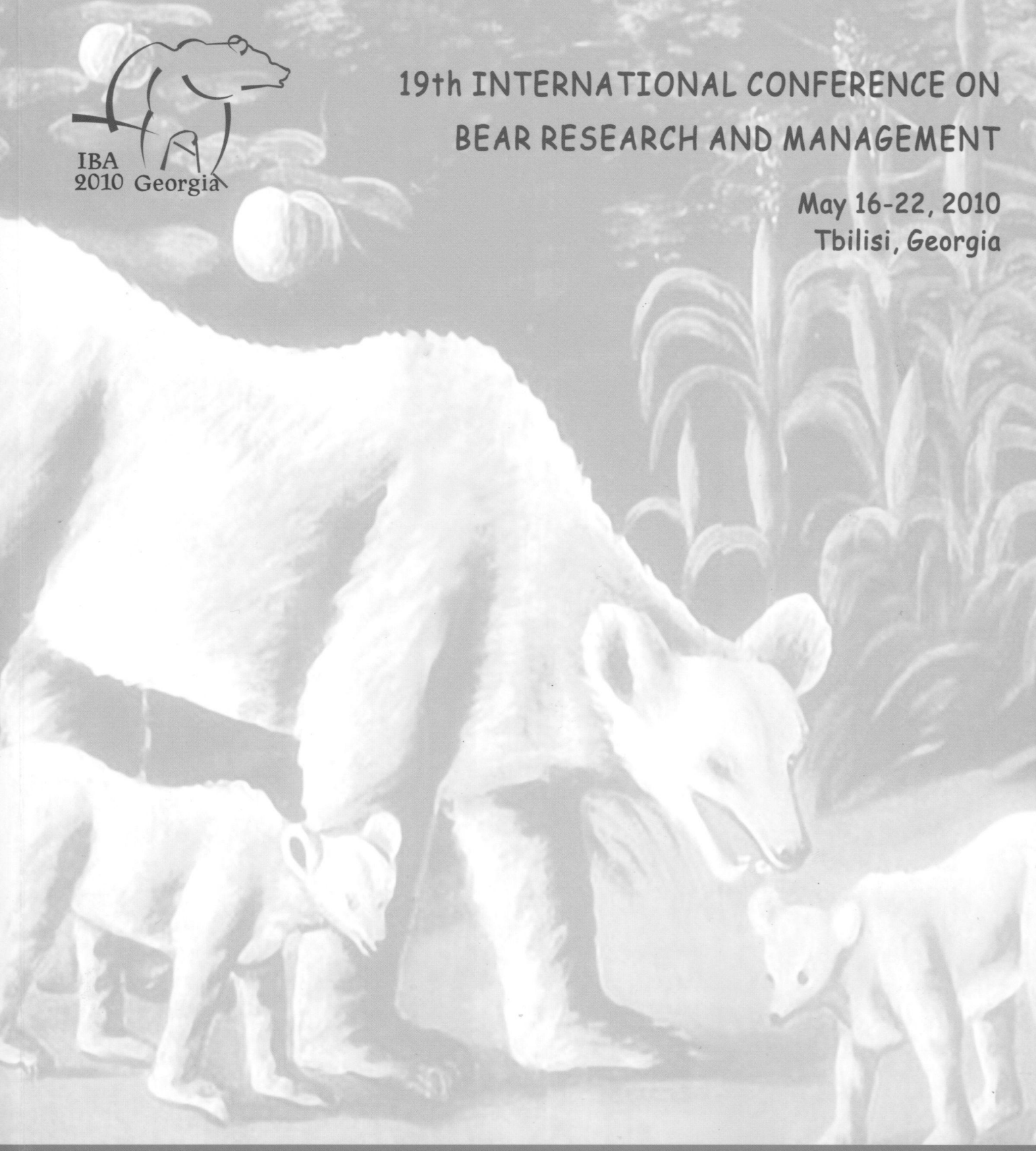
Poster 6

RANGES AND MOVEMENTS OF BROWN BEARS IN CROATIA: COMPARATION OF METHODS USED FOR CALCULATIONS

JOSIP KUSAK, ANA PROHASKA, TOMISLAV GOMERČIĆ AND DJURO HUBER
Veterinary Faculty, University of Zagreb, Heinzelova 55, 10000 Zagreb, Croatia
Phone: 385-1-2390141, fax: 385-1-2441390
Email address: kusak@vef.hr, viaprohaska@gmail.com, tomislav.gomercic@vef.hr, huber@vef.hr

Telemetry tracking is 40 years old method of choice for revealing patterns of movements and sizes and shapes of home ranges of non conspicuous animals. That information is often the base for management of species. With the use of GPS technology, large amounts of high quality GPS locations quickly accumulate. Various methods to calculate the movements and ranges of animas are available today, giving very different results. Here we present the results of GPS tracking of bears in Croatia and the comparation of three methods for calculation of home ranges. Nine brown bears (*Ursus arctos*), five males, four females, in ages from 2.5 to 15 years (average=5.1), were tracked by the use of GPS-GSM collars in Croatia between 2003 and 2009. Tracking time lasted from 42 to 409 (avg=214) days. Collars were scheduled to attempt GPS fix every two hours. The GPS fixing was successful in 48.8% of attempts, resulting in 9882 locations. Home ranges and utilization distributions were calculated as minimum convex polygons (MCP), fixed kernels (FK) where smoothing factor (h) was obtained by least square cross validation (h_{LSCV}). We also used newer method called "local convex hulls" (LoCoH) calculation, where we selected adaptive algorithm, with factor a=maximal locations distance. With MCP we used 100% and 95% of locations, while with FK and LoCoH methods we used 95% and 50% of locations. Calculated home ranges were overlaid on bear habitat suitability map to compare how resulting polygons match with habitat map. The average length of day-to-day movements of all tracked bears was 1674m (n=1395, average range was 48 to 9976, SD=1767). The average time between two GPS fixes was 3.47 hours (n=9814, range 1.1 to 37.2 SD=3.6). During this time tracked animals moved 515.1 m (n=9814, range 0.8 to 8079, SD=848). Recalculated to one hour, the average movement was 217m (n=9814, range 0.2 to 4703, SD=408). Traditional 100% MCP for all bears was 249.7 km^2 (range 31.6 to 963.9, SD=330.5), Areas of 95% MCP for all bears covered only 93.0 km^2 (range 17.8 to 358.6, SD=105.1). Fixed kernels (95% FK) covered 169.5 km^2 (range 17.8 to 62.7, SD=19.8). Local convex hulls (95% LoCoH) covered 48.8 km^2 (range 8.7 to 141.0, SD=49.2). Female ranges were much smaller than the ones of males. Resulting 100%MCP ranges were 2.7 times larger than 95%MCP ranges, but 95% MCP were 1.8 times smaller than 95% FK ranges. LoCoH ranges (95%) were 1.9 and 3.5 times smaller than 95% MCP and 95% FK home ranges respectively. When overlaid on bear habitat suitability map, both MCP and kernel home ranges included unsuitable areas (lakes, sea, settlements; Type II error) and 95% kernel ranges included areas away of any known location (Type I error). Home ranges calculated by LoCoH method had "holes" and "pockets", which actually were patches of unsuitable habitat on habitat map. Home ranges calculated by kernel method were larger than MCP, but both would give satisfactory results if the habitat is continuous and homogenous. With the increase in habitat patchiness (fragmentation) LoCoH method gives better results than the other two methods. LoCoH polygons can also include unsuitable areas, but when the sampling effort is insufficient i.e. tracking time shorter than one year, too long interval between GPS fixes and low GPS success rate. Considering the average hourly movements of bears in Croatia (217m), the 2 hours GPS fix interval would be sufficient, but only if GPS success rate would be close to 90%. Further analyses will reveal which calculations do the best represent the bear use of the habitat.



IBA 2010 Georgia

19th INTERNATIONAL CONFERENCE ON BEAR RESEARCH AND MANAGEMENT

May 16-22, 2010
Tbilisi, Georgia

Program, Abstracts and Information

NACRES

FAUNA & FLORA International

TBILISI ZOO

Alertis

Conference Team and Sponsors

Conference Coordination
- Levan Butkhuzi

Management Overall Assistance
- Nino Dadiani

Publicity, Media Relations and Fundraising
- Tamar Sukhishvili
- Levan Butkhuzi
- Nino Dadiani

Travel Grants
- Bejan Lortkipanidze
- Nino Dadiani

Paper/ Poster selection
- Jon Swenson
- Djuro Huber
- Irakli Shavgulidze
- Bejan Lortkipanidze

Information Technologies, Presentation and Data Management
- Zaza Maglakelidze

Logistics
- Jumber Edzgveradze

Registration and on Site Support
- Nino Dadiani
- Students Team from the Ilia State University, Tbilisi

International Bear Association (IBA) and the Conference Organizers
Gratefully Acknowledge Financial Support of the Following Organizations:

NACRES – Centre for Biodiversity conservation and Research

European Union

Fauna and Flora International

Alertis – Fund for Bear and Nature Conservation (the Netherlands)

Tbilisi Zoo (Georgia)

Ilia State University (Georgia)