CITES and Climate Change:
Interactions, Impacts and Potential Responses

Species Survival Network
6 June 2007

Introduction

There is now strong consensus within the scientific community that global climate change is occurring at rates far faster than previously predicted. A growing body of evidence demonstrates this change is having significant effects on wild species and ecosystems in many regions. Climate change is already identified as a major threat factor for 300 species in the IUCN Redlist, including CITES-listed species such as the Abbot's day gecko (*Phelsuma abbotti*), Bahamas rock iguana (*Cyclota carinata*), Lysan duck (*Anas laysanensis*), Andean flamingo (*Phoenicopterus andinus*), Dendrobatid frogs (*Dendrobates spp.*), and blue whale (*Balaenoptera musculus*), among others. A review of the available literature indicates scores of other CITES-listed species are affected or are likely to be affected by climate change. The extent and severity of these effects will increase as global average temperatures continue to rise.

The most recent assessment report by the Intergovernmental Panel on Climate Change estimates that 20-30% of plant and animal species assessed so far are likely to be at increased risk of extinction if increases in global average temperature exceed 1.5-2.5^{o}C. Physical changes in habitat, disruption of interspecific relationships, changes in exposure and vulnerability to pathogens, and direct physiological effects of temperature change will dramatically increase the vulnerability of species and ecosystems to other anthropogenic threats, including exploitation for international trade. The interaction of these forces poses heightened risks not only to the species being traded, but also to local communities and natural resource-based industries that depend on those species.

In light of these risks, CITES Parties must take the impacts of climate change increasingly into account in their decision-making processes, particularly in the making of non-detriment findings. At present, however, the mechanisms by which they would do so remain unclear. To ensure a consistent response, guidance on this matter is sorely needed from the Conference of the Parties and the Animals and Plants Committees.

As a contribution to the development of such guidance, this information document provides an overview of recent scientific findings concerning the impact of climate change on species. It looks briefly at how other international institutions have integrated climate change into their considerations, outlines existing mechanisms for responding to climate change within CITES, and recommends measures to improve these mechanisms and ensure that trade in CITES-listed species does not exacerbate climate impacts on biodiversity. An Appendix to the document provides examples of impact of climate change on species listed on the CITES Appendices.

The Rapidly Changing Climate

The Intergovernmental Panel on Climate Change (IPCC), established jointly by UNEP and the World Meteorological Organization, is the preeminent global scientific body for the assessment of climate change, climate impacts, and options for adaptation and mitigation. Working Group I of the IPCC assesses the scientific aspects of the climate system and climate change. In its 4th Assessment Report on the state of climate science, Working Group I concluded that the global atmospheric concentration of carbon dioxide has increased from a pre-industrial value of about 280 ppm to 379 ppm in 2005, far exceeding the natural range of atmospheric CO_2 concentrations over the last 650,000 years. (IPCC/WGI 2007). As a result of this change, and similar changes in other greenhouse gases, global average temperatures have increased by 0.76°C over roughly the last 100 years. This increase has

resulted in numerous long-term changes at continental, regional and ocean basin scales, including changes in arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones.

Atmospheric temperatures will rise an additional 0.2°C per decade for the next two decades, with a best-estimate overall temperature increase of 1.8°C-4.0°C, depending on future changes in greenhouse gas emissions. Even if emissions are stabilized quickly, however, both temperatures and sea levels will continue to rise for centuries due to the time scales associated with climate processes. (IPCC WGI 2007)

Impacts on Species and Ecosystems

These changes are already having profound impacts on natural systems. Working Group II of the IPCC, which assesses impacts, vulnerability and adaptation to climate change, has concluded with "very high confidence" that recent warming is strongly affecting both terrestrial and marine ecosystems, through changes in the timing of migration events and flowering times, poleward and upward shifts in plant and animal ranges, and changes in abundance of algae, plankton and fish species. (IPCC WGII 2007) Temperature changes have been most dramatic at the poles, posing serious risks for the survival of ice-dependent species such as polar bears, walruses and seals, while also affecting migratory birds and other mammals. Species at high altitudes are similarly affected, with particular impacts on endemic species in montane habitats. Rising sea levels, saltwater intrusion and more intense storm activity have also affected mangroves and other coastal wetland habitats. In coral reef ecosystems, these impacts are exacerbated by warming waters themselves, which make corals more vulnerable to disease and give rise to coral bleaching events, and by increased acidification of the oceans as a result of CO_2 absorption.

Climate change impacts on biodiversity will increase still further as temperatures continue to rise. Working Group II concluded that most corals will be bleached if temperatures rise more than 1°C, with widespread coral mortality beginning at 2.5 °C. In the Amazon basin, the combined impacts of deforestation and climate change could result in up to 60% of existing rainforest being replaced by savannah habitat, with profound impacts for biodiversity. And in the existing savannahs of Africa, decreased precipitation and increased drying due to climate change will place additional water stress on already marginal ecosystems, with impacts on both humans and wildlife. As a result of these impacts, Working Group II concluded that up to 30% of plant and animal species assessed so far are likely to be at increased risk of extinction if average temperatures increase by more than 1.5-2.5 °C. (IPCC WGII 2007) This is consistent with an earlier, comprehensive assessment of the extinction risk from climate change, which predicted that more than one million species could be driven to extinction by 2050 if emissions continue unabated (Thomas, et al., 2004).

Interactions between Climate Change and other Threat Factors

One conclusion of the Fourth Assessment Report is of particular relevance in the context of CITES. In its report, Working Group II emphasizes that "[v]ulnerability to climate change can be exacerbated by the presence of other stresses." Specifically, Working Group II concludes that:

> *Non-climate stresses can increase vulnerability to climate change by reducing resilience and can also reduce adaptive capacity because of resource deployment to competing needs. Sustainable development can reduce vulnerability to climate change by enhancing adaptive capacity and increasing resilience. At present, however, few plans for promoting sustainability have explicitly included either adapting to climate change impacts, or promoting adaptive capacity [20.3].*

The adaptation to climate change impacts called for by the IPCC is particularly relevant in the context of wildlife use and natural resource management, where the potential either to offset climate stresses or to exacerbate them immensely is both direct and immediate. Because species respond to climate change in different ways depending on their life histories and biological constraints, inter-specific relationships upon will be increasingly disrupted in the changing environment, greatly increasing the already substantial uncertainties associated with wildlife management. Pollinators or prey species may disappear or migrate, new competitors or predators may enter a species' habitat, or existing competitors or pathogens may be released from longstanding environmental constraints. Modifying systems for wildlife management to recognize and respond to early signs of such changes would provide an opportunity to quickly alleviate direct exploitation as a source of additional stress on traded species. By contrast, continuing existing management systems under the assumption that ecosystems are stable and unchanging could lead to the rapid overexploitation of species made vulnerable by climate change. It is thus imperative to take climate change impacts into account in efforts to ensure sustainability of wildlife uses because, as Working Group II cautions, "even the most stringent mitigation efforts cannot avoid further impacts of climate change in the next few decades, which makes adaptation essential, particularly in addressing near-term impacts." (IPCC WG II 2007)

International Responses to Biodiversity and Climate Change

International agreements have recognized the need to link biodiversity conservation and climate change. For example, Decision VIII/30 of the Conference of the Parties to the Convention on Biological Diversity (CBD) encourages Parties and other governments to integrate biodiversity considerations into all relevant national policies, programs and plans in response to climate change, and encourages governments and relevant organizations to develop rapid assessment tools for the design and implementation of biodiversity conservation and sustainable use activities which contribute to adaptation to climate change. In a communiqué issued on 17 May 2007, the CBD Secretariat warned that:

> *Climate change is forecast to become one of the biggest threats to biodiversity. Tackling its causes is vital to safeguard biodiversity and ecosystems and the services they provide to human societies. Protecting biodiversity and maintaining the resilience of ecosystems will at the same time help mitigate climate change, reduce its impacts and help us adapt.*

More recently, the International Tropical Timber Council (ITTC) highlighted the link between deforestation (which affects many animal and plant species listed under CITES) and climate change at its forty-second session (ITTC-42, 7-12 May 2007, Port Moresby, Papua New Guinea).

CITES and Climate Change

Although consideration of climate change has taken place in other conservation agreements, Parties to CITES have yet to directly address the relationship between species conservation and climate change. After considerable discussion during the revision of the CITES Listing Criteria, Resolution Conf. 9.24 (Rev. CoP13) was amended to specifically recognize "climate regime shifts" as an extrinsic factor affecting a species' vulnerability to over-exploitation for purpose of listing decisions. To date, however, Parties have made little direct reference to climate change in listing proposals. Climate change is referenced in Proposal 18 to list the European Eel (*Anguilla anguilla*) on Appendix II at CoP14, which notes that declines in European and American eels, which both spawn in the Sargasso Sea, provide evidence that changes in ocean currents resulting from climate change may have interfered with larval transport, leading to reduced recruitment in eel stocks. Surprisingly, it goes unmentioned in the U.S. proposal to list red and pink corals in Appendix II, despite substantial scientific evidence that warmer seas pose a major threat to coral species.

More significantly, there is little evidence that the impacts of climate change are being considered at all in the context of transfers between appendices, or in the making of non-detriment findings. Nor

has CITES considered how to factor the threat posed to species by climate change into its deliberations. Considering the clear and immediate relevance of climate impacts to managing wildlife sustainably, this is a serious omission.

The text of the Convention provides both the authority and the mandate for Parties to take climate change into account. Article III, paragraph 2(a) and Article IV, paragraph 2(a) of the Convention provide that export permits shall only be granted, *inter alia*, upon a determination by a Scientific Authority of the State of export that such export will not be detrimental to the survival of that species (non-detriment findings or NDFs). Resolution Conf. 10.3 recommends that the findings and advice of the Scientific Authority of the country of export be based on the scientific review of available information on the population status, distribution, population trend, harvest and other biological and ecological factors, as appropriate. Climate change is clearly an appropriate ecological factor to be considered in this context. CITES also requires that exports be regulated to maintain a traded species "at a level consistent with its role in the ecosystem in which it occurs" (Art. IV(3)). Fulfilling that mandate adequately will require far greater attention to what each species' role may be in an ecosystem that is changing rapidly.

Recommendation

CoP14 provides an important opportunity to begin a dialog within CITES on how best to adapt the Convention to a rapidly changing environment. The proposed resolution and decisions included in Annexes I and II to this document offer a mechanism for beginning that dialog.

The draft resolution in Annex I:

i) reiterates that climate change is a relevant factor for assessing the vulnerability of species to overexploitation for purposes of making listing decisions;
ii) agrees that impacts from climate change are relevant factors in determining whether trade in a listed species is detrimental to the survival of that species; and
iii) recommends that Scientific Authorities take into account the impacts of climate change in making non-detriment findings pursuant to Article III, paragraph 2 and Article IV, paragraph 2.

The draft decisions in Annex II:

i) directs the Animals and Plants Committees to each create a working group to develop draft recommendations for incorporating climate change impacts into non-detriment findings and to prepare a draft resolution based on those recommendations for consideration by the Parties at CoP15;
ii) encourages Parties, relevant organizations and interested observers to communicate to the Animals and Plants Committees scientific research and other relevant information regarding the effects of climate change on CITES-listed species, and appropriate responses to those effects within CITES; and
iii) encourages participants in the expert workshop on non-detriment findings hosted by Mexico to consider, as part of their discussions, methodologies for taking climate change impacts into account in the making of non-detriment findings.

Appendix
CITES Species Affected by Climate Change

Marine Mammals

More than 80 percent of the added heat from global warming remains in the oceans (Doney, 2007). Climate change impacts on marine mammals are being caused by changes in prey distribution and abundance, and by warming waters changing sea-ice habitat. Perhaps the most dramatic effect of climate change can be seen in the far north – in the Bering Sea, for example, near-surface temperatures rose around 3° C between 2000 – 2005 (Grebmeier, *et al*., 2006).

- Melting sea-ice throughout the Arctic region means that polar bears and other sea-ice dependent species are losing habitat. Polar bears (CITES Appendix II) are almost entirely dependent on sea ice to locate food. The disappearance of summer sea ice has been linked to declines in both numbers and mean body weight in some polar bear populations (Parmesan, 2006). As the overall sea ice available to polar bears shrinks, polar bears are forced to spend longer periods of time on land, leading to more interactions with humans and potentially increased exposure to hunters and poachers.

- The stranding of hundreds of grey whales (CITES Appendix I) along the west coast of the Americas in 1999-2000 may have been caused by starvation resulting from a decline in their prey in the Chirikov Basin of the Bering Sea. Scientists believe that walruses (CITES Appendix III) were also affected by this decline in their prey base (Simmonds and Isaac, 2007).

- Some marine mammals have nowhere to go as their habitat changes. For example, the vaquita marina (CITES Appendix I) is confined to the northern part of the Gulf of Mexico and is particularly vulnerable to climate change because it cannot move north away from adverse changes to its range (Simmonds and Isaac, 2007).

- Climate change may be the factor that pushes the North Atlantic right whale (CITES Appendix I) to extinction. Following the end of commercial whaling, this whale was expected to recover slowly. However, a decline in its principal food (planktonic copepods) due to climate change has meant a dramatic decline in calving rates of the North Atlantic right whale (Simmonds and Isaac, 2007).

- Global warming may foster disease among marine mammals. For example, in the 1990's, after abnormally low rainfall resulted in less food for striped dolphins (CITES Appendix II) in the Mediterranean, thousands died from disease that was thought to have spread more easily due to the poor nutritional state of the dolphins at that time.

- All marine mammals listed on CITES are to some degree negatively impacted by climate change, including harbour porpoise (CITES Appendix II), Antarctic fur seal (CITES Appendix II), narwhal (CITES Appendix II), bowhead whale (CITES Appendix I), Galapagos fur seal (CITES Appendix II), and the common dolphin (CITES Appendix II) (Simmonds and Isaac, 2007).

Birds

Sea levels have been projected to rise by between 0.18 to 0.59 meters by 2100 as glaciers and ice sheets melt. This estimation is thought by many to be low given the alarming increase in surface ice melting (Doney, 2007). Near-shore habitats, including nurseries for many coastal species, will be harmed, including mangrove forests, marshes, wetlands and estuaries (IPCC, Working Group I, 2007). Coastal mangrove forests in the Sundarbans in Asia will likely disappear following a one-

meter rise in sea level (IPCC, 2002). Coastal wetland loss estimates following projected sea-level rise are high around the world. For example, it is estimated that 84-98 percent of the Baltic coastal wetlands and 81-100 percent of the Mediterranean coastal wetlands would be lost (IPCC, 2002). Loss of wetlands due to climate change is one of the reasons behind the recently reported decline of 44 percent of the world's waterbird species (Wetlands International, 2007). In addition, climate change is already affecting tropical montane forest species which are often on isolated, with nowhere to move to when temperatures rise and conditions change.

- Waterbird species that depend on coastal wetlands and are likely to be affected by sea-level rise include Sarus crane (CITES Appendix II), Nordmann's greenshank (CITES Appendix I), Steller's sea-eagle (CITES Appendix II), red-crowned crane (CITES Appendix I), oriental stork (CITES Appendix I), Baikal teal (CITES Appendix II), and milky stork, (CITES Appendix I).

- In Costa Rica's Monteverde Cloud Forest, the quetzal (CITES Appendix I) has declined as the climate has changed its upper-slope montane habitat. Among the factors causing its decline is increasing nest predation by toucans that have shifted upslope due to changing climate conditions (Pounds, *et al.*, 2005).

Reptiles

Populations of animals dependent on temperature to determine the sex of their broods, including many reptile taxa listed on CITES, may be unable to evolve rapidly enough to counteract the consequences of rapid global temperature change (Janzen, 1994). Some critical marine turtle nesting beaches in Malaysia have already shifted into a totally female-producing temperature range (Limpus, 2006). Some lizards are apparently responding, at least in the short term, by modifying their nest site preferences (Doody *et al*., 2006), and it is thought that marine turtles may also adjust, but likely slowly over decades or hundreds of years (Limpus, 2006). Further, the combined impact of increased frequency of hot summers, increased storm intensity and flooding events is expected to be damaging to coastal ecosystems, especially coral reefs and seagrass pasture on which green turtles (CITES, Appendix I) and other turtles depend (Limpus, 2006).

- Within the southern Great Barrier Reef, nest temperatures are reaching lethal temperatures for marine turtle eggs causing increased debilitation and even death of eggs and hatchlings (Limpus, 2006). Great Barrier Reef marine turtle species include the hawksbill turtle (CITES, Appendix I), green turtle (CITES, Appendix I), loggerhead turtle (CITES, Appendix I), leatherback turtle (CTIES, Appendix I) and olive Ridley/Pacific Ridley (CITES, Appendix I).

Amphibians

Global warming has been identified as a driving factor behind widespread amphibian extinctions from epidemic fungal disease (Pounds *et al.*, 2006). According to the Global Amphibian Assessment (www.globalamphibians.org), around one-third of amphibian species are classified globally as threatened, with the highest numbers in Latin America.

- A multi-species population crash in 1987 led to the disappearance of the golden toad (CITES, Appendix I) and many other species from the Monteverde Cloud Forest in Costa Rica. Cloud forest habitat depends on moisture. Rising tropical sea surface temperatures were found to correlate with increased frequency of dry days in the cloud forest – reducing critical moisture for species such as the golden toad (Pounds, 2005).

Corals

Short periods (> 3 days) of maximum monthly temperatures can cause corals, 213 species of which are listed on CITES Appendix II, to expel the algal cells that normally live within their tissue. This process is known as "bleaching", and can lead to coral death. Tropical oceans are 0.5 – 1.0° C warmer than 100 years ago and coral bleaching has become more common (Hoegh-Guldberg, 2005). For example, the particularly strong El Nino phenomenon in 1997-1998 caused coral bleaching in tropical oceans globally. Sixteen percent of coral colonies surveyed in measurements made in 1997 had disappeared by the end of 1998 (Hoegh-Guldberg, 2005). In some areas, the loss was much larger: the western Indian Ocean reef systems lost as much as 46 percent of their living reef-building corals (Hoegh-Guldberg, 2005). Corals cannot shift far northward to avoid rising sea temperatures, since they depend on light availability which is lower in more turbid northern waters (Hoegh-Guldberg, 2005). Further, they are directly affected by the increasing acidity of the oceans due to rising $C0^2$ levels and by increasing storm damage, in part resulting from climate change-linked increases in intensity of hurricanes (Parmesan, 2006).

- Staghorn coral (CITES Appendix II) was formerly a dominant species across the central shelf lagoon of Belize, but in the 1980's disease resulted in complete mortality (Hoegh-Guldberg, 2005).

- Thin lettuce leaf coral (CITES Appendix II) replaced staghorn coral in the central shelf lagoon of Belize in the early 1990s, but was wiped out in turn by the high water temperatures of 1998 (Hoegh-Guldberg, 2005).

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Annex 1

DRAFT RESOLUTION OF THE CONFERENCE OF THE PARTIES

Conf. 14.XX

Climate Change and CITES

AWARE that human activities have resulted in numerous long-term changes in the earth's climate, including changes in arctic temperatures and ice, widespread changes in precipitation amounts, ocean salinity, wind patterns and aspects of extreme weather including droughts, heavy precipitation, heat waves and the intensity of tropical cyclones.

CONCERNED about the impacts on biodiversity that have already been observed as a result of those changes, including impacts on species included in the CITES Appendices;

RECOGNIZING the competence of the Intergovernmental Panel on Climate Change (IPCC) and its Fourth Assessment Report, "Climate Change 2007," analyzing the causes of climate change, its potential impacts, and options for adaptation and mitigation;

TAKING NOTE of the conclusion of Working Group II of the IPCC on Impacts, Adaptation, and Vulnerability that "observational evidence from all continents and most oceans shows that many natural systems are being affected by regional climate changes, particularly temperature increases";

NOTING, in particular, the findings of Working Group II with respect to biodiversity and natural ecosystems, which include: that "approximately 20-30% of plant and animal species assessed so far are likely to be at increased risk of extinction if increases in global average temperature exceed exceed 1.5-2.5º Celsius"; that if temperature increases above this level, there are projected to be major changes in ecosystem structure and function, species' ecological interactions, and species' geographic ranges, with predominantly negative consequences for biodiversity; that "vulnerability to climate change can be exacerbated by the presence of other stresses"; and that "the resilience of many ecosystems is likely to be exceeded this century by an unprecedented combination of climate change, associated disturbances (e.g., flooding, drought, wildfire, insects, ocean acidification), and other global change drivers (e.g., land use change, pollution, overexploitation of resources)."

ACKNOWLEDGING the special vulnerability of polar regions, where changes in ocean temperatures and sea-ice cover are having significant detrimental effects on many organisms including migratory birds, mammals and, in particular, higher predators; and of ocean ecosystems, in which "the progressive acidification of oceans due to increasing atmospheric carbon dioxide is expected to have negative impacts on marine shell forming organisms (e.g., corals) and their dependent species";

WELCOMING Decision VIII/30 of the Conference of the Parties to the Convention on Biological Diversity, which encourages Parties and other Governments to integrate biodiversity considerations into all relevant national policies, programmes and plans in response to climate change and which encourages Governments and relevant organizations to develop rapid assessment tools for the design and implementation of biodiversity conservation and sustainable use activities which contribute to adaptation to climate change;

CONSIDERING that Article III, paragraph 2(a) and Article IV, paragraph 2(a) of the Convention provide that export permits shall only be granted, *inter alia*, upon a determination by a Scientific Authority of the State of export that such export will not be detrimental to the survival of that species;

CONSIDERING further that Article IV, paragraph (3) of the Convention requires that trade in specimens of species included in Appendix II should be so limited to ensure the species is maintained throughout its range at a level consistent with its role in the ecosystems in which it occurs;

RECALLING that Resolution Conf. 10.3 recommends that the findings and advice of the Scientific Authority of the country of export be based on the scientific review of available information on the population status, distribution, population trend, harvest and other biological and ecological factors, as appropriate;

RECALLING further that Resolution Conf. 9.24 (Rev. CoP13) recognizes rapid environmental change, including climate regime shifts, as an extrinsic factor that may affect the vulnerability of species such that it is considered to be threatened with extinction;

THE CONFERENCE OF THE PARTIES TO THE CONVENTION

REITERATES that climate change is a relevant extrinsic factor to be considered in assessing the vulnerability of wild populations of species proposed for inclusion in the CITES Appendices;

AGREES that impacts from climate change are relevant biological and ecological factors to be considered in determining whether trade in specimens of CITES-listed species will be detrimental to the survival the species;

RECOMMENDS that CITES Scientific Authorities take into account the impacts of climate change on a CITES-listed species in making non-detriment findings required under Article III, paragraph (2) and Article IV, paragraph (2).

Annex 2

DRAFT DECISIONS OF THE CONFERENCE OF THE PARTIES

Directed to the Animals and Plants Committees:

14.XX The Animals and Plants Committees shall:

a) each create a working group to develop draft recommendations on how the impacts of climate change should be incorporated into the making of non-detriment findings; and

b) prepare a draft resolution based on those recommendations, and taking into account the outcomes of the international experts workshop on non-detriment findings, for consideration at the fifteenth meeting of the Conference of the Parties.

Directed to Parties, Relevant Organizations, and Observers:

14.XX Parties, relevant organizations and observers are encouraged to communicate to the Animals and Plants Committees scientific research and other relevant information regarding the effects of climate change on CITES-listed species, and appropriate responses to those effects within CITES.

Directed to Participants at the International Experts Workshop on Non-Detriment Findings

14.XX Participants at the international experts workshop on non-detriment findings (NDFs), hosted by Mexico pursuant to Decision 14.XX, are encouraged to consider, as part of their discussions, appropriate methodologies for taking climate change impacts into account in the making of NDFs.