How does the NSIDC organize the communication of research materials? M. Serreze indicated that the NSIDC has a communication committee and that its basic tenant was to make the information scientifically accurate but accessible at the same time.

Polar bears have seen warming climatic conditions before – are there good estimates of what sea ice looked like in the paleoclimate record? M. Serreze indicated that there is not a lot of data and that it is hard to reproduce the historical sea ice record.

Wednesday June 11th

PBSG member Greg Thiemann and Simon Stuart, IUCN Species Survival Commission Chair were introduced and welcomed to the meeting.

8. Red List Assessment

The IUCN is planning to update the Red List Assessment of all species listed on Appendix II in 2015; this includes the polar bear. Ø. Wiig is the PBSG lead for this assessment. Members were provided with an update on the status of this assessment through a series of presentations – 1) overview (Ø. Wiig); 2) generation length (E. Regehr); 3) current perspectives of assessments (R. Akçakaya); 4) possible use of a PVA approach (E. Regehr); and 5) proposed way forward (Ø. Wiig).

Overview of Red List Assessment Process – Øystein Wiig

The Red List Assessment is an estimate of extinction risk; what is the likelihood of a species becoming extinct in the near future? The IUCN has developed specific criteria to assess this, including data quality requirements. There is recognition that lack of data should not prevent an assessment. Under the IUCN, there are nine Red List categories (in increasing degree of risk):

1. Not Evaluated (NE)
2. Data Deficient (DD)
3. Least Concern (LC)
4. Near Threatened (NT)
5. Vulnerable (VU)
6. Endangered (EN)
7. Critically Endangered (CR)
8. Extinct in the wild (EW)
9. Extinct (EX)

Categories 5-7 comprise a broader category – Threatened. Polar bears are currently listed on the IUCN Red List as Vulnerable, which is the lowest of the three threatened categories.

There are three important terms used in the Red List Assessment process:

1. Population = total number of individuals in taxon = global population

2. Population size = number of mature individuals – the estimated, known, or inferred number capable of reproduction
3. Subpopulations = geographically or otherwise distinct groups among which there is little demographic exchange. Little demographic exchange is limited to very small numbers (e.g. 1 successful migrant or gamete transferred per year).

Thus, there is a significant difference between the IUCN and PBSG definitions of subpopulation, which will need to be addressed in the upcoming assessment.

Five separate criteria can lead to a species being listed under one of the Threatened categories:

A. Population Size Reduction
B. Geographic Range restriction
C. Small population size that is declining
D. Very small population size or restricted population range
E. Quantitative analysis such as PVA or other projection model approach

Of these five, only three potentially apply to polar bears – A, C, and E. Each criterion has thresholds that are quantitatively assessed.

Criterion A (Population Size Reduction) can be met in 4 ways
A1: Population reduction in **past** and **causes of decline now ceased**
A2: Population reduction in **past** and **causes of decline ongoing**
A3: Population reduction expected in **future**
A4: Population reduction in **past AND future**

Whether the population reductions in A1-A4 have occurred can be based on:

a. Direct Observation
b. An Index of abundance
c. Decline in Area occupied, extent of occurrence or habitat quality
d. Actual or potential levels of exploitation
e. Effects of: introduced taxa, hybridization, pathogens, pollutants, competitors, or parasites.

Population reductions expected in the future (A3) can be demonstrated by a combination of projected, inferred, and suspected trends of decline. The magnitude of decline over the next 3 generations would determine which threatened category a species would fall into – ≥30% (Vulnerable), ≥50% (Endangered), and ≥80% (Critically Endangered).

Inferred information is based on variables that are indirectly related to the variable of interest-generally in the same or similar units whereas suspected information is based on circumstantial evidence or variation in different types of units related to population abundance.

Criterion C (Small Population Size that is Declining) can be met in 3 ways
A global population of <10,000 mature individuals that is

C1: Continuing to decline at a rate >10% in 3 generations
C2: Continuing decline at any rate
plus **C2a**, all subpopulations are very small (<1000 mature individuals) or most of the mature individuals in the global population reside in one subpopulation,
or **C2b**, there is extreme fluctuation in the number of mature individuals.

Criterion E (Quantitative Analysis), which can be any form of analysis that estimates the extinction probability of a taxon based on known life history, habitat requirements, threats, and management options. Based on this analysis, a species would be listed as Vulnerable, if there is a 10% chance of extinction in 100 years; Endangered, if there is a 20% chance of extinction in 20 years or 5 generations; or Critically Endangered, if there is a 50% chance of extinction in 10 years or 3 generations.

In summarizing his presentation, Ø. Wiig noted that polar bears were classified as Vulnerable on the last Red List Assessment in 2006. However, criteria are far more stringent now and another assessment is due by **June of 2015**. There are two main issues that the PBSG will need to address for the upcoming Red List Assessment:

1. Calculation or estimation of Generation Length
2. How to relate the rate of habitat loss to a rate of population decline (Criterion A3) or estimate the probability of extinction (Criterion E).

<u>Generation Length</u> – Eric Regehr
The IUCN Red List Criteria define generation length as the average age of the parents of the current cohort. Analysis has been undertaken to estimate the generation length for polar bears. Although generation length can be determined from field data or from matrix projection models, the IUCN recommends estimating for pre-disturbance scenarios and not from heavily harvested populations. We should use un-harvested or sustainably harvested populations to develop estimates.

E. Regehr summarized the work that he has been leading on estimating generation length (GL) from data provided by a number of PBSG members.

A. Goal = estimated observed GL
   1. Field data from multiple populations
      a. Use ages of females accompanied by cubs and,
      b. Ages of Females (age -1) accompanied by yearlings
      c. Recognize numerous potential caveats and assumptions.
   2. Evaluate Variation over time and among populations in GL
   3. Understand factors influencing GL
   4. Identify one or more, or a range of, values to use in conservation assessments

B. Goal = Evaluate GL using matrix based models
   1. Breakdown the life cycle of polar bears so that every possible age and reproductive stage of females is represented in the model

2. Include mechanistic density dependence based on theory and biology, where ice extent is a proxy for K, includes interannual variability and trends in K based on sea ice extent. Include density independent stochasticity based on variance components
3. Run model multiple times with realistic vital rates parameters
4. Model produces a probability for each age and reproductive stage, and from that you can calculate the GL
5. Estimate standard errors by bootstrapping

C. Compare field and model estimates.

The data set he worked with had 3,191 observations of adult females with young, from which the observed GL was computed. It was noted that there was much variation among the subpopulations. The median GL was 11.2 years and the mean GL was 11.4 years. Considering all factors, the appropriate GL range was 11-13 years. These preliminary findings may change when the analysis is finalized.

The next steps in the GL portion of the process are:

1. Finalize data and model calculations
2. Sensitivity analyses
3. Possible comparisons of different models (e.g. asymptotic approximations)
4. Write manuscript including theoretical context and recommendations of the most appropriate GL.

IUCN Red List Assessment of the Polar Bear – Resit Akçakaya and Kevin Shoemaker

R. Akçakaya is Chairman of the IUCN Standards and Petitions Committee, which ensures that assessments meet the Red List requirements. He gave a presentation, via teleconference, on the perspectives of the Standards and Petitions Committee with respect to the Bayesian Network approach and several options for the upcoming assessment of polar bears.

Four shortcomings of the Bayesian Network (BN) approach (from the standpoint of the work of Amstrup et al. and the Red List requirements) were noted. First, BN models are mainly a vehicle for placing expert opinion into a common framework. They are not straightforward to update on the basis of observed data and there is concern that data would not be able to overwhelm the priors. Second, the BN model structure is not based on population dynamic theory. Third, the results from the BN approach are not applicable to Red List Criteria A or C, which require estimates of the amount of the decline not the probability of decline. Finally, the results are not applicable to Red List Criteria E, which requires quantitative not qualitative states.

It was agreed that the Red List Assessment has quantitative requirements which would not be met by current renditions of the BN model.

R. Akçakaya reviewed two options for an assessment of polar bears that would meet IUCN requirements.

1. Population reduction based on projected habitat loss – This approach will require an understanding and development of the relationship between habitat loss and population reduction. Habitat loss over the next 3 generations would need to be estimated and then the resultant population reduction calculated. This might require that weighted averages of subpopulation reductions be used. The outcome of this would then be assessed using Criterion A3c. The challenges of this approach include integrating summer and winter habitat loss into a single estimate and then determining the link between habitat loss and rate of population decline. It could be done for a single global population or by subpopulation. We already have projections of habitat loss.

2. Population reduction based on population model – This approach requires the development of a functional relationship between projected habitat change for each subpopulation and vital rates over the next 3 generations (i.e., develop a survival-sea ice function for each subpopulation). Weighted averages of subpopulation reductions would be used and then assessed against Criteria A3c, C, or E. The challenges include that a metapopulation model would be needed to relate knowledge about individual subpopulations to the global population if using Criterion E. We also need reasonable estimates of the size of all subpopulations; we cannot simply say, for example, that for subpopulations where are estimates are currently poor that in the future these will be 20% lower. Other considerations include that what happens in one subpopulation may not be independent of what happens in another and, similarly, ice metrics may not be independent for neighboring subpopulations.

Regardless of which approach or combination of approaches is taken, the final Red List category will be determined to be the one that is of the highest level of risk (i.e., if Criterion A3c indicates Vulnerable but Criterion E indicates Endangered, the species would be listed as Endangered).

Possible Use of a PVA Framework to Assess Under Criterion E – E. Regehr

E. Regehr followed up on Resit's comments with a discussion on how we could use a PVA framework for subpopulation-specific stochastic projections to address Criterion E – population model approach to assessing population decline. The essential components that we would need to include in a PVA model are:

1. Vital rates – We would estimate current vital rates where these were available but use mean values otherwise. We would need to estimate density relative to carrying capacity (K) and then have some idea as to where the population was relative to K at the time vital rates were estimated.

2. Current and future environmental conditions – We will need estimates of environmental conditions. We could use satellite observations and use forecasted ice metrics from IPCC climate models to calculate future conditions on a subpopulation basis.

3. Estimate the relationships between vital rates and environmental conditions – We will need to understand the ***Ice—>K—>vital rates*** relationship. What is unknown is the relationship

between ice and K. For well-studied populations, we could calibrate the ***Ice—>K*** function to match observed population trends.

Other considerations discussed were questions regarding whether or not the ***Ice—>K*** relationship is stable. It is clearly not and will vary with time; can we assess that variation? For all subpopulations, hypotheses for current and future ***Ice—>K*** relationships will need to be developed. Can we develop reasonable approximations for the poorly known subpopulations? Once we have completed this on the subpopulation level, we will need to scale up to the range-wide population in a way that makes sense. We would then evaluate a range of outcomes and evaluate the sensitivity of these outcomes to key assumptions.

Proposed Way Forward – Øystein Wiig
The timeframe in which to develop the assessment is tight and requires a subgroup to ensure it is completed in time. Next steps identified included gathering information for each specific subpopulation, complete the analytical assessment, consultations with other members during summer and autumn, holding a workshop of the working group in November/December, revising based on consultations and workshop, and completing assessment by June 2015. The importance of completing this assessment was stressed – it is important for the IUCN, the IUCN PBSG, the polar bear Range States, and the polar bear.

Working Group (to develop draft Red List Assessment of the polar bear) *– Steve Amstrup, Kristin Laidre, Nick Lunn, Marty Obbard, Eric Regehr, Greg Thiemann, Øystein Wiig (lead), and Resit Akçakaya*.

9. CITES

D. Cator provided an update on polar bears and CITES. Appendix I species are those threatened with extinction; trade is only allowed under exceptional circumstances (e.g. research). Appendix II species are those not necessarily threatened but trade must be controlled to avoid use incompatible with survival. At CITES CoP16 in 2013, a proposal to list polar bears on Appendix I was rejected. The next opportunity for consideration of uplisting to Appendix I would be at CoP17 in 2016 (South Africa). Parties to CITES would propose species for uplisting; IUCN and TRAFFIC would conduct an analysis of each proposal. If the polar bear was to be proposed again, the PBSG would likely be asked to contribute information/expertise to the analysis process in late 2015.

Between the CITES CoP meetings, technical/scientific meetings of CITES Animals Committee occur at which a Review of the Significant Trade (RST) process is undertaken. This review of trade in Appendix II-listed species is a regular process and is undertaken to determine if there is ongoing information that might affect the next round of proposals and considerations.

As part of this process, the polar bear was identified by UNEP-WCMC as a “high volume” traded species (based on threshold of 50 trades per year). At the meeting of the CITES Animals Committee, the UK proposed polar bears for further review. Initially, Canada questioned this