2012 Progress Report

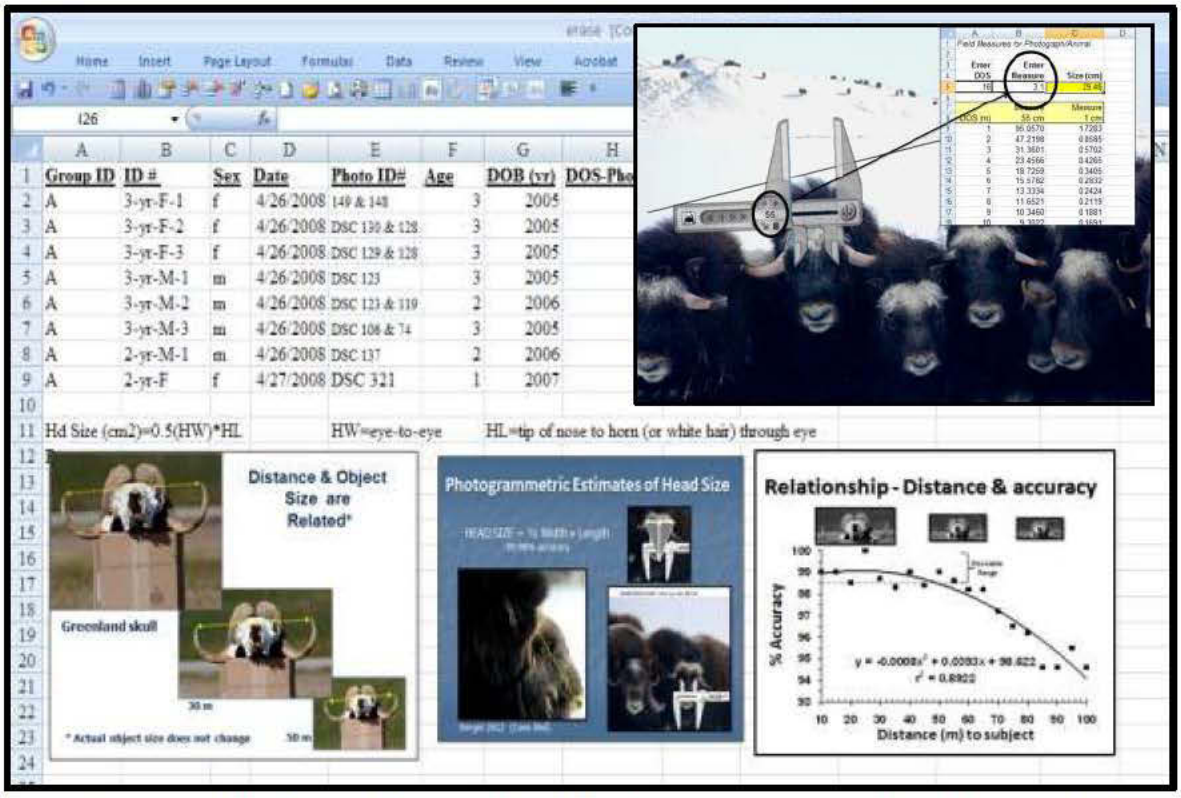
Trans-Beringia Muskoxen — Creation of Ecological Baselines in an Era of Arctic Warming

Joel Berger

Summary — This report summarizes key efforts and progress on this NPS-funded project. The chief gains were the signing of a Memorandum of Understanding between Russian and American authorities, the training of a Russian polar scientists from Wrangel Island on photogrammetry techniques, the fall-2012 publication of a previously-accepted paper on photo-imaging as applied to muskoxen, other northern wildlife, and weather factors in the journal Conservation Biology, presentations of the on-going work to scientific and popular audiences in Alaska and/or the contiguous 48 states, and continued data analyses and fieldwork (in WEAR NPS units). Challenges and plans are also discussed.

Key Achievements

- A MOU – –Agreement on scientific and technical cooperation between Wrangel Island State Reserve in Chukotka, and grant recipient University of Montana and cooperator, The Wildlife Conservation Society‖ – was signed in January 2013. This agreement was initiated in late July 2012, and because of complexities, language differences, and institutional challenges, six months were required for the execution of signatures. Nevertheless, to my understanding, this is a first such document and should lead to continued cooperation.
- Dr. Alexander Gruzdev, Director of the Wrangel Island Zapovednik, was invited and visited University of Montana* to partake in a training session about photogrammetry techniques.



Example of computational approach, spreadsheet, photo measures, and calculations to approximate head size and growth

This involved a practical and conceptual understanding of size-distance relationships, and simple computational algorithms in which size measures on photographs are translated to head size dimensions (see inserts above). Personnel involved in this, in addition to Alexander and me, included Dr. Cynthia Hartway, who helped on computation matters, and Tajik interpreter, Farah Shukurova. Such training was requisite to assure that metrics derived from non-invasive measures on Wrangel Island standardized with those being gathered from western Arctic NPS lands. To assure familiarity with equipment and as an opportunity to connect Alexander with conservation planning and practice in the USA, we took advantage of the proximity of the university to Yellowstone National Park. Alexander used equipment to practice on large mammals such as bison and pronghorn. Alexander returned to Wrangel Island with project-related equipment that included camera and a standardized long lens, laser rangefinder, and appropriate software.

From top left to bottom right: i) Alexander and Joel at Yellowstone Visitor Center; ii) Alexander with rangefinder and Farah, iii) Alexander post-photo-imaging with pronghorn, iv) Alexander and Joel at Native American museum exhibit, v) book store at Yellowstone with Cindy, Alexander, and Joel, and vi) Cindy, Alexander, and Joel.

- Fieldwork in WEAR NPS Units (Bering Land Bridge and Cape Krusenstern) was conducted in March and April 2012 as part of the comparative nature of this project.

- Publications. A paper on photogrammetry of muskoxen (and moose) was published in the journal Conservation Biology in October (Berger, J. 2012. Estimation of body-size traits by photogrammetry in large mammals to inform conservation. Conservation Biology 26:769-777. This paper is ancillary to the three anticipated papers that will be submitted for publication based upon this project.

Conservation Biology

Conservation Practice and Policy

Estimation of Body-Size Traits by Photogrammetry in Large Mammals to Inform Conservation

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Abstract: *Photography, including remote imagery and camera traps, has contributed substantially to conservation. However, the potential to use photography to understand demography and inform policy is limited. To have practical value, remote assessments must be reasonably accurate and widely deployable. Prior efforts to develop noninvasive methods of estimating trait size have been motivated by a desire to answer evolutionary questions, measure physiological growth, or, in the case of illegal trade, assess economics of horn sizes; but rarely have such methods been directed at conservation. Here I demonstrate a simple, noninvasive photographic technique and address how knowledge of values of individual-specific metrics bears on conservation policy. I used 10 years of data on juvenile moose (*Alces alces*) to examine whether body size and probability of survival are positively correlated in cold climates. I investigated whether the presence of mothers improved juvenile survival. The posited latter relation is relevant to policy because harvest of adult females has been permitted in some Canadian and American jurisdictions under the assumption that probability of survival of young is independent of maternal presence. The accuracy of estimates of head sizes made from photographs exceeded 98%. The estimates revealed that overwinter juvenile survival had no relation to the juvenile's estimated mass ($p < 0.64$) and was more strongly associated with maternal presence ($p < 0.02$) than winter snow depth ($p < 0.18$). These findings highlight the effects on survival of a social dynamic (the mother-young association) rather than body size and suggest a change in harvest policy will increase survival. Furthermore, photographic imaging of growth of individual juvenile muskoxen (*Ovibos moschatus*) over 3 Arctic winters revealed annual variability in size, which supports the idea that noninvasive monitoring may allow one to detect how some environmental conditions ultimately affect body growth.*

Keywords: conservation policy, moose, muskoxen, orphans, overwinter survival, photogrammetry

- Presentations (scientific and popular);

  Scientific (Climate change as related to muskoxen and conservation)
  - University of Montana (Missoula, Montana) - September
  - Bronx Zoo (Bronx, New York) - October
  - Society of Conservation Biology (annual meeting) Oakland, California - July
  - Beijing-Normal University, Beijing, China – December
  - Bhutan Ministry of the Environment (Thimphu, Bhutan) February
  - University of Vienna (Austria) – September

  Popular (Climate change as related to muskoxen and conservation)
  - Kotzebue, Alaska (NPS Visitor Center) – March

Planned Activities and Challenges

While the logistics of fieldwork in Arctic Alaska are complicated, they have generally been resolved through generous NPS support out of Kotzebue. The logistics of field work on the Chukotka side of Beringia are more complicated and generally require a commitment of a 4 to 6 week stay on Wrangel island. This duration appears necessary because of difficulties in planning and executing flights onto and off Wrangel Island. Although one Russian scientist was trained in 2012 (Alexander Gruzdev), in 2013 we will invite and train an additional Russian scientist. This will facilitate data collection in winter 2013 or early in 2014 by Russians on Wrangel, and in 2014 Berger will then visit the Zapovednik to assure progress with non-invasive monitoring.

<u>2013</u>

- Field work – Arctic Alaska (March-April)
- Talks and Outreach
- Dr. Sipko Taras (or replacement) to USA (summer)
- Data processing from field work (Fall)

<u>2014</u>

- Field work (Berger & Gruzdev) – Wrangel Island – late winter or spring
- Talks and Outreach
- Beringia Days
- Data processing from field work (Fall)

*The Schedule of Dr. Alexander Gruzdev for Photogranunetric Training at University of Montana

The University of Montana

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TENTATIVE SCHEDlJLE FOR DR ALEXA!"\'ɥnER GRUZDEV

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Airport Pick-up (Joel Berger and Farah Shukurova); odging: Holiday Inn (dowmown Missoula. Montana) Dinner: Iron Horse with Joell Berger and Farah Shukurova

SundnJulv22

Breakfast: Holi day ll nn; Shopping – to purchase a range finder (to estimate distance to animals) Photo-sess oiinfi elds arooodMis.soula
Photo-sess ons of cattle and horses
Dinner: Upper Rattlesnake at Or. Cindy Hanway's home)
Invited Guests are: 1) Oay Miller (American biologi st working for the Wilcli fe Conservation Society, studying tigers in Primorsky Krai), 2) Farah, 3) Joel. 4) Julie Brovm (language specialist), 5) Nick Sharp (biologist for Wi dlife Conservat on Society who stucfies elk and moose). 6) Dr. Cindy is a population biologist who stud es plants and animals and recently worked in Mol"\golia, and 1) Tammy Mildenstein (wildlife biologist – UM works in Phillipines).

:\<Iondn Ju!Y23

Breakfast: catallyst {downtown Missoula – vJith Joet).
Computer training for converting photos to measures – in Berger Laboratory at University of Montana. Cindy and Farah to he p.

Mid-day: Bicyc e break, and then complete computer training.
Diooer (picnic – type – outdoors): Joel s horne (with Farah and other guests to be determined ALSO NICK SHARP – UMPHDSTUDENT).

Tuesda; Ju!Y24

Open – depends on progress (we may have to work; Cindy on stand-by; Farah to help) OR perhaps a shopping option tor Alexander.
Afternoon: eave for Yellowstone National Park; (Cindy and Farah all soi n attendance)

Graduate Degree Programs
Biochemistry
Microbiology
Organismal Biology & Ecology
Wildlife Biology

An Equal Opportunity University

Diooer and Evenil'lg: in Bozeman (Montana).

WednesdnJulv25

Leave at 6AM for Yellowstone (and spend day in Yellowstone). Evenine and Dinner: O\ico Hot Sprines: (all so – optional but il intorested bring a bathing suit as wo'll soak in tho hot springs). (Cindy and Farah also in attendance). (Qndy and Farah all so in attendance)

ThursdnJulY26

Eartv moml n & visit In Yellowstone to look lor wolvos; then drive to Misso Ula (Aiexandor back to Holiday Inn; dinner in Missoula). (Cindy and Farah also in attendance)

FridnJulv27 Alexander's mid-day departure (Joel and Farah go to airport)