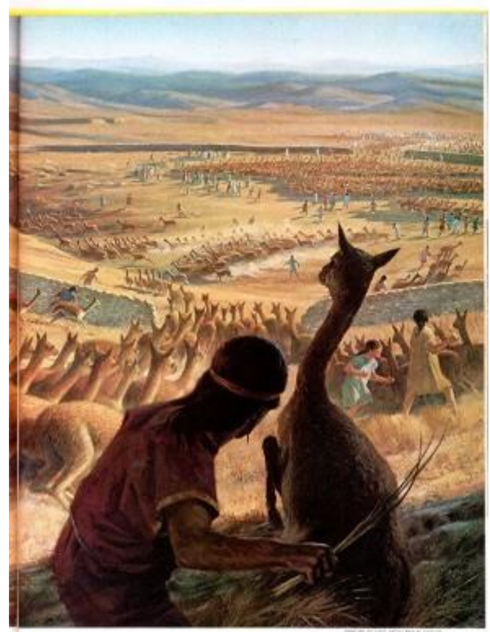
En el tiempo presente:

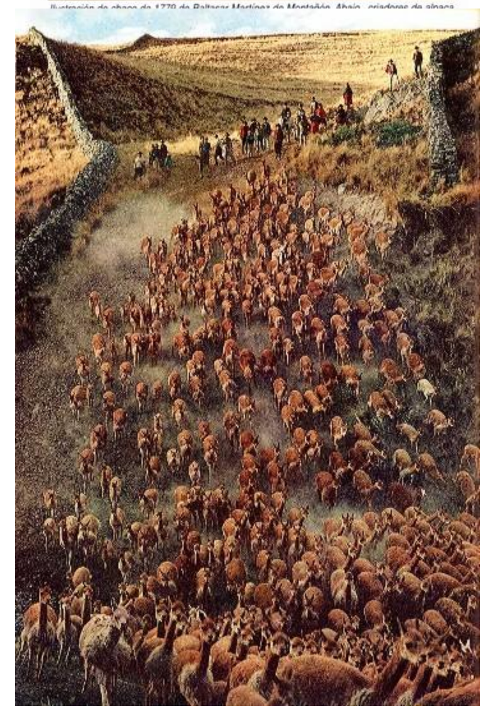
•Hasta 1978: Protección, difusión

•De 1980 – 1990: Desarrollo de tecnología (Proyecto Vicuña)

•De 1994 – 2000: Participación campesina y apertura del mercado internacional asociación a los otros camélidos (Creación del CONACS)

•De 2001 – Presente : Aprovechamiento comercial con poca ingerencia del Estado





Restauración o medidas de alivio

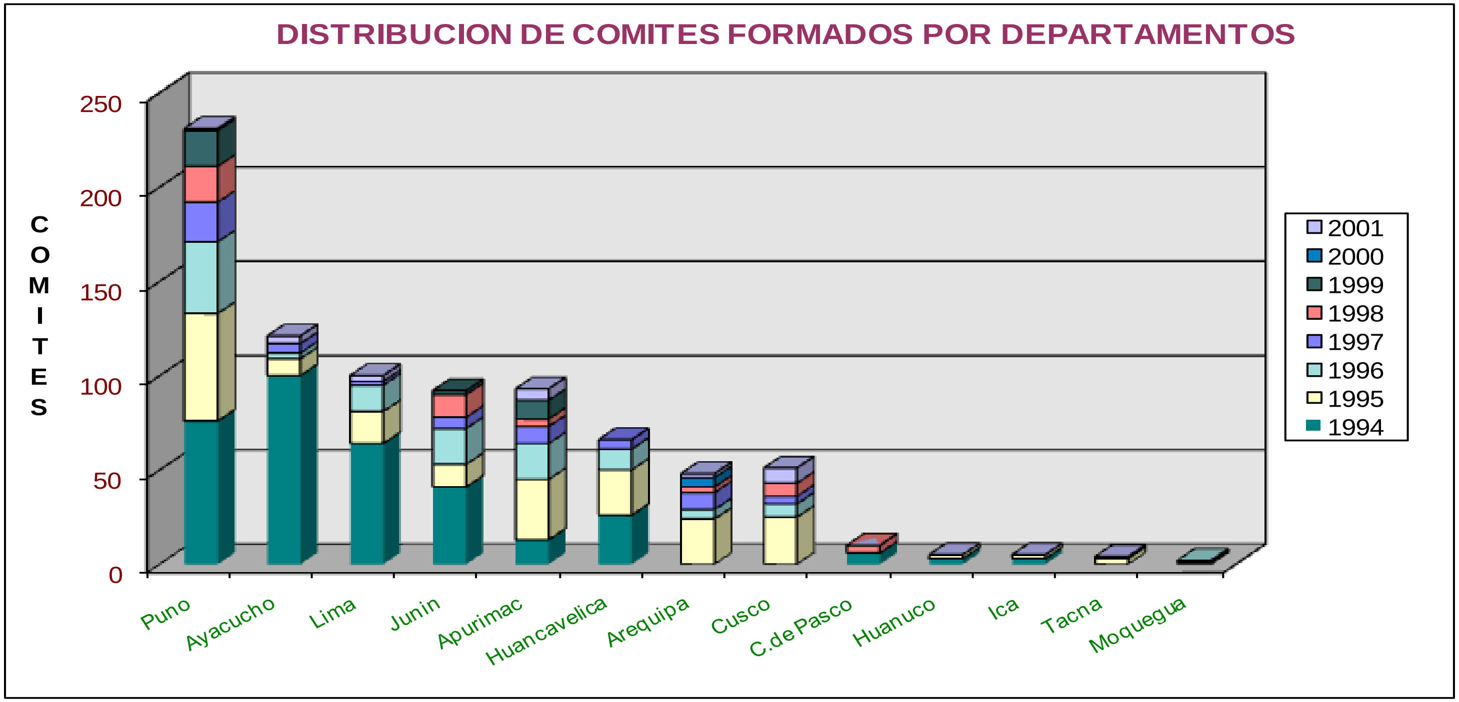
COMITES COMUNALES DE VICUÑAS FORMADOS Y RECONOCIDOS POR EL CONACS

DEPARTAMENTO	1994		1995		1996		1997		1998		1999		2000		2001		TOTAL 1994 - 2001			
	F.	R.	F.	R.	F.	R.	F.	R.	F.	R.	F.	R.	F.	R.	F.	R.	F.	%	R.	%
1.- Puno	76	76	57	31	38	51	21	0	19	53	19	0	1	0	0	0	231	27.83	211	29.59
2.- Ayacucho	100	100	9	5	3	7	5	0	0	5	0	0	0	0	4	0	121	14.58	117	16.41
3.- Lima	64	64	17	3	14	4	2	0	0	14	0	0	2	0	3	0	102	12.29	85	11.92
4.- Junin	41	41	12	2	19	5	6	0	12	13	2	0	0	0	0	0	92	11.08	61	8.56
5.- Apurimac	13	13	32	17	19	17	9	0	4	26	10	0	0	0	6	0	93	11.20	73	10.24
6.- Huancavelica	26	26	24	24	11	11	5	0	0	5	0	0	0	0	0	0	66	7.95	66	9.26
8.- Arequipa	0	0	24	7	5	16	9	0	3	16	0	0	5	0	2	0	48	5.78	39	5.47
7.- Cusco	0	0	25	9	7	18	4	0	7	9	0	0	0	0	8	0	51	6.14	36	5.05
9.- C.de Pasco	6	6	0	0	0	0	0	0	4	4	0	0	0	0	0	0	10	1.20	10	1.40
10.- Huanuco	3	3	2	2	0	0	0	0	0	0	0	0	0	0	0	0	5	0.60	5	0.70
11.- Ica	3	3	2	0	0	0	0	0	0	1	0	0	0	0	0	0	5	0.60	4	0.56
12.-Tacna	0	0	3	0	0	3	0	0	0	1	1	0	0	0	0	0	4	0.48	4	0.56
13.- Moquegua	0	0	1	0	1	1	0	0	0	1	0	0	0	0	0	0	2	0.24	2	0.28
TOTAL	332	332	208	100	117	133	61	0	49	148	32	0	8	0	23	0	830		713	

Fuente: Oficinas Regionales CONACS. Elaboracion: Domingo Hoces

F. = Comitès formados

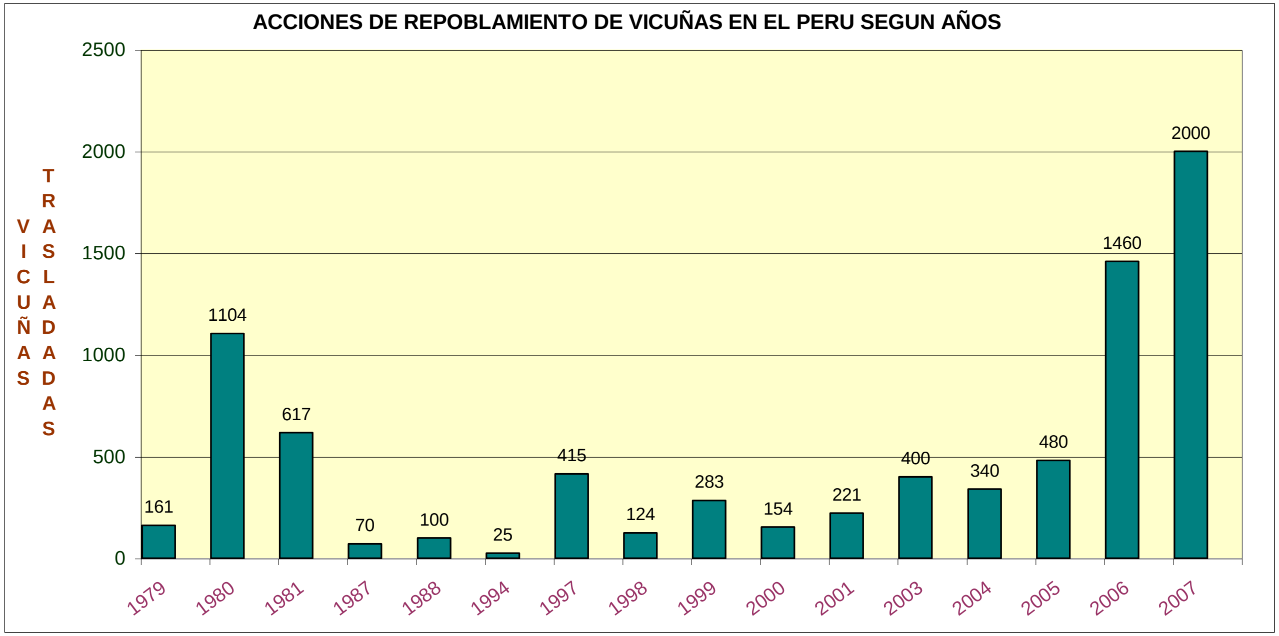
R. = Comitès reconocidos por el CONACS



ACCIONES DE REPOBLAMIENTO DE VICUÑAS EN EL PERU 1979 - 2007

LOCALIDAD ORIGEN	LOCALIDAD DESTINO	1979	1980	1981	1987	1988	1994	1997	1998	1999	2000	2001	2003	2004	2005	2006	2007	TOTAL VICUÑAS	%
Pampa Galeras	1.- Junin		395	617														1,012	12.72
Pampa Galeras	2.-Huancavelica	121	601										400			500		1,622	20.39
Andamarca	Huancavelica														120			120	1.51
Pampa Galeras	3.- Arequipa	40						95										135	1.70
Arequipa	Arequipa										74	78						152	1.91
Pampa Galeras	4.- Ancash		108					100										208	2.62
Junin	Ancash											50		53				103	1.29
Pampa Galeras	5.-ECUADOR					100				100								200	2.51
Pampa Galeras	6.- Cajamarca						25	170								240		435	5.47
Pampa Galeras	7.-C.de Pasco							50		72								122	1.53
Junin	C.de Pasco										29							29	0.36
Apurimac	8.-Cusco								100									100	1.26
Puno	9.-Puno									74				47				121	1.52
Pampa Galeras	10.-La Libertad				70									240		240		550	6.91
Puno	La Libertad																2000	2,000	25.14
Pampa Galeras	11.-Pampa Galeras									37	51	69			120			277	3.48
Apurimac	12.-Apurimac								24			24						48	0.60
Pampa Galeras	Apurimac															480		480	6.03
Cabana	Apurimac														240			240	3.02
TOTAL	TOTAL	161	1104	617	70	100	25	415	124	283	154	221	400	340	480	1460	2000	7954	

Fuente: Ex Proyecto Especial Vicuña, Proyecto Barbara D¨Achile, Of.regionales CONACS. Elaboracion: Domingo Hoces



Sistema de monitoreo

Los métodos usados para monitorear la cosecha

Mes	Producción de Procedencia					Transforma	Prendas de Vestir		Evaluación del Producto		
	Fibra Sucia	Fibra Pre-deserdada	Fibra Deserdada	Fibra Lavada	Fibra Corta	Hilo	Tela	Prendas	Programado	Ejecutado	Avance Porcentual (%)
Periodo Julio - Diciembre 2006											
Julio	18	0	0	1	0	0	2	1	35	22	62.86
Agosto	22	0	0	0	2	0	5	7	25	36	144.00
Setiembre	4	17	0	0	0	0	0	0	55	21	38.18
Octubre	14	42	10	0	0	0	2	1	25	69	276.00
Noviem	25	4	4	0	0	0	0	0	50	33	66.00
Diciem	7	0	0	0	0	4	5	5	40	21	52.50
Periodo Enero - Junio 2007											
Enero	45	0	0	0	0	0	11	7	60	63	105.00
Febrero	41	13	0	0	0	2	3	14	50	73	146.00
Marzo	54	22	6	0	0	2	0	0	40	84	210.00
Abril	12	8	2	0	0	0	0	0	30	22	73.33
Mayo	5	22	25	0	0	4	4	13	10	73	730.00
Junio	2	0	0	0	0	1	0	2	10	5	50.00
TOTAL:	249	128	47	1	2	13	32	50	430	522	121.40

Fuente: Dirección de Conservación - CONACS

MARCO LEGAL Y CONVENIOS

- **NACIONAL**

  -Ley 26496 . Regimen de Propiedad, comercialización y Sanciones por la Caza de las especies Vicuña, Guanaco y Sus Hibridos (Julio 1995)

  -Decreto Supremo N° 007-96-AG. Regl. de la Ley 26496 (Junio 1996).

  -Decreto Supremo N° 053-2000-AG. Faculta Manejo y Aprovechamiento a usuarios distintos de comunidades (Set. 2000)

  -Decreto Supremo N° 008-2004-AG. Modifica articulos del D.S. 007-96-AG (Febrero 2004)

  -Decreto Supremo N° 034-2004-AG. Aprueba categorización de especies de fauna silvestre (Set. 2004)

  -Decreto Supremo N° 006-2005-AG que modifica el Art. 30º del Decreto Supremo Nº 008-2004-AG (Enero 2005)

  -Decreto Supremo N° 010-2005-AG. Designa al CONACS Autoridad Administrativa CITES en Camélidos Sud. Silvestres (Febrero 2005).

- **INTERNACIONAL**

  -Convenio Vicuña (Lima 1979)

  -Convención CITES (Washington 1973)

  -Convención CMS (Boon 1997)

Utilización y comercio de alcance estatal

	PRODUCCIÓN PRELIMINAR DE FIBRA EN EL AÑO 2002			
Nº	Departamento	Producción de fibra (kg) dentro de cercos	Producción de fibra (kg) fuera de cercos	TOTAL Kg
1	Ayacucho	2.908,390		2.908,390
2	Puno	473,573		473,573
3	Junín	335,514	454,410	789,924
4	Lima	176,110		176,110
5	Apurímac	178,908	43,074	221,982
6	Huancavelica	51,350	90,960	142,310
7	Ica	36,000	69,400	105,400
8	Arequipa	72,320	40,687	113,007
9	Cusco	31,652	69,044	100,696
10	Tacna	21,357		21,357
11	Pasco	24,045		24,045
	TOTAL	**4.309,219**	**767,575**	**5.076,794**
	%	84,88	15,12	100,00

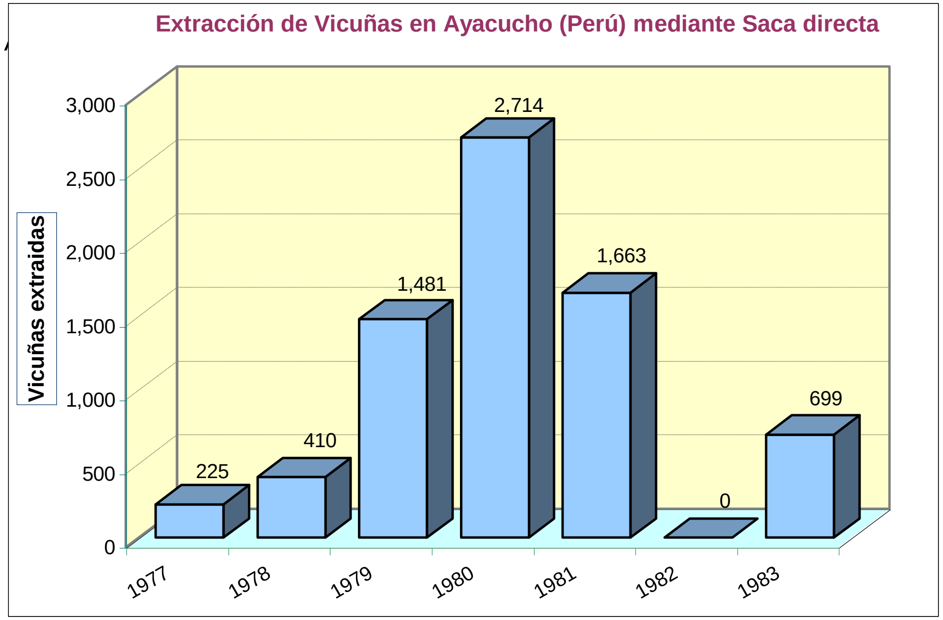
Fuente: CONACS . Elaboración: domingo Hoces

Módulos de Uso Sustentable para la Crianza de Vicuñas En Semicautiverio

Nº	DPTO.	Nº DE CERCOS	Nº VICUÑAS AL 2003	%
1	Ayacucho	75	5,183	19.39
2	Apurimac	30	3,740	13.99
3	Arequipa	14	915	3.42
4	Junin	25	4,646	17.38
5	Ica - Huancavelica	24	1,494	5.59
6	Cusco	8	726	2.72
7	Puno	65	9,036	33.80
8	Lima	26	997	3.73
		267	**26,737**	100.00

Fuente: Programa de Camélidos Silvestres – CONACS (2004)

Cosecha (Extracciones)



FUENTE: Estadisticas del ex Proyecto Especial Vicuña. Elaboración: Domingo Hoces

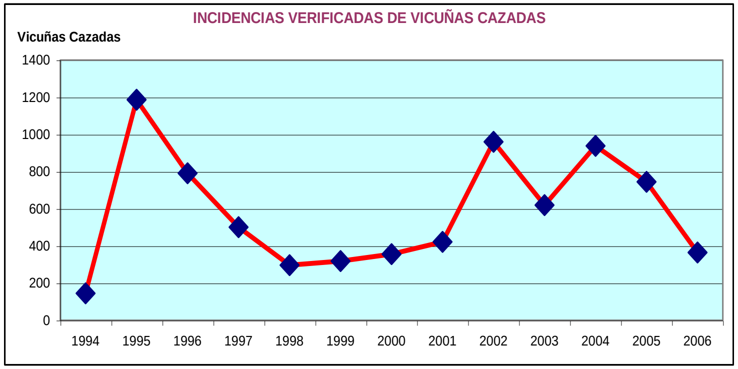
Cosecha Legal

INCIDENCIAS DE CACERIA FURTIVA DE VICUÑAS 1994 - 2006

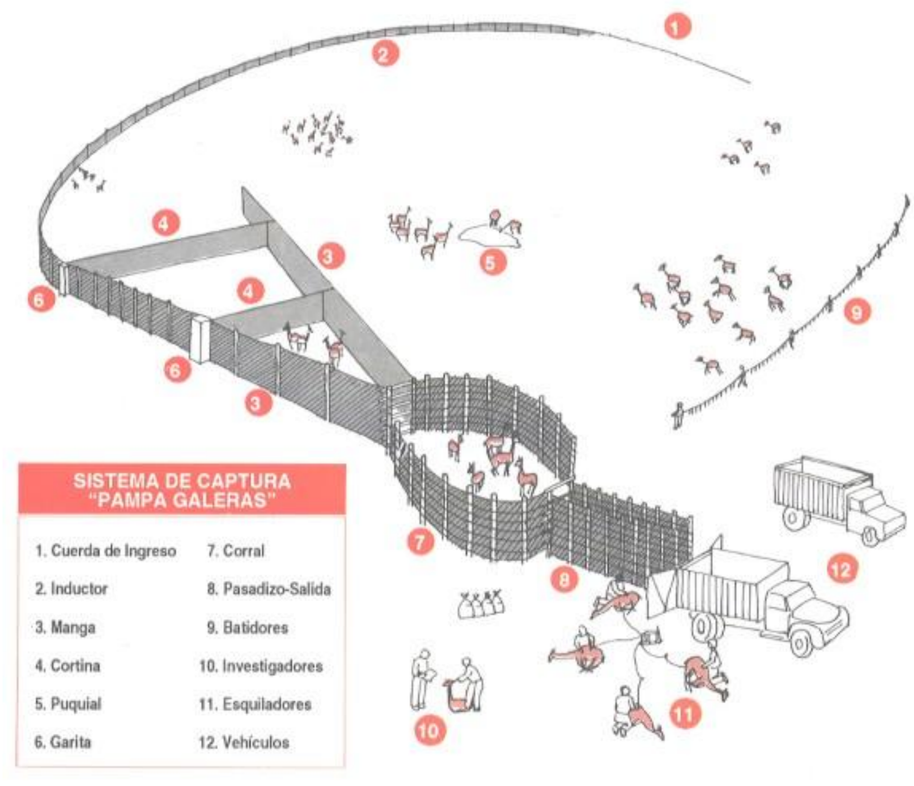
Nº	DEPARTAMENTO	VICUÑAS CAZADAS													TOTAL	%
		1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006		
1	AYACUCHO	46	415	281	190	86	35	19	217	389	287	189	149	192	2,495	32.64
2	LIMA	0	104	166	41	0	47	29	46	345	138	426	34	14	1,390	18.18
3	APURIMAC	0	219	219	151	98	61	19	19	72	93	0	0	58	1,009	13.20
4	HUANCAVELICA	0	51	0	0	0	81	174	75	22	29	292	59	100	883	11.55
5	PUNO	98	179	68	92	112	16	31	12	0	7	0	107	0	722	9.45
6	ICA	0	98	0	0	0	0	0	0	0	0	0	260	0	358	4.68
7	JUNIN	1	3	2	18	0	9	13	7	132	59	14	98	0	356	4.66
8	CUSCO	0	115	55	0	0	45	20	27	0	2	12	0	0	276	3.61
9	AREQUIPA	0	2	0	9	0	25	52	20	0	5	5	37	0	155	2.03
	TOTAL	145	1,186	791	501	296	319	357	423	960	620	938	744	364	7,644	100.00

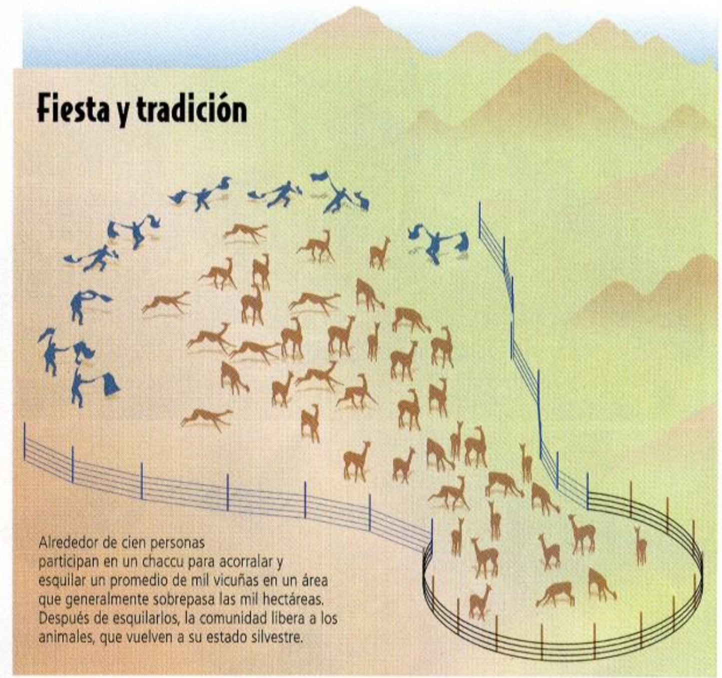
Fuente: Oficinas Regionales del CONACS. Elaboración Domingo Hoces

Cosecha Ilegal



Aprovechamiento No Extractivo (Solo Fibra)





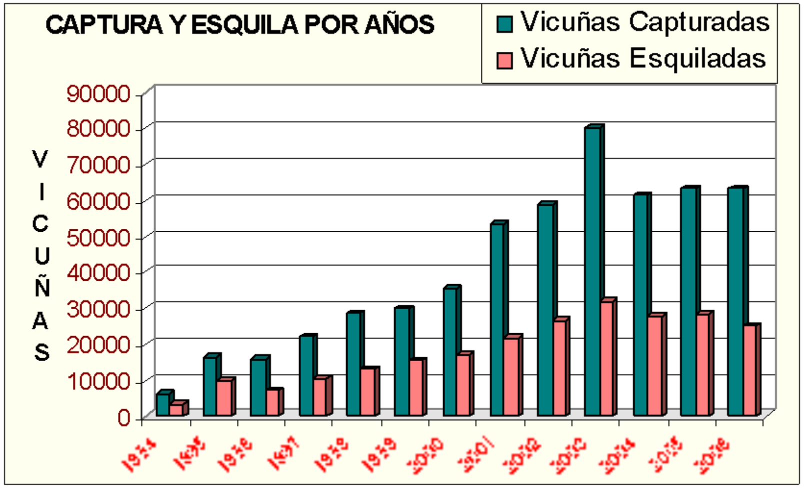
SISTEMAS ACTUALES DE CAPTURA

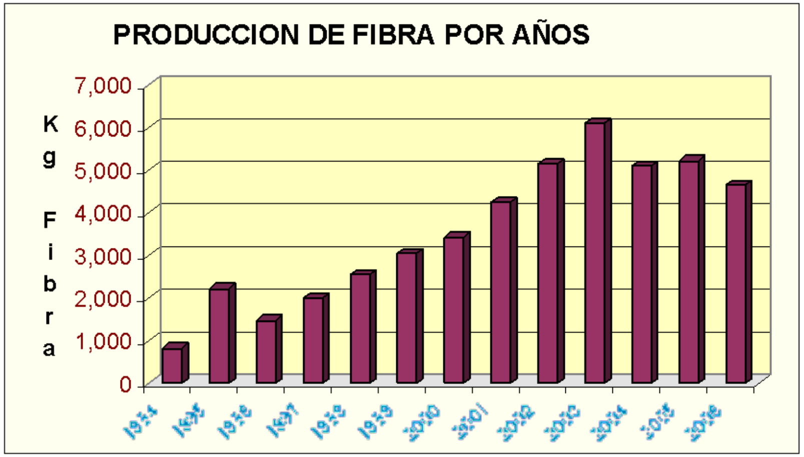
LA OBTENCIÓN DEL VALIOSO VELLÓN (200 gr, por animal), VALORIZADO EN U.S. $ 500 EL Kg, ES LA META

Captura y Esquila		
Año	Vicuñas Capturadas	Vicuñas Esquiladas
1994	6128	3278
1995	16204	9616
1996	15683	7145
1997	22118	10352
1998	28612	13083
1999	29859	15462
2000	35637	16956
2001	53273	21711
2002	58542	26385
2003	80317	32058
2004	61455	27698
2005	63124	28450
2006	63203	24969

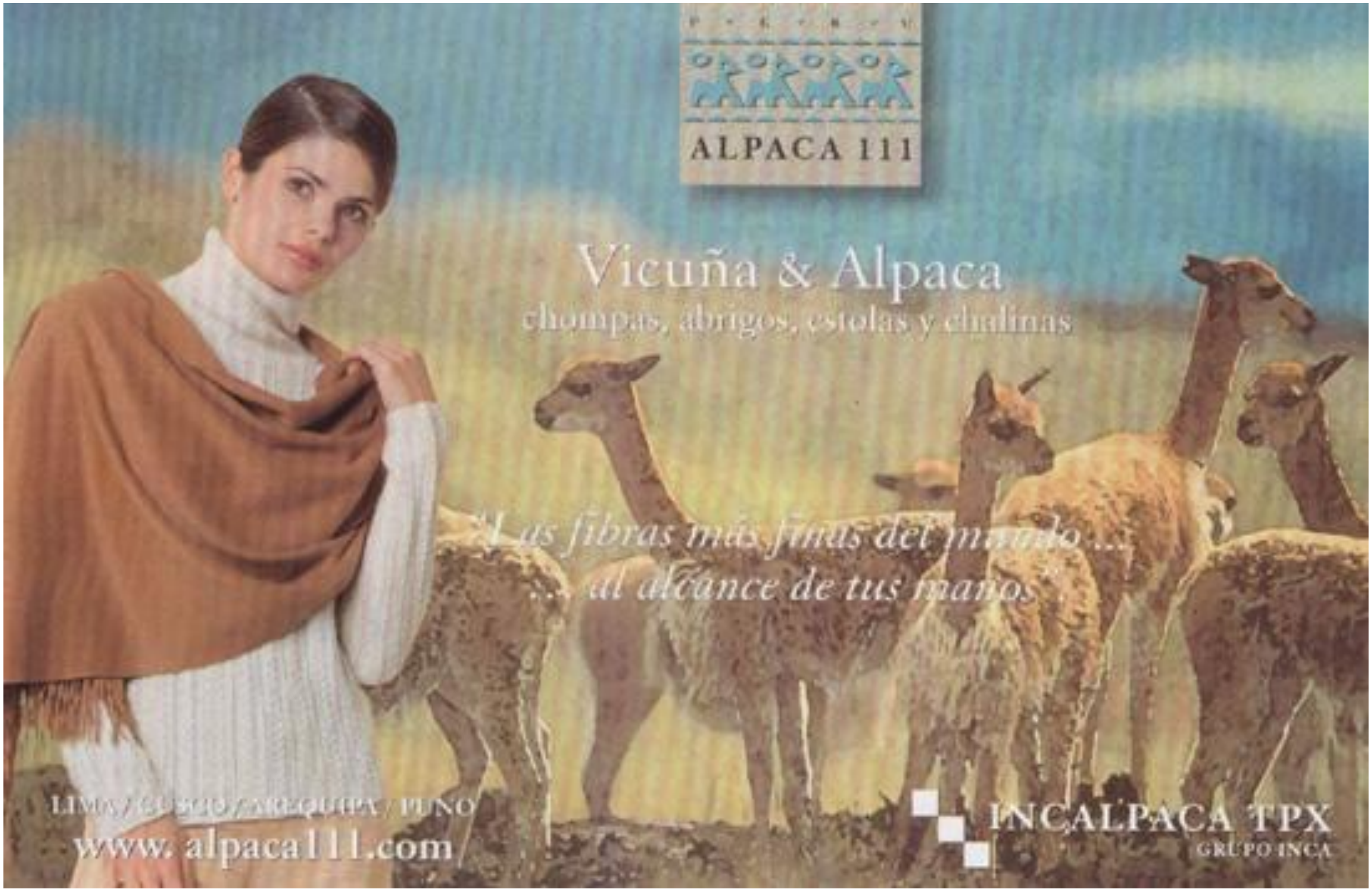
Produccion Fibra		
Año	Kg de Fibra	Acum Fibra
1994	832	832
1995	2,223	3,055
1996	1,478	4,533
1997	2,008	6,541
1998	2,543	9,084
1999	3,052	12,136
2000	3,427	13,411
2001	4,257	19,819
2002	5,149	24,968
2003	6,093	31,061
2004	5,083	36,144
2005	5,221	41,365
2006	4,635	46,000

Fuente: Ex Proyecto Vicuña y CONACS. Elaboración: Domingo Hoces

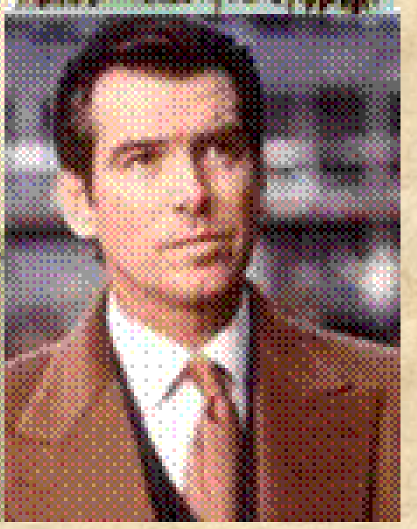




MERCADO NACIONAL: BASE AREQUIPA



POSICIONAMIENTO DE LA FIBRA DE VICUÑA EN EL MERCADO MUNDIAL



IVC
Laniera Aganona
Cadena
Alpha Tops
Gatti France
Nova Mosila
Itochu Wool LTD
Leaf INC.
Nando Sweaters INC
Nagawa Company
Takisada Osaka

PRENDAS ELABORADAS EN EL PERU

MARCAS OFICIALES

VICUÑA PERU

TEJIDO PLANO

EXPEDIENTE Nº 161350-2002
Solicitante: CONSEJO NACIONAL DE CAMELIDOS SUDAMERICANOS - CONACS, de PERÚ.
Signo Solicitado: La denominación VICUÑA PERU-ARTESANIA escrita en letras características, sobre la letra V se aprecia la figura de un cerro y la representación estilizada de una vicuña, todo formado por líneas verticales; conforme al modelo adjunto.

VICUÑA PERU-ARTESANIA

Distingue: Prendas de vestir. Clase 25.
Lima, 3 de octubre del 2002
SILVIA BALLIVIAN SEMINARIO
Oficina de Signos Distintivos - INDECOPI
002-FA-0366474-1 1v. 23 octubre

TEJIDO DE PUNTO

.

Recomendaciones

-Manejar los conceptos, definiciones, esquemas de trabajo y políticas propias que le corresponde a la Vicuña como animal SILVESTRE, erradicando el uso o aplicación de sinonimias pecuarias.

-No incluir a la Vicuña en programas, instituciones, proyectos, leyes o políticas que se refieran a las especies domesticas alpaca y/o llama ni dentro de definiciones o conceptos referidos a los camélidos sudamericanos en general

Un éxito de la CITES

La vicuña, el más pequeño de todos los camélidos que habitan en los Andes, se incluyó en el Apéndice I en 1975 ya que se encontraba en peligro crítico de extinción. En respuesta, los Estados del área de distribución diseñaron planes para lograr la gestión sostenible de los rebaños existentes. Tras el éxito obtenido, los Estados Partes en la CITES acordaron años más tarde que algunas poblaciones de vicuña se habían recuperado suficientemente para que fuesen transferidas al Apéndice II y se autorizase una reanudación parcial del comercio de su lana. Este comercio ha generado valiosos ingresos para las comunidades locales, que a su vez se han convertido en una fuerza eficaz contra la caza furtiva.

!!   MUCHAS

GRACIAS !!