Proceedings

2007 International Workshop on the Rehabilitation, Release and Monitoring of Orphan Bear Cubs

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Edited by
Dr. John J. Beecham
Dr. Anand Ramanathan

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Founded in 1969 in an effort to end the seal hunt in Canada, IFAW is an international animal welfare and conservation organization that works to protect wild and domestic animals and to promote animal welfare and conservation policies that advance the well being of animals and people. IFAW's worldwide mission includes the rescue, rehabilitation and protection of animals and their habitats around the world.

The TMU is a US-based foundation that provides grants to American non-profit organizations to support cultural and environmental exchange between the United States, Russia, and countries in eastern and central Europe.

Participants from 13 countries attended the workshop and provided invaluable input to discussions on a range of topics. Their attendance would not have been possible without the financial assistance provided by IFAW and the TMU. IFAW and the TMU covered all travel related expenses for the participants attending the workshop, including airfare, lodging, and meals.

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Executive Summary

For more than three decades, biologists and rehabilitators in the United States and Canada have been involved in releasing orphaned American black bear cubs into habitats occupied by bears. Techniques for rehabilitation ranged from fostering very young cubs to lactating female bears in their winter dens, to pen-raising the cubs and releasing them when they were considered self-reliant and capable of surviving on their own.

Considerable experience and expertise in bear rehabilitation now exists in many other countries. This workshop on "The Rehabilitation, Release and Monitoring of Orphan Bear Cubs" brought together experienced wildlife rehabilitators and management authorities to discuss rehabilitation release and monitoring strategies for returning orphaned bear cubs to the wild. The primary goal of the workshop was to enable all participants to share their experience and expertise in raising and releasing rehabilitated bears back to the wild and to discuss guidelines for best management practices. The latter includes strategies for bear rehabilitation and release programs for all eight bear species. The workshop consisted of four technical sessions related to rehabilitation issues and a fifth session on bear welfare, conservation, and public education on bear issues.

An attempt was made during the workshop breakout sessions to identify the "Best Practices" for bear rehabilitation efforts. This proved to be a difficult task because of differences among geographical regions and species. Generally, the participants agreed that the rehabilitation process should be outcome oriented; the primary objective is for releases to be successful, regardless of differences in approach to rehabilitation. A successful release is defined as any situation where a released bear demonstrated the ability to locate and obtain sufficient natural food to sustain itself for an extended period of time (> 1 month) and where the bear did not become involved in a nuisance situation within the first year after release. Each session also identified a variety of principles regarding the rehabilitation process. These consensus items were listed as "Best Practices", with qualifications in many cases. Best Practices identified during the technical sessions included:

Session 1. **Criteria for Accepting Cubs into Rehabilitation**

- Age – A range of ages is acceptable for placing cubs in a rehabilitation facility. Participants preferred to work with younger cubs that had limited exposure to humans. However, older (< 2 year-old), non-habituated cubs also made excellent candidates for release back to the wild.
- Behavior – Cubs that expressed natural aversion behavior toward people (fear, wariness) were considered better candidates for rehabilitation than habituated cubs. However, participants recognized that the behavior of cubs in a rehabilitation facility changes over time and that with proper handling, habituated cubs could be taught to avoid people by using aversive conditioning.
- Health – Although cubs are capable of surviving with significant handicaps, the consensus of the participants was to reject cubs that had permanent injuries or handicaps that would negatively affect their ability to survive in the wild. They also agreed that cubs who would

require long-term veterinary care during the rehabilitation process were not suitable candidates for rehabilitation programs. All cubs should be quarantined for 2-4 weeks upon arrival at the rehabilitation facility to ensure that they did not transmit diseases or parasites to other cubs in the facility. Prophylactic treatment for endo-and ecto-parasites is highly recommended, and vaccinations for canine adenovirus-1, canine distemper and canine parvovirus in very young animals, and rabies in all animals, should be considered. It is absolutely essential that vaccines are high quality, and made from killed viral vaccines (A. Ramanathan and K. Loeffler, pers. comm. May 2008).

Session 2. **Critical Components of the Care and Rehabilitation of Orphaned Bear Cubs**

- Quarantine new arrivals for 2-4 weeks prior to introducing them into enclosures with other cubs.
- Provide prophylactic treatment for potential disease organisms by inoculating young cubs with killed canine adenovirus-1, canine distemper and canine parvovirus, vaccines, and all individuals against rabies, and treating them for parasitic infestations.
- Minimize contact with people to 1-2 primary caretakers.
- Discourage direct interactions between cubs and caretakers.
- Allow socialization among cubs.
- Mimic natural environment as much as possible within enclosures and provide behavioral enrichment to encourage natural behaviors.
- Provide protection from weather extremes.
- Wean cubs at 2-3 months of age.
- Provide natural foods prior to release.
- Scatter and hide foods within the enclosure to encourage natural feeding behavior and vary feeding schedule to prevent development of food-anticipatory behavior (stereotypic pacing in anticipation of feeding).

Session 3. **Criteria for Making Decisions about the Suitability of Bears for Release**

- Release only bears that are in excellent physical condition with intact teeth and claws and no handicaps that would reduce their ability to survive in the wild.
- Release bears when they are large enough to defend themselves from predators.
- Release bears that are genetically compatible with those in the release area.
- Release bears when natural food resources are abundant in the release area.
- Release only bears who are inclined to avoid people.

Session 4. **Release and Post-Release Monitoring of Bears**

- Evaluate habitat characteristics of the release location prior to releasing cubs to make sure that the area is suitable for releasing cubs.
- Mark all released bears and monitor the bears using either passive marks (ear-tags, tattoos, etc.) or remotely using telemetry equipment.

- Develop intervention plans prior to releasing bears to ensure that responsible governmental agencies are fully prepared to take appropriate action if a bear becomes involved in a conflict situation.
- Ensure genetic compatibility between released bears and the recipient wild population.
- Keep records for all releases, evaluate and publish results in peer-reviewed articles.
- Use appropriate release methodology for each species and geographic area (See section on release methods).

Introduction

As human population and anthropogenic development in wildlife habitats increase, bear populations are expected to decline as a result of habitat loss and human-bear conflicts. Other human activities that severely impact bears include killing bears to protect life and property, unregulated hunting, commercial exploitation for bear body parts and illegal pet trade (Servheen 1990). These situations will lead to greater numbers of bear cubs being orphaned and brought into the rehabilitation facilities. To meet this growing need, individuals and organizations dedicated to animal welfare and conservation are developing new approaches to prepare these animals for release back to the wild.

For more than three decades, biologists and rehabilitators in the United States and Canada have been rehabilitating and releasing orphaned American black bear cubs into occupied bear habitat. Techniques range from fostering cubs to lactating female bears in their winter dens, to pen-raising the cubs and releasing them when they were considered self-reliant and capable of surviving on their own (Clark et al. 1980, Alt and Beecham 1984, Carney and Vaughan 1987, Clark 1999). In the past 15 years, biologists have experimented with releasing brown bears in the U.S., Russia, Croatia and Romania; Asiatic black bears in the Russian Far East (RFE), India, and South Korea; sun bears in Indonesia; and Andean bears in Ecuador (Goodrich, pers. comm. February 2005, Fredriksson, pers. comm., January 2006, Castellanos, pers. comm., August 2005, Bereczky, pers. comm., October 2005). Considerable experience and expertise now exists in many countries. This workshop provided a unique opportunity for experts to share their knowledge and experience. Moreover, the meeting informed competent authorities so that they would be able to make informed decisions about bear rehabilitation and release programs in areas under their jurisdiction.

The Rehabilitation, Release and Monitoring of Orphan Bear Cubs workshop was organized by the International Fund for Animal Welfare with support from the Trust for Mutual Understanding. It, brought together experienced wildlife rehabilitators and management authorities to discuss rehabilitation, release, and monitoring strategies for returning orphaned bear cubs to the wild.

The primary goals of the workshop were 1) to enable all participants to share their experience and expertise in hand rearing and releasing rehabilitated bears back to the wild, and 2) to discuss guidelines for best management practices for bear rehabilitation and release programs for all for eight bear species. Under these goals, the specific objective was to identify critical components essential to rehabilitation programs that will a) lead to enhanced survival of rehabilitated bears, and b) minimize the risks of released animals becoming involved in human-bear conflicts. A concerted effort was made to identify and highlight differences in approaches and techniques among regions and for different species from successful programs throughout the world.

The workshop consisted of four technical sessions related to rehabilitation issues, a fifth session on bear welfare, conservation, and education, and a final plenary summary session. The technical sessions covered the following topics:

- Session 1: Criteria for accepting cubs into a rehabilitation program;
- Session 2: Critical components of the care and rehabilitation of orphaned bear cubs;
- Session 3: Criteria for making decisions about the suitability of bears for release; and,
- Session 4: Release and post-release monitoring of bears.

Methods

Technical sessions were introduced by invited presentations from 3 or 4 presenters. Each presenter gave a short 20-minute presentation on a topic related to the major focus of each session. After all presentations were given, the workshop participants were divided among five tables. Assignments to each table were based on a desire to partition participants in a way that would achieve as much geographical distribution and species experience as possible. Two primary workshop techniques were used to enable all participants to be fully engaged in the process of the workshop. Technique 1 was used to identify critical components of rehabilitation practices for Sessions 1-4. Six individual presenters introduced Session 5 (bear welfare, conservation, and education). Technique 2 was used to develop the key points for this session.

Technique 1- Participants were asked to answer a set of predetermined questions prepared by the workshop organizers (Appendix 1). Workshop organizers also identified a discussion leader for each table, a designated scribe to document important elements of the discussion, and a translator. Participants at each table were asked to answer the following questions as part of their overall discussion of each topic:

- Which elements of the area under discussion can be identified as the “best management practices”?
- Are there elements that we should discourage?
- Which elements are different for different species (e.g. size/behavior), and why?
- Which elements are different for different regions (e.g. climate, predators, human populations), and why?

After discussions were completed, one member of the each table was asked to present the findings of their group to the reassembled group of participants. Results gathered from the various tables was compiled and summarized by the session facilitators for presentation to the group the following morning.

Technique 2 – Participants were encouraged to consider a set of four predetermined questions (Appendix 2), while listening to each of the session presenters. A general discussion among all participants followed regarding bear welfare, conservation and education. Participants then placed their individual answers on post-it notes and attached those notes to posters taped to the walls for each question. The questions prepared for Session 5 by the workshop organizers were:

- Which outreach and education methods presented would be right for your situation?
- What outreach and education techniques do you use which are different than those presented?
- What specific welfare and/or conservation issues does your activity address?
- What are your questions related to these issues?

Other questions that the participants were asked to discuss among themselves were:

- Can you identify different welfare and conservation reasons for rehabilitation efforts for different species and/or regions?
- How effective is rehabilitation in addressing the welfare challenges of bears?
- How does your rehabilitation activity benefit bear conservation?
- In what way would you like to change the perceptions of bear rehabilitation with the: 1) Public; 2) Scientists; 3) Government administrators?
- In what way would you like to change policy, regulations or enforcement, specifically with regard to: 1) rehabilitation; 2) other issues?

After all participants had completed the process, the session facilitators arranged the post-it notes into groups of "key points" and placed them in order of priority based on the number of similar, individual responses. This priority ordering did not represent the importance of each issue, but simply the number of participants that were working on similar issues related to the topic under discussion. At that point, facilitators for the plenary summary session presented the results to the participants and guided a group discussion of the key points identified in the session in an effort to achieve consensus among the participants about the importance of each of the key points. The facilitators also reviewed items that were generated during the workshop but which had not been fully discussed because of time constraints.

Best Practices - An attempt was made to identify the "Best Practices" during workshop breakout sessions. This proved to be a difficult task because of differences among geographical regions and species. Generally, the participants agreed that the rehabilitation process should be outcome oriented. The primary objective was for the releases to be successful, regardless of differences in approach to rehabilitation. However, during each session a variety of generalizations were agreed upon regarding the rehabilitation process. These consensus items were listed as "Best Practices", with qualifications in many cases.

Session 1. Criteria for Accepting cubs into a Rehabilitation Program.

Facilitators: Dr. John Beecham and Dr. Alexander Malev

Summary of Invited Presentations

Criteria for accepting Asiatic black bears into a rehabilitation program – Dr. Kira Skripova

Dr. Skripova is a senior researcher for the Russian Academy of Sciences in the Russian Far East (RFE) and has been working on a rehabilitation project for Asiatic black bears in the Ussuri Nature Preserve since 1999. Dr. Skripova has accepted 36 black bear cubs into her rehabilitation facility and has successfully released 30 cubs. Dr. Skripova's facility is also cooperating with the government of South Korea by providing Asiatic black bear cubs for restoration efforts in Jirisan National Park, South Korea.

Dr. Skripova assesses the age, physical health, behavior, and history of human contact of cubs before accepting them into her rehabilitation program. She prefers to take cubs that are less than four months of age, and suggested that cubs that have been in captivity more than 3 months are not suitable for release back to the wild. Cubs that are in good health and do not have permanent physical injuries or health issues are suitable for release, while cubs that are sick or require frequent handling to treat injuries are not suitable for release because of habituation problems. Behaviorally, cubs should be fearful of humans and demonstrate some aggressive behaviors towards humans. Cubs that are too friendly or beg for food are not suitable candidates for release.

Criteria for accepting brown bears into a rehabilitation program – Dr. Valentin Pazhetnov

Dr. Pazhetnov is the founder of Orphan Bear Rehabilitation Project (OBRP) and has been involved in rehabilitation of brown bears in Russia since 1982. Dr. Pazhetnov is also a member of the Russian Academy of Sciences and is a well-respected brown bear expert in Russia. The OBRP is located in the Tver Region of Northwest Russia in the village of Bubonitsy. Dr. Pazhetnov, his wife Svetlana, and their son Sergey have released 111 of 144 bears brought into their rehabilitation facility. Many of the cubs raised by the Pazhetnovs were orphaned as a result of a winter hunting season, so many of the cubs raised for release from OBRP enter the facility at a very young age (< 1 mo.).

Dr. Pazhetnov indicated that he thought it was important that cubs come into the facility before they were three months of age (age at which cubs typically leave their maternal dens). His primary concern was previous exposure to human contact, which may negatively affect the chances for releasing the cubs successfully. Dr. Pazhetnov stated that imprinting on moving objects has

usually not occurred with the cubs until after they are two months of age. He suggested that it might be easier for cubs to adapt to rehabilitation environments when they enter the facility at an early age (<3 mos.). However, he also indicated that cubs that left their maternal den with their mother usually showed a strong avoidance response to humans. He preferred to take in cubs that demonstrated active defensive behaviors in the presence of humans. The primary source of cubs taken into IFAW OBRP is from winter bear hunting seasons in which denning female bears with newborn cubs are shot. This practice of hunting bears in dens has been limited in areas where IFAW OBRP is active, but it still occurs in parts of Russia.

Criteria for accepting polar bears into rehabilitation – Ms. Alison Hood

Ms. Alison Hood is programs director at Born Free Foundation in the U.K. and has been involved in polar bear issues for several years. Polar bears present a difficult challenge for rehabilitation efforts because they are primarily carnivorous in their food habits and catching their prey requires skills that are learned from their mothers. A limited number (n = 3) of attempts have been made to release orphaned cubs to the wild, all in Hudson Bay, Canada. The results of these release attempts are largely unknown. All attempts involved fostering orphan cubs with an older, adult female who was accompanied by a single cub about the same age as the orphan cub. Each cub that comes into captivity is held a maximum of 10 days, while local wildlife department teams conduct aerial search to locate a suitable surrogate family to foster the orphaned cub. Prior to fostering, the orphaned cub is examined physically to make sure that it is in reasonable physical condition and is capable of traveling with its foster mother. Major factors that play a role in whether an attempt is made to foster an orphaned cub include: 1) physical condition of the cub, 2) availability of a suitable surrogate family, 3) time of year (ice condition), 4) cub's demeanor, 5) time frame between when cub enters captivity and when foster family is located (≤ 10 days).

Work Session Summary

The circumstances that result in orphaned cubs are varied and are not restricted to any particular time of year. As a result, cubs show up at rehabilitation facilities during all months of the year. Participants in the workshop cited examples of cubs entering their respective facilities as young as 2-3 weeks of age from winter bear hunts in Russia to almost 12 months of age from drought conditions in western North America. Poaching activities and subsistence hunting also cause cubs to be orphaned during their first year of life. In a few cases, bear cubs kept illegally as pets are seized by governmental agencies and brought to rehabilitation facilities. In these instances, rehabilitators have few options other than to take the cub and then attempt to ascertain if it is a suitable candidate for release back to the wild.

The consensus of the working groups was that several factors were pertinent to the decision making process regarding the suitability of cubs for rehabilitation and eventual release back to the wild. Those factors included age of the cub, behavioral characteristics, and health status.

Age:

Although age was considered important, it was clear that age alone was not a major determinant of the suitability of a cub for rehabilitation and release. The primary age-related concern was the amount of time a cub was kept in captivity prior to entering a rehabilitation facility. The longer a cub was kept in captivity and exposed to large numbers of people and or hand fed, the greater likelihood that the cub would be habituated to people. The level of habituation is often a more important determinant of the suitability of the cub for rehabilitation than the age when it comes into the rehabilitation process. Many participants expressed a preference for taking younger cubs and were reluctant to admit older (> 3 months of age) cubs into the rehabilitation process. Their primary concern was the potential for habituation of older cubs prior to arriving at the rehabilitation facility. Similarly, participants using "assisted" release strategies, where the cubs are taken for daily walks into the forest by 1 or 2 caretakers, indicated that it was necessary to take in young cubs, so that they would have an opportunity to imprint on the caretakers that would take the cubs on their daily walk into the forest. Other participants cited numerous examples of successfully raising and releasing older cubs. Older cubs that enter a rehabilitation facility directly from the wild and who consistently demonstrate natural behaviors (wariness) in the presence of caretakers can be excellent candidates for release back to the wild. Examples were also cited of habituated cubs entering a rehabilitation facility and being successfully dehabituated and released. In these cases, it was necessary to allow these cubs to socialize with other cubs in the facility and to keep the cubs in the facility until they began to demonstrate a natural inclination for independence from other cubs and from their caretakers. This behavior typically occurs about the time that family break-up naturally occurs in the wild (1.5 years of age for most species; 2.5 years of age for others).

Behavior:

Each cub that enters a rehabilitation facility has a distinct personality and should be evaluated individually as to its suitability for rehabilitation. The expression of natural behaviors, such as fear or avoidance of people, will vary depending on the age of the cub and its experience prior to arriving at the facility. In the case of very young cubs that have not traveled with their mothers outside the maternal den, the expression of fear or avoidance will be absent. Unless these cubs are going to be released using an "assisted" release strategy, they have to be handled in the rehabilitation process very carefully to prevent them from habituating to their caretakers. It will be impossible to avoid some level of habituation with young cubs if they have to be bottle-fed. However, after they are weaned contact with the caretakers should be minimized to avoid further habitation. Older cubs should be expected to show fear unless they have been in captivity, fed, and/or exposed to people prior to arriving at the rehabilitation facility. Reducing the level of human contact with older cubs during the rehabilitation process may be sufficient to mitigate prior habituation and allow the cub to be released.

Health:
A critical step in determining the suitability of a cub for rehabilitation and release is an assessment of their health status. Typically, a licensed veterinarian would carry out this function in the first few days after the cub arrives at the rehabilitation facility. However, not all facilities have immediate access to qualified veterinarians and staff members are required to conduct the assessments. Participants in the workshop sessions indicated that their primary health related concerns were those associated with the need for long-term veterinary care during the rehabilitation process, which may lead to habituation or permanent disabilities that would affect the ability of cubs to survive in the wild. Several examples were given of cubs surviving with missing limbs and significant injuries. Disease was not considered a major issue for cubs in a rehabilitation facility because most diseases are treatable and prophylactic treatment was standard. Diseases that were mentioned as potential problems were rabies, hepatitis, canine distemper and tuberculosis. Cubs at facilities located in rabies prone areas should be vaccinated. The decision about whether to vaccinate against other pathogens should be made on the basis of the endemic prevalence of those pathogens. Cubs are also examined for tuberculosis and not released if they show evidence of exposure or active disease. Serologic studies of disease in wild bears have demonstrated that they are periodically exposed to a variety of diseases in the wild (Yunker et. al. 1980, Collins et al. 1884, Schmitt et al. 1987, Chomel et al. 1989, Reman et al. 1993, Mainka et al. 1994, Banks et al. 1999). However, few active cases of disease have been found in wild bears. Nevertheless, the participants agreed that it would be unethical to knowingly release a cub back to the wild if it were diseased.

Round worm infestations and Ursicoptic mange are not uncommon in captive reared bears, particularly in crowded conditions. Both conditions are easily treated with ivermectin and all bears should be routinely treated while they are held in the rehabilitation facility. Endoparasites (intestinal parasites) should be treated immediately on admission to the facility and then repeated 3 weeks later and then again once every one to 6 months, depending on the climate and on the risk of re-infection at the rehabilitation facility. Rehabilitators have a variety of drug choices for treatment of endoparasites. Ivermectin is convenient because it can be injected or given orally. Oral anthelminthics like fenbendazole, mebendazole, thiabendazole and pyrantal are also used against most roundworm infections, and it is advisable to use these drugs on a rotating basis to avoid the development of drug resistance. Protozoal infections (e.g., coccidia, amoeba, Giardia) or tapeworms will not be sensitive to these drugs (nor to ivermectin) and have to be diagnosed and treated specifically. Sarcoptic-type mange appears to be responsive to treatment with ivermectin in most cases (See Appendix IV). Demodectic mange is generally a sign of immunosuppression and treatment focuses on the underlying cause of this. . Secondary bacterial infections must be treated concomitantly (K. Loeffler pers. comm. May 2008).

Flea shampoos and topical drugs that are used in dogs and cats such as selamectin or lufenuron may be used to control other ectoparasites, like fleas.

Drugs like Sentinel® which contains lufenuron and milbemycin, or selamectin, are effective against fleas and ticks, as well as against the common roundworm-type intestinal parasites (K. Loeffler pers. comm. May 2008).
It is equally important for each cub to be examined by a licensed veterinarian to insure that it is healthy and in good physical condition prior to release.

Best Practices:

- Age – A range of ages is acceptable for admitting cubs into a rehabilitation facility. Participants preferred to work with younger cubs, especially when using the "assisted" release method. However, older, non-habituated cubs also made excellent candidates for release back to the wild.
- Behavior – Cubs that expressed natural avoidance behavior towards people (fear, wariness) were considered better candidates for rehabilitation than habituated cubs. However, participants recognized that the behavior of cubs in a rehabilitation facility changes over time and that with proper handling, even habituated cubs could be taught to avoid people.
- Health – Although cubs are capable of surviving with significant handicaps, the consensus of the participants was to reject cubs that had permanent injuries or handicaps that would negatively affect their ability to survive in the wild. They also agreed that cubs who would require long-term veterinary care during the rehabilitation process were not suitable candidates for rehabilitation programs. All cubs should be quarantined for 2-4 weeks after arrival at the rehabilitation facility to insure that they did not transmit diseases or parasites to other cubs in the facility. Prophylactic treatment for endo-and ecto-parasites is recommended. Vaccination is controversial and depends on the endemic disease risks in the release area.

Session 2. Critical Components of the Care and Rehabilitation of Orphaned Bear Cubs.

Facilitators: Dr. Anand Ramanathan and Ms. Mila Danilova

Summary of Invited Presentations

Critical components of care and rehabilitation of brown bear cubs – Mr. Sergey Pazhetnov

Sergey has worked with Dr. Valentin Pazhetnov (his father) for several years and is working on a Ph.D. related to the rehabilitation and release of orphan brown bear cubs. The approach used at OBRP is one of the most conservative approaches used for raising bear cubs in that Valentin and Sergey emphasize minimal contact with cubs in their care. They suggest that no one speak while in the presence of the cubs because they believe that it is important that cubs not become accustomed to human voices. Sergey also suggested that caretakers wear the same clothing when they are interacting with the cubs to "standardize" their appearance. Interactions between the cubs and caretakers are discouraged and caretakers actively discourage the cubs from approaching them during feeding.

Sergey stated that it was important for caretakers to recognize that each cub had its own personality and that not all cubs can be successfully released using the same approach. In situations where cubs are unsuccessfully released from OBRP at 7-8 months of age, they are returned to the facility, over wintered in semi-natural dens and then released the following spring at 15-17 months of age. In most cases, subsequent releases are successful.

Bear rehabilitation technique for the tropics: A case study of Asiatic black bears (*Ursus thibetanus*) in Northeast India. – Dr. N.V.K. Ashraf

Dr. Ashraf is the Director for Wild Rescue at the Center for Bear Rehabilitation and Conservation (CBRC), a program of the Wildlife Trust of India (WTI) and IFAW. The CBRC is located in the Pakke Tiger Preserve, Arunachal Pradesh, India. The IFAW- WTI project began in 2002 with three Asiatic black bears rescued from illegal human captivity. The bears arrived at CBRC at or under 6 months of age and were maintained in quarantine for two weeks before they were moved into a covered enclosure for 3-4 months. The cubs were then relocated into a pre-release enclosure and held there for 1-2 years and then "hard" released in the Pakke Tiger preserve. All three cubs were exposed to human contact prior to entering the CBRC facility and none were successful in transitioning back to the wild. Two cubs were killed shortly after release (1 by villagers; 1 by a leopard or tiger) and the third returned to the CBRC facility.

Dr. Ashraf changed his protocol for raising cubs as a result of his experience with the three Asiatic black bear cubs mentioned above. The CBRC now uses

a modified "soft" or assisted release method. Cubs are now raised in the CBRC facility until they are about five months old. Then they are placed in an enclosure located in the release area and are walked in the forest by two keepers for approximately 9 months. They are returned to the enclosure each night and are provided with supplemental food. The cubs gradually become more independent and are left on their own during the day after 10 months. They are free to return to the enclosure, but often do not do so as they achieve more independence.

Care and rehabilitation of American black bears: Critical components – Ms. Angelika Langen

Angelika and her husband, Peter, operate the Northern Lights Wildlife Rehabilitation facility in Smithers, British Columbia, Canada. The Langens have been involved in raising and releasing American black bears since 1990 and have released more than 100 bears. Most cubs enter their facility in early spring, although cubs do come in during the fall. Cubs are kept in a natural enclosure and are provided with behavioral enrichment to minimize the potential development of stereotypic behaviors. Cubs are housed together to facilitate socialization and to minimize interactions with their caretaker. Angelika prefers to restrict the number of caretakers for the cubs to one individual when possible and attempts to teach the cubs to climb trees to avoid strangers that approach the enclosure. She stated that some cubs display personality traits that suggest they are comfortable in close association with people and that extraordinary efforts are needed to teach those cubs to avoid people (i.e. using electric cattle prods when they approach their caretaker).

Cubs are fed goats milk with yogurt and lactobacillus to facilitate digestion. Once they are weaned they are fed oatmeal and honey, vitamins, and eventually dog food to provide them with essential nutrients. Cubs that enter the facility in late summer and fall are occasionally dehydrated and malnourished. These cubs need to be treated immediately for the dehydration and provided food slowly to avoid upsetting their digestive system. All cubs are dewormed when they enter the facility. Mange has been observed, but it is easily treated with ivermectin.

Sun Bear Rehabilitation Efforts – Ms. Gabriella Fredriksson

Gabriella Fredriksson is a conservation biologist based in Indonesia and working on her Ph.D. on sun bears. Her presentation focused primarily on the ecology of sun bears and on her experiences releasing 8 sun bears in 1997 (5) and 1998 (3). The five bears released in 1997 were 2.5-5 years of age and had been held in captivity for several years prior to being released using a "hard" release. All of these bears were killed by villagers in nuisance situations (3), recaptured (1), or disappeared. Subsequently, three cubs were brought to Ms. Fredriksson and they were released gradually using the same methodology described by Dr. Ashraf for Asiatic black bears (in fact, Dr. Ashraf modeled his release methodology based upon the methods Ms. Fredriksson used in 1998). The assisted release used by Ms. Fredriksson was successful for two females and they are still using the forest in the vicinity of her research camp

eight years after their release. The male that she released was very habituated to people (he had entered her care before his eyes were open) and was eventually killed illegally by local loggers.

Ms Fredriksson described the situation in Indonesia for sun bears as marginal due to habitat loss, lack of natural food resources, and conflicts with people along the forest borders. She believes that there are few suitable locations for releases in Indonesia. Gabriella attributes the success she had in releasing the two female sun bears to: 1) less time in captivity before entering the rehabilitation program, 2) the assisted release method (more time to acclimatize to their surroundings), 3) younger age at release, and 4) being integrated into her research project, which provided them with a level of care (protection) that they may not have received in another area.

Summary of Work Session

Participants in the workshop used a variety of approaches to care for bears. In many cases the methods employed reflected personal preferences that had worked well in the past. However, in some cases the methods were developed to accommodate geographical and species-specific requirements. Although the protocol varied among regions and species, the overall goal of achieving a successful outcome was the guiding principle for all rehabilitation facilities.

The preferred rehabilitation process is dependent on several factors that vary among geographical areas and species. Critical to the process is raising the cubs in a way that maximizes their potential to survive in the wild, while at the same time minimizing the potential for habituation to humans. This objective requires that rehabilitators consider the lengths of time cubs are kept in the rehabilitation facility, the intensity of husbandry administered to the cubs, the type of release (i.e. hard vs. assisted), and the characteristics of the release location. In situations where cubs will be released in remote areas with few human settlements, rehabilitators have greater flexibility in the amount of contact they have with cubs in their care. The presentation on Hamr and Bink's study in Ontario, Canada (see summary of evening presentation on page 21) demonstrated that the amount of human contact during the rehabilitation process is of lesser importance when releasing cubs in remote areas with few human settlements. The successful release of cubs using an "assisted" release approach also confirms this relationship between human contact during the rehabilitation process and the presence of human activities in the release area. However, in areas where human settlements are not uncommon or are widely dispersed across the landscape, rehabilitators need to limit contact with cubs, particularly after weaning.

Facilities:
The rehabilitation facilities used by participants in the workshop ranged in size from large (> 3 ha) located in relatively remote areas to smaller enclosures located in rural settings. Many participants used multiple enclosures during the process of raising the cubs and believed it was important to have larger enclosures available for the cubs and need more space to roam The size of

facilities needed for rehabilitation efforts was not a major focus of discussions at the workshop; the NWRA (Miller 2000) has published minimum standards for housing of bears in captivity for rehabilitation purposes. However, the participants did suggest that it was important for enclosures to mimic the natural environment as much as possible to encourage natural behavior in the cubs. In those situations where cubs were being raised in an urban environment or in small enclosures, it was important to provide the cubs with behavioral enrichment to reduce the stress associated with their environment and to prevent the development of stereotypic behaviors. Other considerations that were deemed important included: providing a safe environment with protection from adverse weather elements (extreme heat or cold), elevated dry areas for resting during wet weather, and denning areas for cubs raised in temperate regions. While the facilities should allow bears to display natural behaviors such a digging and climbing, care should also be taken to ensure that bears are not able to dig or climb out of the enclosures. Therefore, measures are required to prevent escapes, as well as to prevent predators (e.g. leopards, pumas, wild bears), from entering the enclosures.

Care and Handling:
Habituation of cubs to their caretakers is an important consideration during the rehabilitation process. For very young cubs that enter rehabilitation facilities, it is very difficult to avoid some degree of habituation because the cubs have to be hand fed for several weeks and may require social contact with other cubs or their caretaker to adjust to their new environment. Fortunately, habituation to people at this stage in their life can be negated by actively discouraging interactions between the caretakers and the cubs after they are weaned. Providing the cubs with an opportunity to socialize with other cubs also redirects their focus from their caretaker. Eventually they become disinterested in actively engaging their caretakers, especially if they receive negative stimuli during any attempts to interact with the caretaker. All participants at the workshop indicated that restricting the number of caretakers to 1 or 2 individuals was important. Individuals using an “assisted” release strategy should also give cubs access to natural environment shortly after the cubs are weaned.

Feeding:
Very young cubs need formula that is high in calories, protein and fat, while low in carbohydrates and should be fed every 2-3 hours around the clock. Researchers experimenting with various formulas while raising brown bear cubs from three separate litters concluded that a formula composed of 24% fat, 12% protein and very few carbohydrates simulated the caloric quality of bear milk and resulted in faster cub growth rates than artificial diets high in carbohydrates (Huber et al. 1993). Milk of bears has higher levels of fat and protein, and lower levels of lactose than what is found in milk from cows. When choosing a milk substitute for hand-raising bear cubs, considerations of casein, whey, and lactase and curd formation in stomach are as important as fat, protein and carbohydrate composition. Recommended formulas available in the market are made of puppy milk replacer (Esbilac® or Multimilk®, PetAg). Cow milk carries the risk of forming lactobezoars (concretions of milk solids) in the intestinal tract of bear cubs, which can be a critical, if not

life-threatening, issue. Certain species of bears, such as sun bears, giant pandas, sloth bears and spectacled bears appear particularly prone to forming lactobezoars. It is imperative that if the only available option is to feed milk from a source other than carnivore milk formulas, it must be pre-digested with lactase prior to feeding (add 1-2 drops of liquid lactase per 100 ml milk and refrigerate for 24 hours prior to use, or predigest the milk in a water bath at 32-35 degrees C for 90 minutes and then stored in refrigerator (K. Loeffler, pers. comm. May 2008). Cubs must be carefully monitored for bloating, inappetance, discomfort and constipation.

As cubs get older, the number of feedings per day and the quantity of food can be tapered off to 10-20 percent of their body weight (Lintzenich et al. 2006). Cubs generally wean themselves from the bottle at 5 to 6 months of age, but they can be forcibly weaned at a much earlier age. Weaning cubs at an earlier age may help in breaking the bond that develops between cub and caretaker and assist in reducing the level of habituation. At weaning, their diet consists primarily of fruits, dry dog food (for nutritional balance), hard mast species (nuts), some vegetables, and occasionally fish or the carcasses of wild animals. Solid foods can be presented to bears in a variety of ways (scattered, hidden, chunks, etc.) to increase behavioral enrichment in the enclosure and to encourage the bears to search for their food as they do in the wild. Some participants at the workshop suggested feeding bears remotely to reduce the probability that cubs would associate receiving food with people. Others also did not allow conversation to occur in the presence of the cubs at feeding for the same reason. It is not clear how effective these approaches are in reducing habituation or the association of food with people, but they certainly are not harmful to the process.

Socialization of cubs:
Allowing cubs to socialize with one another during the rehabilitation process is important in reducing the potential for habituation with their human caretakers. While raising cubs together encourages natural behaviors as they interact with one another, it also reduces their focus on the caretakers. This is a critical factor for rehabilitators using “hard” release methods, where it is important for cubs to adapt quickly to a new environment after their release and to avoid contact with people. It is also a consideration for rehabilitators using an “assisted” release strategy because they also want to encourage those same natural behaviors, while maintaining limited habituation to caretakers during the period the cubs get acclimatized to their release sites and are gradually released back to the wild. Play behavior is also critical to normal social and physical development of cubs. Moreover, housing cubs together provides opportunity for them to substitute one another for the close physical contact that they normally experience with their mothers.

There was some discussion about mixing various age groups of cubs in the rehabilitation facility and also mixing different species of bears. Many participants were uncomfortable with the idea that cubs of different ages or species could be housed together. There were also examples of negative outcomes when new arrivals were introduced into an enclosure with an established group of cubs. In contrast, other participants cited experiences

where they had no difficulty with mixing cubs of various ages, different species (North American brown bears and American black bears), and introducing new cubs into an enclosure with an established group of cubs. Attempts to introduce new cubs, regardless of age or species differences, should be approached cautiously and gradually.

Best Practices:

- Quarantine new arrivals for 2-4 weeks prior to introducing them into enclosures with other cubs.
- Provide prophylactic treatment against potential disease organisms and parasitic infestations.
- Minimize human contact with bears to 1-2 primary caretakers.
- Discourage direct interactions between cubs and caretakers.
- Allow socialization among cubs.
- Mimic natural environment as much as possible within enclosures and provide behavioral enrichment to encourage natural behaviors.
- Provide protection from weather extremes.
- Wean cubs at 2-3 months of age.
- Provide natural foods prior to release.
- Scatter foods within the enclosure to encourage natural feeding patterns and vary feeding schedule to minimize stereotypic (pacing) response in anticipation of feeding.

Evening Presentation

Survival and behaviour of orphaned and rehabilitated black bears in Central Ontario, Canada: A radio-telemetry monitoring study. - Mr. Matthew Binks* and Dr. Joseph Hamr (Presented by Dr. John Beecham)

Sixty orphaned and rehabilitated black bear yearlings (30 males, 30 females) from 3 central Ontario wildlife shelters were radio-collared prior to release in the spring of 2002 and monitored until emergence from dens in March-April 2003. Cubs were rehabilitated using different strategies at the three facilities.

At Lakeland Lodge facility, human-bear interaction was not avoided. The cubs were often hand-fed from within the enclosure, allowing bears and humans close contact on a daily basis. The vast majority of food provided to the animals was stale doughnuts and muffins donated by local restaurants. Occasionally, the bears were given candies and other sweets by hand. They were spoken to, named and cared for as pets.

The second rehabilitation facility, Aspen Valley, is an animal sanctuary that deals with multiple wildlife species. It houses cubs in small enclosures (1-2 cubs) that are set up under a roof in a single row. A plastic barrel that is open at one end offers a den site, should the animal attempt to hibernate. The facility also has a large, fenced area that allows bears to be rehabilitated in a semi-natural environment. A wooden shelter is provided for protection from elements and as a potential den. The bears are free to excavate dens in the enclosure. In order to facilitate hibernation, Aspen Valley reduces feeding as denning season approaches and most cubs hibernate for part or all of the winter season. Aspen Valley operates as both a rehabilitation and educational facility. One aspect of the educational program allowed individuals or groups to visit and observe some of the animals being rehabilitated. Exposure to visitors would enhance habituation opportunities. Feeding also brought bears in contact with humans as the facility did not practice blind feedings. Unlike Lakeland Lodge, Aspen Valley employees did not interact with the cubs. Food was placed in the enclosures with care taken to avoid direct interaction. Food consisted of donated dry dog food, apples and doughnuts.

The third facility, Bear With Us also used dry dog food and as much fruit and vegetables as possible. The feeding procedure involved as little contact with animals as possible. Several screens were set up to shield bears visually from an individual bringing food. Food was placed in an antechamber and bears were not allowed access to the food until the rehabilitator had left the immediate area. For the most part, bears remained wary of the rehabilitator throughout their time at the shelter. Bear With Us encouraged hibernation in the captive animals by gradually reducing food as denning season approached. All of the animals engaged in at least partial hibernation.

Twelve wild yearling cubs were radio-collared as part of a control sample of bears during the study. Control animals were trapped using either a mobile box-trap or a mobile barrel trap. These animals were sedated using the standard drug protocol. During sedation, animals were removed from the

traps and measurements taken from the study bears. All animals were also weighed, sexed and radio-collared. The control animals were allowed to recover from sedation before relocation to previously used release sites.

Release locations (at least 2 km between sites) were scattered along remote bush roads and trails. This release pattern facilitated monitoring logistics, maintained bears in the habitat of their origin (upper Great Lakes-St. Lawrence ecotonal forest) and avoided immediate conflicts with humans in residential areas. Bear population densities for this area varied from 30 to 60 per 100 km^2.

During winter den-checks a set of morphometric parameters were obtained. These measurements were used to assess the body condition of the orphaned bears using Body-Condition Index (BCI) for Ursids (*in* Binks 2008). BCI scores of the orphaned animals were compared to those of nuisance bears of the same cohort captured in early May 2003 in the study area. Data on insulative properties, elevation, slope and aspect of 25 examined dens allowed for further interpretation of BCI scores. Post-release movements of orphaned and rehabilitated bears were systematically monitored by radio-telemetry. Bears dispersed on the average 33.7 km from the release site, with a maximum distance over 400km. **No differences were observed in survival rates, den use, or propensity for involvement in conflict activity among the three (3) facilities or the control group of bears.**

* Binks, Matthew. 2008. Post-release behaviour and survival of shelter reared, juvenile black bears in central Ontario. M.S. Thesis, Laurentian Univ. Sudbury, Ontario, Canada. 92pp.

Session 3. Criteria for Making Decisions about the Suitability of Bears for Release.

Facilitators: Mr. Curt Clumpner and Ms. Karina Agaronyan

Summary of Invited Presentations

Suitability of rehabilitated brown bears for release – Dr. Valentin Pazhetnov and Mr. Valentin Pazhetnov, Jr.

Dr. Pazhetnov believes that the main factor influencing the successful release of orphaned cubs is the level of habituation to humans. Bears raised at OBRP are typically released in managed forests where logging, recreation, and berry picking are common activities. Dr. Pazhetnov suggested that if the bears did not demonstrate strong avoidance to humans, they would likely be killed shortly after release. Another factor affecting the suitability of cubs for release was their body condition and overall health status. Cubs from OBRP are usually released at 7-8 months of age and are all given antihelmentics and rabies vaccinations prior to release. Valentin also believes that it is important to release cubs in a forested area frequented by few people and that information on the status of the resident bear population in the release area is available. All cubs should be marked with ear tags. Valentin and Sergey have recently been marking cubs with radio transmitters for monitoring their survival, post-release movements, and behavior.

Limitations to the release of rehabilitated bears – Dr. Djuro Huber

Dr. Huber is a member of the Faculty at the Veterinary College, University of Zagreb in Croatia. Djuro described the ecology of brown bears in central Europe, emphasizing aspects of their ecology that makes the release of cubs challenging. In his opinion, there are very few remaining natural habitats remaining in western and central Europe large enough to provide adequate habitat for most individual bears, much less populations. Dr. Huber suggested that placement in properly managed sanctuaries was a viable option for orphaned brown bear cubs that had become habituated to people. These sanctuaries would provide an opportunity to educate the public about bear ecology and conservation, while functioning as a repository for orphaned cubs.

An experiment of returning brown bear cubs into the wild at the northern edge of the brown bear range – Dr. Olga Makarova

Full presentation is included in Appendix IV by A.M. Khokhlov and O.A. Makarova (page 103).

Monitoring released Asiatic black bears – Mr. Sergey Pizuik

Mr. Pizuik is a Ph.D. student working in the Ussuri forest in the southern part of the Russian Far East (RFE) on Asiatic black bears. Mr. Pizuik briefly

discussed bear ecology in the RFE and his experiences releasing cubs back to the wild. He indicated that cubs were being orphaned as a result of poaching activity to satisfy the demand for bear parts in China (paws and gall bladders) and for cubs as pets. Mr. Pizuik estimated that about 50 cubs are brought into rehabilitation centers each year in the RFE.

Sergey indicated that cubs raised in captivity, exposed to frequent human contact and fed by hand became habituated to humans and were not good candidates for release back to the wild because they tended to seek out contact with humans after their release. However, Mr. Pizuik's group has been successful in releasing cubs, which were isolated from human contact during the rehabilitation process. He found that small cubs that were orphaned or abandoned during the denning period were capable of surviving the remainder of the winter period if they were provided with nesting material and shelter until spring and then released. Mr. Pizuik indicated that they are currently using Dr. Pazhetnov's rehabilitation protocol for raising and releasing cubs.

Summary of Work Session

It appears that there are no significant differences among species, with the exception of polar bears, in assessing their suitability for release back to the wild. Polar bears are primarily carnivorous and the ability to hunt seals out on the sea ice presents rehabilitators with a major challenge in terms of preparing orphaned cubs for release. Predatory skills are often learned through trial and error and rehabilitators have found it difficult to train cubs to hunt in a captive environment. However, in areas with abundant prey or marine mammal carcasses for scavenging, it may be possible to successfully release cubs (Ovsyanikov, pers. comm., this workshop). Predatory behavior in other species of bears is generally opportunistic and of less importance as a foraging strategy. The survival of released cubs is largely dependent on three essential prerequisites prior to release. They need 1) adequate natural forage, 2) to avoid people, and 3) to avoid being preyed upon by large bears or other predators.

Foraging Skills:
Most, if not all, the skills released cubs need for survival in the wild are innate and do not need to be taught during the rehabilitation process. Cubs taken into captivity prior to leaving their maternal dens have constructed winter dens, fed on natural foods after release, and demonstrated other natural behaviors when threatened, such as lip curls and vocalizations. (Beecham 2006, Pazhetnov pers. comm., this workshop). Rehabilitators that use an "assisted" release strategy, where cubs are walked in the forest by 1 or 2 caretakers, have also reported that cubs appear to know which natural foods to select while foraging (Ashraf pers. comm., this workshop). Other rehabilitators using a similar release strategy report that cubs will taste a wide variety of plants while foraging, and select only those that provide adequate nutrition (Kilham pers. comm., this workshop).

Behavior:
It is evident that each cub has a "personality" that is unique from those of other bears and that they may respond differently to the rehabilitation process

than their siblings or other cubs in the facility. Assessing the suitability of cubs for release often involves evaluating the level of habituation that has occurred prior to or during the rehabilitation process. The behavior of most cubs, especially those allowed to socialize with other cubs, evolves over time. Cubs usually reach a point in the rehabilitation process (usually near the time of natural family break-up in the wild) where they appear to tolerate the presence of their caretakers, but do not seek them out for food or attention. However, other cubs may continue to display habituation behaviors (begging for food, seeking out contact with caretakers) throughout their time in captivity and are not suitable candidates for release in areas where the probability of them coming into contact with people is moderate to high. Highly habituated cubs may be suitable candidates for release in remote areas or using "assisted" release methods, where it is feasible to use that methodology, because they will eventually adopt an indifferent, avoidant attitude towards their caretakers and other people.

Although there are few, if any, differences among bear species when assessing their suitability for release, there are differences in public perception about the dangers and risks associated with releasing orphaned cubs. There are no documented cases of released cubs causing harm to anyone after their release. However, this does not diminish the perceived threat that some people may feel from released cubs, and strongly suggests the need for public education programs on rehabilitation efforts, particularly in release areas. Released cubs occasionally become involved in conflicts with humans and that potential needs to be fully considered in determining if a cub is suitable for release. This consideration is particularly important with regard to the landscape characteristics of the release site, including level of human habitation and activity in the area.

The importance of wariness in released cubs extends to not only to humans it may encounter in the forest, but also to other animals, especially large predators. Adult bears, leopards and other large predators occasionally prey on small bears and can be a significant source of mortality. Habituated cubs are often slow to respond to threats in their environment and may fall prey to predators more frequently than their wild counterparts.

Maternal Protection:
American black bear and brown bear cubs are known to survive in the wild after being orphaned at 5 and 7 months of age, respectively. However, cubs that are orphaned at that age likely have lower survival rates than those who gain independence from their mothers when they are older and larger in size. Wild bear cubs typically begin supplementing the nourishment they get from nursing as soon as they are able to travel with their mothers, by feeding on both herbaceous plants and any animal protein available to them. The maternal bond extends beyond the age when cubs are weaned primarily to provide the cubs protection from other bears and from large predators, while they are too small to defend themselves. Several participants in this workshop (Ashraf, Beecham, Skripova, Bereczky, and Pazhetnov, pers. comm.) related examples of predation occurring on cubs released prior to the age at which natural family break-up would occur in the wild. Predation was documented

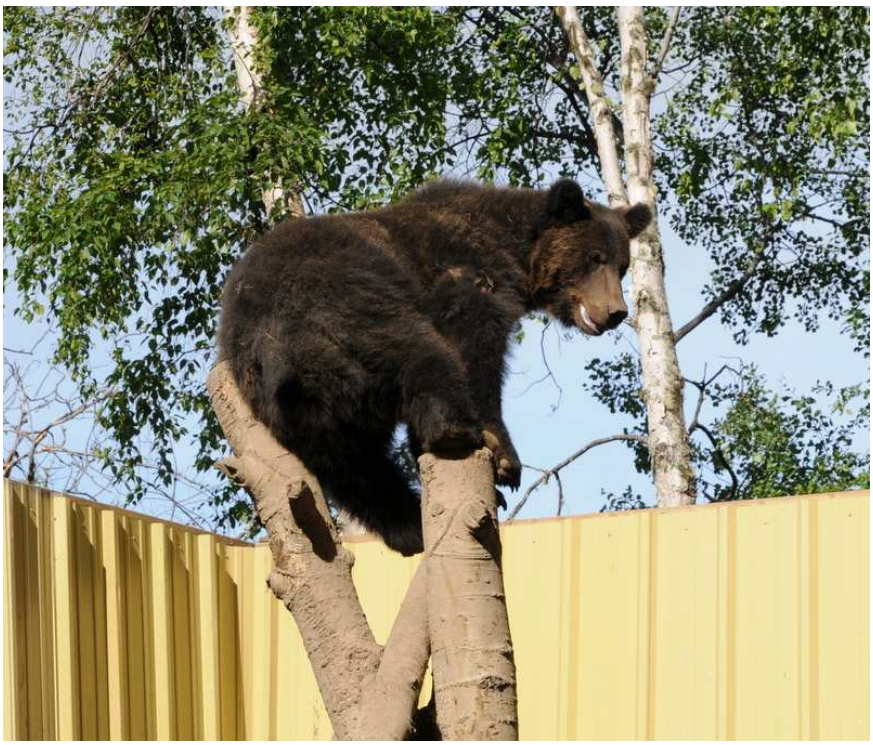
on released cubs by other bears, leopards, wolves, lynx, and tigers. As a result, many workshop participants recommended releasing cubs at or near the age at which normal family break-up would occur (17 to18 months of age in many species) rather than at 7 to 8 months of age. The "assisted" release methodology used by some rehabilitators (Ashraf, Fredriksson, and Kilham, pers. comm., this workshop) mimics the natural patterns of development in cubs by allowing the cubs to acclimatize to the release area, while caretakers provide them with protection from predators.

Genetic Considerations:
Genetic considerations frequently are cited as a major concern regarding the decision to release orphaned or captive-bred bears into the wild. The primary concern involves the loss of genetic integrity in the recipient bear population as a result of hybridization. The level of genetic diversity among conspecific bear populations varies considerably, and is a reasonable indicator of geographic separation over time. Bear populations that have been isolated for centuries from other populations of the same species are known to possess detectable differences in genetic make-up, resulting in a unique genetic signature for the population. The issue of genetic "pollution" as a result of hybridization is not a relevant concern in situations where the provenance (capture location) of the orphaned cub is known and the proposed release location is within the same geographical range of the species. In situations where the provenance of the cub is unknown, genetic testing of the cub and the recipient bear population prior to release is the only safe, ethical approach (Beecham 2006).

The genetic and biological implications of the relationship between the level of genetic diversity and the "health" of wild bear populations are complex and not clearly understood. Examining the issue from another perspective, there may be some potential benefit from releasing orphaned bear cubs into small, isolated bear populations. Isolated bear populations generally show a loss of genetic diversity within the population because of inbreeding (Waits 1996, Waits et. al. 1998, McCarthy et al. 2009). Genetic distance is a function of geographic distance and the characteristics of the intervening landscape (Paetkau et. al. 1998). Releasing orphaned cubs into these environments may be used as an intrusive management option designed to prevent the loss of genetic variability in "at risk" bear populations.

Best Practices:
- Only release bears that are in excellent physical condition (intact teeth and claws) and with no physical challenges that would prevent their survival in the wild.
- Release bears when they are old enough and large enough to defend themselves from predators.
- Release bears that are genetically compatible with those in the release area.
- Release bears when natural food resources are abundant in the release area.
- In temperate climates, consider winter releases when few people are using the forest.

- Release only bears that appear wary of, and are inclined to avoid people.



Session 4. Release and Post-Release Monitoring of Bears.

Facilitators: Dr. John Knight and Dr. Nikita Ovsyanikov

Summary of Invited Presentations

Criteria for the suitability of release sites, optimum habitat for bears, and improving post-release survival success. – Mr. Dave Jackson

Dave Jackson is the project coordinator for the Andean Bear Project (ABP), which is located in the Yanahurco Reserve in northern Ecuador. Under the direction of Armando Castellanos, the project leader, the ABP has been involved in rehabilitation efforts for Andean (spectacled) bears since 1995. The group is also involved in ecological studies of Andean bears. ABP works with local communities on human-bear conflict issues and conducts educational programs on the ecology of Andean bears in local communities. Dave and Armando use a hard release strategy for releasing bears back to the wild at 1.5 to 3 years of age. To date, 2 of 8 releases can be considered successful. Bears released between 1995 and 1998 were not successful. Failure of these releases was attributed to the young age of the bears at release (2 to 3 years old), poor choice of release sites (too close to human settlements), and parasitism. One of the successfully released cubs has since produced a litter of cubs.

ABP personnel examine bears prior to release to ensure that they are in good physical condition. All bears receive treatment for parasites, antibiotics and vitamins prior to release. Bears are now released in remote areas with few human settlements. Measures of success for ABP releases include survival, establishment of a home range and breeding activity with wild bears in the area.

Special methods used for post-release monitoring of brown bears in Romania: – Mr. Leonardo Bereczky

Mr. Leonardo Bereczky is the project coordinator for the Vier Pfoten brown bear rehabilitation project in Romania. The project began in 2004 and is located in a remote area outside of the town of Belan in the Eastern Carpathian Mountains. The project site is not accessible to the public. Rescued brown bear cubs are housed in three enclosures during the rehabilitation process. The first enclosure, about 0.5 ha in size, is used to acclimate the cubs to captivity. It is constructed from chain link and electric fencing to keep the bears inside the enclosure. A second, 5 ha electrified fence enclosure (with no chain link fencing) is located adjacent to the acclimatization enclosure. The cubs are moved into this enclosure after they have become accustomed to the electric fencing, usually after a 3 to5 week period. The third enclosure, constructed entirely of electrified fencing, is approximately 8 ha in size and is connected

directly to the second enclosure. All three enclosures contain mixed forest/shrub vegetation cover and the cubs that are being raised at the facility are all radio-collared to make sure that they can be recaptured if they escape from the enclosures during the rehabilitation process. The vegetation cover within the enclosures provides up to 50% of the food consumed by the bears during some seasons. Leonardo supplements their food supplies with apples, meat and other vegetables as required during the year.

Leonardo originally tried releasing cubs from the facility at 7 to 8 months of age, but was not successful due to predation by adult brown bears or other predators (wolf and lynx). He now releases bears at 1.5 to 2 years of age and monitors them via telemetry from an ultra-light aircraft or via GPS-GSM radio collars. Success criteria include post-release avoidance of humans (no conflict behavior), survival, and reproductive success.

Release strategies used by various rehabilitation programs and monitoring results – Dr. John Beecham

Dr. Beecham has been involved in rehabilitation of orphaned bear cubs since 1972 and is currently responsible for the release of bears from the Idaho Black Bear Rehabilitation (IBBR) facility in Boise, Idaho. John recently completed a white paper on the rehabilitation and release of orphan bear cubs and was involved in organizing this workshop. John presented information on factors surrounding the release and monitoring of bear cubs. His presentation highlighted considerations related to selecting a release site, such as obtaining release site approvals from appropriate governmental agencies, performing habitat assessments to ensure that the area is historical bear habitat and large enough to support a viable bear population, and has adequate natural food resources. Other factors that can influence the suitability of a release site include: presence of other large predators, potential for intraspecific competition, genetic diversity and integrity issues, and the need to prevent the introduction of diseases and parasites into the resident bear population. He briefly discussed factors associated with determining the suitability of cubs for release (physical condition, behavior, and socialization) and release strategies that have been used to release cubs back to the wild (fostering, summer/fall, spring, winter, and assisted releases). John outlined the importance of monitoring releases and discussed the various objectives that are often associated with monitoring efforts (nuisance behavior, survival, and reproduction). He also emphasized the need to develop an intervention plan for bear releases that identified factors responsible for monitoring releases. The intervention plan would also include frequency and duration of the monitoring effort, identify members who would respond to a potential conflict situation, and options for resolving conflicts.

Summary of Work Session

Release site selection is an integral part of the rehabilitation process and, in some cases, dictates the methods used during the rehabilitation process. Selection of remote areas for release provides rehabilitators more flexibility in their approach to rehabilitation than are available to rehabilitators who must release bears in human dominated landscapes. Several factors should be considered in selecting an appropriate release site, including habitat related variables and other factors that may significantly affect the probability of cubs surviving after their release.

Habitat Variables:
A primary consideration in selecting a release site is the characteristics of the habitat. The habitat should be within the historic or current distribution range of the species, large enough to accommodate a viable population of bears, and have sufficient food resources, water, and vegetative cover to be classified as good quality habitat. Other important considerations are land-use issues. The presence of human settlements on the landscape can affect the success of releases, as well as how the land is being used. The potential for human-bear conflict increases dramatically in areas where human densities are high and agricultural pursuits (livestock grazing, orchards, apiaries, etc.) dominate the landscape. Recreation and resource extraction activities may also be important factors influencing the success of release efforts and should be considered during the release site selection process.

Other Ecological Variables:
A variety of other factors may influence the selection of a release site, including the status of the resident bear population, the presence of large predators, cultural considerations, and political constraints. Competition for resources is often cited as a concern regarding the release of orphan bear cubs into an area that is currently occupied bear habitat. The social structure of bears revolves around a dominance hierarchy system that results in dominant individuals gaining access to limited resources (food, mates, etc.) before sub-dominant bears. Where resources are plentiful all bears have access to those resources. Competition occurs when resources are limited, and it is unlikely that (young) released bears would be able to successfully compete with dominant, resident bears. Where competition does occur, it is likely that released bears, rather than resident bears, are adversely affected. The social organization of bears suggests that survival rates of released cubs may be enhanced by choosing release sites where the social structure of the resident bear population has been disrupted (i.e. hunting), which would typically result in fewer adult males and less competition for food resources, rather than releasing them in protected areas where the resident bear population is stable and dominated by large adults.

The presence of large predators in the release area may also affect survival rates. Several workshop participants cited examples of altering the methods they used to rehabilitate cubs based on the presence of large predators in the release areas that were available to them. In most cases, those participants

chose to release their cubs later (17 to 18 months of age rather than at 7 to 8 months of age), when the cubs were larger and better able to defend themselves against predators. Others elected to use an "assisted" release strategy, where caretakers walked the cubs in the forest each day, gradually increasing the area covered over 4 to 7 months, while providing the cubs with protection from predators.

In many countries, resident wildlife species are considered the property of the government and the "state" is responsible for instituting protective laws and regulations and management programs for those species. As a result, selecting appropriate release sites generally requires direct involvement of government officials in the release process, or at least obtaining the necessary permissions and permits from governmental agencies to release cubs into the wild. In those countries where rehabilitation programs are operated by the government, selection of release sites is an integral part of the operation of the facility. It is important to consider cultural factors in selecting a release site, to properly inform and educate the public in the vicinity of the release location and to gain its support for the program.

Timing for Releases:
In addition to size and age of the cubs, release site characteristics significantly influence the timing of releases. Factors such as the abundance of natural food resources, seasonal weather patterns, and human activity patterns are important determinants of optimal release times. Food resources are often available seasonally and are patchy in distribution. Timing releases so that they correspond with the availability of natural foods enhances the probability that cubs will successfully transition to the wild without becoming involved in conflict situations. In those situations where high levels of human activity preclude releasing bears during abundant food periods, alternatives such as placing the cubs in winter dens (in temperate climates) or choosing a remote site for the release may be considered. In areas where bears do not den, human activity is distributed evenly throughout the year, or large predators are a primary concern, using an "assisted" release strategy may be the best alternative. A major cause of mortality in bear populations is human activity (legal hunting, poaching, etc.). Although cubs typically adjust quickly to living in the wild (within several weeks) there is an adjustment period after their release where they may be more vulnerable to hunters and/or poachers. It is advisable to release cubs outside the time frame for legal hunting seasons or excessive poaching activity to minimize the chances that cubs may be killed shortly after their release.

Release Strategies:
Preferred release strategies are often based on ecological differences among regions (hibernate during a portion of the year vs. remain active all year). The primary goal is to maximize survival rates within the context of constraints imposed by the environment, the age and physical condition of cubs entering rehabilitation, and the level of human activity that is occurring in the release area. A variety of methods have been used successfully to release cubs back to the wild.

Fostering- Fostering cubs to wild females can be logistically challenging and is not a common technique for returning orphaned cubs to the wild. However, it has been used successfully with American black bears (Alt and Beecham 1984) and with limited success with polar bears in Manitoba, Canada (Hood pers. comm., this workshop). A significant limiting factor for using this method is locating suitable foster mothers in situations where the addition of one or more foster cubs would not put undue stress on the adopting mother's family group. The additional stress associated with adopting additional cubs can be difficult, especially if the cubs are still nursing. Lactating American black bears readily accepted orphan cubs introduced into their dens. The process of fostering cubs is more difficult for older cubs that are introduced to adult females who have left their winter dens. In those cases, it is necessary to capture the female and her natural offspring and then place the orphaned cub(s) with the family group while the female was tranquilized. Vicks vapor rub can be placed in the nose of the adult female to interfere with her sense of smell and to facilitate her acceptance of the orphaned cub(s). That same procedure was used with polar bears in Manitoba. However, it is unclear if, and for how long, the application of Vicks vapor rub affected the female's ability to hunt, and if it did, for what duration of time. Ovsyanikov (pers. comm., this workshop) indicated that he has observed natural adoption in polar bears when food resources were abundant. Conversely, he has also observed females killing unrelated cubs during periods of food shortages.

Summer/Fall Releases- Bear cubs are self-sufficient as early as 5 to 7 months of age and can be released when food resources are plentiful. This technique has been used quite successfully by a variety of rehabilitators. Preliminary data from these releases, however, suggests that cubs released prior to the age of 9 months have lower survival rates than cubs released near the age of natural family break-up (17 to 19 months of age). The high mortality rates have been attributed to predation by large carnivores, including bears, and conflicts with people. Summer/Fall releases are logistically easy and cost effective because the cubs were maintained at the rehabilitation center for shorter periods of time and released at a younger age (5 to7 months).

Spring Releases- Releases that occur near the time of natural family break-up are common and result in good survival rates. Food resources are typically abundant at this time of year and high in protein content. Early spring releases usually occur before people commence using forest habitats heavily and cubs have an extended period of time to adjust to their new environment. Spring releases require that cubs be held over winter in temperate climates. In this situation, cubs are frequently forced into hibernation during the winter period by withdrawing food, although they may be fed throughout the winter period. This decision depends in part on the physical condition of the cub in the autumn and whether it has sufficient resources to withstand a denning period. Spring releases are logistically simple, but are more costly than summer/fall releases, especially for cubs that are fed through the winter.

Winter Releases- In temperate climates, there are two common approaches used for winter release: 1) release the cubs in early winter without

providing a winter den for them (Karen Noyce, pers. comm., Nov. 2007) or 2) place them in a natural or artificial den in mid-winter. Cubs have an innate ability to recognize when, where and how to select and prepare a winter den. This makes early winter releases logistically easier than mid-winter releases and more cost effective than spring releases. Placing cubs in winter dens has also been a very effective approach for successfully releasing cubs. The major advantage of winter releases is the cubs typically emerge from the dens at a time when human use of the forest is negligible and they have adequate time to adjust to their new environment before significant human activity occurs in the spring. Mid-winter releases are definitely more challenging, but excellent success rates make the effort worthwhile.

Soft Releases- This release strategy is not commonly used because many rehabilitators do not have the financial resources necessary to fund the process, nor do they have access to appropriate release sites. Soft releases require that the animal be confined to an enclosure at the release site for a period of time (weeks or months) prior to its release. In some cases, the enclosure is located at the rehabilitation facility and it is simply opened up when it is time to release the cubs. In these situations, the cub is free to leave when it chooses and may even be provided with supplemental food in the enclosure for a short transition period. Another approach is to place the cubs in an enclosure that is located some distance from the rehabilitation facility, hold it there for a period of weeks or months and then to release the cub directly from the enclosure. This approach is more difficult logistically and is more expensive than soft releases that occur directly from the rehabilitation facility. Rehabilitation facilities that are located in rural or remote areas have used soft releases for bears, but most facilities are not located in areas where the use of this method is practical or feasible (Bereczky, Jackson, Kilham and Pazhetnov pers. comm., this workshop).

Assisted Releases- This release strategy is similar to a soft release approach except that the cubs are taken for daily walks in the surrounding forest and returned to the enclosure at night. Frequent contact between cubs and 1 or 2 caretakers is critical to the rehabilitation process where the "assisted" release method is used to place cubs back in the wild. This method requires that the cubs be imprinted on their caretakers at an early age, so that they will stay with the caretakers during their forays into the forest. The walks in the forest begin shortly after the cubs are weaned and continue until the cubs are approximately 18 months of age. The caretakers provide the cubs with a level of protection while the cubs are acclimating to their forest habitat. Over time, the cubs become independent of the caretakers and, eventually, refuse to return to the enclosure at night. Supplemental food is provided to the cubs in the enclosure for a period of time after "chaperoned" walks are discontinued, but not all cubs will return to the enclosure to feed. The advantage of an assisted release approach is that it allows the cubs to acclimatize over a period of time to their new habitat, while being protected from large predator by their caretakers. The primary disadvantages are the logistical challenges of walking the cubs in the forest every day for several months, and the cost of labor associated with hiring caretakers to walk the cubs. Participants attending this workshop have used this approach

successfully in Russia (Pazhetnov), North America (Kilham), Indonesia (Fredriksson) and India (Ashraf).

Monitoring:
A critical part of the rehabilitation process involves monitoring the success of the released cubs. Monitoring entails a variety of considerations, including the objectives of the monitoring effort, methods used, frequency and duration of monitoring, budget, and geographical constraints. The overall goal of the monitoring effort is to determine how well the rehabilitation effort has succeeded in returning cubs to the wild. Beneath that umbrella, rehabilitators are concerned that: 1) movements and survival rates of the released cubs are not significantly different than those of their wild counterparts, 2) the released cubs do not become involved in conflict situations shortly after release, and 3) whether the released individuals become breeding members of the standing wild population of bears in the area.

Movements and Survival- The standard approach for monitoring cubs is to equip them with radio collars and to document their movements and survival rates for a period of months or years. Many rehabilitation efforts for bears are carried out by individuals and non-profit organizations (NGOs) that do not have the funding or manpower to conduct extensive monitoring efforts. As a result, most cubs are ear-tagged and released with no radio transmitters. In these situations, data are acquired opportunistically and are not timely in terms of using those data to improve rehabilitation methods from year to year or to intervene quickly in situations where the cubs are involved in conflict activities. However, a few rehabilitators have managed to collect detailed information on cub survival and movements using telemetry equipment (see the Ontario presentation on page 18). Recently, several rehabilitators have begun using GPS, GPS/GSM and GPS/Argos satellite radio collars to monitor bear movements and survival, despite the high cost of GPS radio collars. Monitoring for movements and survival typically occurs for up to 2 years after the cubs are released.

Conflict Activity- Every bear has the potential to become involved in conflict activity when environmental conditions negatively affect their natural food supplies. However, if released cubs do become involved in human-bear conflicts, they usually do so within a short period of time after their release. Monitoring for conflict activity therefore typically requires only short-term monitoring for 30 to 60 days after the cubs are released.

Reproduction- Collecting information on cubs entering the breeding population is rarely an objective of monitoring efforts because it requires tracking the cubs for 3 to7 years (age at first breeding for many bear species), and is often impractical and very expensive. However, cubs released in areas where bear research is on-going have been monitored for several years post-release, and reproductive activity has been documented in those cubs (Beecham, Jackson, Jeong, Kilham and Langen, pers. comm., this workshop).

Intervention Plans- Developing an intervention plan is clearly part of the monitoring process for conflict activity, but is treated separately here to

emphasize the importance of being prepared to take action should a released cub become involved in a conflict situation. The plan should be developed jointly among responsible wildlife agencies and rehabilitators prior to the release of any orphaned cubs.

The basic elements of the plan should include: 1) identifying who will be responsible for monitoring released cubs, 2) the frequency and the duration of the monitoring effort, 3) identifying who will respond to reports of potential conflicts, 4) what kinds of bear activity are considered conflicts worthy of intervention, and 5) how each type of conflict be resolved. Although the potential for released bears to become conflict animals exists, data from releases suggest that it is low. Nevertheless, it is important to be prepared to intervene, if necessary, to prevent or minimize damages by released cubs.

Evaluation- A critical component of the rehabilitation process is evaluating the results and using that information to improve how cubs are raised and subsequently released. Monitoring cubs using telemetry equipment is the only way to gather timely information about how released cubs adapt to their new environment. In areas where it is difficult to monitor cubs using standard VHF or GPS telemetry methods because of geographical constraints, it is important to find the financial resources necessary to use advanced technology to monitor cubs.

Best Practices:

- Evaluate habitat characteristics of the release location prior to releasing cubs to ensure suitability
- Monitor all releases and adjust release methods accordingly
- Develop intervention plans prior to releasing bears
- Ensure genetic compatibility between released bears and the recipient wild population
- Keep records for all releases, evaluate and publish results in peer reviewed articles
- Use appropriate release methodology for each species and geographic area

Evening Presentation

Lecture on behavior of black bear cubs raised loose in the wild. – Mr. Ben Kilham

Mr. Kilham presented an overview of his results from observing the behavior of three litters of cubs that he raised by walking them in the forest, followed by continued contact with some of them as adults. The subjects that he addressed were instinctive and learned behavior; spring, summer and fall foods; breeding, play, and olfactory marking behavior; and the social behavior of the black bear. He also discussed the behaviors that have the most relevance to bear rehabilitation.

According to Ben, black bears appear to be highly social and they form hierarchies with matriarchal control of female relatives that share a common home range. Similar results were found with brown bears in Norway (Zedrosser et al. 2007). These

observations suggest that bears are not solitary animals. Ben has witnessed forceful eviction of unrelated, introduced (rehabilitated) cubs from socially controlled home ranges, implying that the social structure of the resident bear population may be more important than current thinking suggests. The evicted cubs dispersed from the release area; two of the cubs were subsequently killed during the hunting season several kilometers from the release site. In areas like New Hampshire (northeastern USA), where hunting regulates populations, rehabilitated cubs have an easier time finding open home ranges. It was clear from other presentations at this conference that the situations and conditions on the ground vary greatly from location to location. These conditions should be reflected in telemetry data; animals that disperse relatively quickly would indicate socially controlled home ranges at the release site, and animals that are able to find stable home ranges quickly would reflect openings in the social structure. The reasons for these differences may vary from site to site.

Ben also presented evidence of black bear cubs eating fresh ungulate scat. He hypothesized that the bears were ingesting this material to inoculate their intestines with organisms that would aid in the digestion of cellulose. The bear cubs were also able to identify edible plants with the "Kilham Organ", which he believes is an accessory organ to the vomeronasal system that is designed to identify light aromatic molecules related to food identification and scent detection. It is with this system that cubs are able to find food when released and can learn independently of their natural mother's training. Ben suggested that cubs may learn what to eat by smelling their mother's breath as she foraged.

Ben identified two types of scent: 1) aromatic scent from sweat glands and 2) a scent of low volatility carried in the sebaceous oil. He described the function of the olfactory lobe in the brain and its relationship to the nasal epithelium and the accessory olfactory lobe and its relationship to the vomeronasal system. Ben mentioned both intentional and unintentional marking and how they relate to the complex olfactory communication that is a function of living in a food-sharing society. More information can be found in *Among the Bears*, Kilham and Gray, Henry Holt and Company, 2002.

Session 5. Threats to Bears: Bear Conservation and Welfare and the Role of Public Education.

Facilitators: Mr. Victor Watkins and Ms. Elena Sitnikova

Summary of Invited Presentations

Brown bears in Russia – Ms. Elena Sitnikova

Ms. Sitnikova is a scientist based in the Bryansky Les Nature Preserve about 500 kilometers southwest of Moscow. It borders the Ukraine and Belarus. Elena described the distribution of brown bears (a red listed species near the southern extent of its range in Russia) and indicated that there are two

populations in the Bryansky Preserve area. She has been working on brown bear restoration efforts in the Bryansky Preserve since 1996. Between 1996 and 2002, their group released several brown bear cubs that were raised at the Pazhetnov's facility and four (4) cubs that were raised locally. Two cubs released in 2002 were fitted with ear-tag transmitters, but the transmitters did not work very well and the team lost track of the cubs after the first autumn. In 2005, an ear-tagged adult female with a cub was observed in the Bryansky Preserve (most likely a female released in 2000), suggesting that at least one released cub survived for three (3) years and was actively breeding. Elena also indicated that hunters in the area were pleased with the restoration effort (based on a questionnaire her team developed). She reported that the hunters were cooperating with biologists in the area by reporting sightings and tracks of bears they encountered during the hunting season.

Brown bears in Estonia – Mr. Peep Mannil

Mr. Mannil described Estonia as a small country with a relatively large (600) population of bears. The country does not have a large population of people, but they are distributed throughout the country and there are few wild places for releasing bear cubs. The first cubs released by Mr. Mannil's group were raised initially at the Pazhetnov facility in Russia during 1998 and then released in Estonia. The following year the group took the orphaned cubs to Pazhetnov's facility and spent some time with the Pazhetnovs learning about their protocol for raising cubs. Estonia now has its own rehabilitation facility where they rehabilitate various species, from song birds to bears. To date, they have released 25 bears. Approximately 30% have gotten into conflict situations shortly after release, but only three (3) have been shot as conflict bears. The others eventually moved away from people and have not been involved in conflict behavior. Two 3-year-old released bears were killed by hunters.

Brown bear cub releases from Kazan Zoo – Dr. Alexander Malev

Dr. Malev described releasing 10 brown bear cubs born in captivity at the Kazan Zoo (Russia). The first 2 cubs were left with their mothers for four months and then were taken to the Pazhetnov's facility to evaluate their behavior and potential for release. The cubs were eventually released and did quite well in the wild. Since then an additional 8 cubs have been born in the Kazan Zoo, were raised for a period of 4 months by their mothers and were then released back to the wild in the Tartar region where bears are red listed. None have been involved in conflict situations, but they have not been monitored with telemetry equipment, so data on survival are lacking.

Wolf rehabilitation in northern Russia – Mr. Vladimir Bologov

Mr. Bologov uses the Pazhetnov protocol for raising and releasing wolf pups in the Bubonitsy area. He has raised 22 pups using the approach that Valentin uses for brown bear cubs, usually in groups of 1 to 6 animals. Once the animals reach one year of age, they are released by opening the enclosure and letting them leave when they choose. Mr. Bologov uses snow tracking during the winter months to follow the wolves and learn more about their territoriality, social behavior and winter diet.

Public education: Encouraging people to change their ways to live with wildlife – Ms. Angelika Langen

Ms. Langen discussed the benefits of educating the public about bear ecology and rehabilitation of orphaned cubs using examples from her experiences in British Columbia, Canada. Angelika pointed out that educating the public about the ecology of bears and their behavior can dispel many of the misperceptions that people have about various bear behaviors (e.g. the significance of a bear standing on its rear feet). She indicated that people in her province have been successful in changing governmental policies on how to deal with bear conflicts by educating the public about alternative ways to reduce conflicts. They have also experienced some success in changing governmental policies regarding releasing orphaned bear cubs by educating the public about the benefits of rehabilitation programs. Angelika argued for more stringent regulations to prevent people from allowing bears to have access to human foods. She also stated that it was important for those regulations to be enforced if we are to be successful in reducing human-bear conflicts near communities located in bear habitat.

Angelika pointed out one benefit of education that is not often mentioned: the recruitment of volunteers into rehabilitation programs. The encroachment of people into wildlife habitat has resulted in the need for additional rehabilitation programs in many countries. Education is an avenue for recruiting new rehabilitators and volunteers into existing programs.

Conservation threats and issues at stake in Southeast Asia – Ms. Gabriella Fredriksson

Ms. Fredriksson discussed the conservation status of Asiatic black bears and sun bears in Southeast Asia. The main threats to Asiatic black bears in Southeast Asia are poaching, particularly for body parts for markets in China, and habitat loss. Ms. Fredriksson indicated that China and Vietnam currently have about 12,000 and 4,000 to 5,000 bears in bile farms, respectively. Habitat loss due to large wild fires is a more significant threat to sun bears in Indonesia than poaching. Gabriella cited estimates of Asiatic black bear populations at about 50,000. There is a dearth of information on population numbers of sun bears in Asia, including information about their basic ecology. She suggested that the highest conservation priority for sun bears is to ascertain their distribution, evaluate habitat conditions and develop a monitoring protocol.

Bear welfare issues in Russia – Ms. Mila Danilova

Ms. Danilova described two issues that are priorities for IFAW in Russia: 1) the protection and conservation of brown bears and 2) welfare issues. Mila indicated that Russia has a population of about 120,000 to160,000 brown bears and the population appears to be stable. Brown bear hunting is legal in Russia, and is not a major threat to free-ranging populations. However, the winter hunt for bears does result in orphaned cubs, which is a welfare issue that is of concern to IFAW. Cubs are often orphaned at the den sites and either die, or are captured and placed in rehabilitation facilities, used to train hunting dogs, raised for consumption in restaurants, or exhibited as tourist attractions. Human-bear conflicts are rare in Russia and are not considered a significant threat to populations. Major threats are loss of habitat and habitat fragmentation, particularly as a result of logging activities.

IFAW has been working on hunting legislation for Russia since 1991 and is focusing its efforts primarily on ending the winter hunt for bears and protecting female bears accompanied by cubs. They have had some success influencing hunting regulations in local areas with the help of the Pazhetnovs. IFAW has also worked on legislation to protect captive bears where they are used to attract tourists in the larger cities and some outlying areas.

Summary of Work Session

The discussion during this session centered on identifying the welfare and conservation benefits of rehabilitation programs and approaches we might use to change the perception of rehabilitation by the public, scientists, and governmental officials. Although bears are legally protected in many countries, human encroachment into bear habitats will increase dramatically in the coming decades due to the exponential growth of human populations, which will increase the likelihood of human-bear conflicts and increased mortality rates for bears. Recent advances in technology allow people to work from their homes in rural areas, which may lead to additional pressures on bear habitat.

This scenario is typical in the U.S., Canada and parts of Europe where people are choosing to live in more rural areas rather than in the city. However, in many less developed countries, the situation is very different because the human population is abandoning rural areas and moving into the cities looking for employment. Many wildlife species are expanding into these abandoned rural areas, and populations, including those of bears, are recovering rapidly.

The illegal trade in wildlife and wildlife parts (e.g., bear gall bladders and paws) is also placing significant and ever-increasing pressure on the wild population of bears in Asia. Human encroachment and the activities associated with increasing multiple uses of forest habitats will continue to result in cubs being orphaned. The choices we face in deciding how to manage this challenge are limited to: 1) leaving the cubs in the wild to fend for themselves; 2) capturing them and placing them permanently in a zoo, sanctuary or research facility; 3) capturing them and placing them temporarily in a rehabilitation facility; or 4) euthanizing them (Beecham 2006). Suitable permanent facilities are not available in many areas for taking in orphaned cubs, which eliminates this option for most cubs. Public attitudes generally do not support leaving cubs in the wild where they may starve to death nor do they favor euthanizing small cubs. By necessity, that leaves rehabilitation as the most palatable option for many wildlife managers.

Welfare Value:

Rehabilitation and release of orphan bear cubs has recognizable welfare and conservation benefits. The primary benefits, from a welfare perspective, accrue to the individuals who are rescued and brought into a rehabilitation facility. Rehabilitation offers managers a better alternative than euthanasia and can free up resources for other animals kept in permanent captivity. Other than the distinct benefit to the cub, there is an extraordinary opportunity to use the plight of these cubs to raise public awareness about the causes of cub orphaning and the status of wild bear populations and their habitat. Public education efforts surrounding orphaned cubs provides a vehicle for teaching people about bear behavior and ecology, which can effectively improve the public perception of bears and their value to society.

Conservation Value:

The conservation value of bear rehabilitation efforts are more difficult to identify. Orphan bear cubs have been raised and released back to the wild for more than three decades, yet much of the information documenting the successes and failures of these efforts remains anecdotal. The participants in this workshop identified the need to collate existing information and to publish it in order to illustrate the conservation value of rehabilitation efforts to the scientific community and governmental entities. They also identified a need to place more emphasis on monitoring of released cubs for the documentation of the success of future releases and the causes of failure, and to prepare intervention plans that will guide how we respond to conflict situations involving released cubs. Conflict activities precipitated by released cubs have the potential to negatively affect bear conservation programs for

wild bears by negatively influencing public perceptions of the value of bears to society.

The methodologies that were described by participants in this workshop were largely developed from experience working in areas with abundant bear numbers. However, it is clear that these methods are reasonably robust and it is likely that they will be effective in future efforts to augment or restore bear numbers in areas where numbers are low and in which limiting factors have been identified and addressed. The first restoration project using orphaned cubs exclusively to repopulate an area where the native population was nearly extirpated is now occurring in South Korea using cubs raised in the Russian Far East (Lee and Jeong, South Korea; Skripova, RFE, pers. comm., this workshop). Another opportunity to use rehabilitation of bear cubs in a conservation context includes introducing new individuals into small, isolated populations where genetic diversity has become a concern. Maintaining genetic integrity in wild populations is an important concern for wildlife managers, and the loss of genetic diversity in some isolated populations is of equal concern.

Changing Perceptions:

Participants identified several actions that would work toward improving the perception of the public, scientists, and governmental administrators towards rehabilitation efforts for orphaned bear cubs. Among the suggestions were programs to educate stakeholders about the process and the results of efforts to release cubs back to the wild. Publishing popular and scientific papers and periodically holding workshops and conferences was considered valuable. These efforts would bring together people who have experience, or who are interested in raising and releasing cubs and may be a viable way to build confidence in the methodology that is currently being used to prepare cubs for life in the wild. Strategies for addressing the issue of bear cub rehabilitation will have to recognize that people living in urban environments have a different relationship to bears than those living in rural areas where conflicts with bears are a part of their everyday life. These programs, policies and regulations need to be flexible in order to address factors that may differ among regions and species of bears.

Controversial Issues and Practices to Avoid

There was general consensus among the participants that rehabilitation programs for orphaned bear cubs had welfare and conservation benefits. However, many of the individuals involved in rehabilitation efforts have developed the methods they currently use by trial and error and there are no accepted "standards" for rehabilitating cubs. It was clear from the workshop that there are many differences in the way cubs are raised across geographic regions and, to some extent, among species, to settle on a one-size-fits-all approach. The participants in this workshop documented several aspects of the rehabilitation process that are sensitive issues for wildlife professionals or that are practices which they would recommend avoiding. Those include:

Sensitive Issues -

- Little is known about the impacts of releasing cubs into occupied bear habitat. Are there valid concerns regarding issues related to competition, genetics, disease, etc.?
- Is appropriate medical screening occurring prior to releases to ensure that disease transmission is not a risk to resident wild bears?
- Are cubs being released only after a well designed monitoring program and intervention plan is in place?
- Why is there a lack of reporting on the results of releases (successes and failures)?
- Could (and would) funds spent for rehabilitation efforts be better spent on habitat or other conservation programs?
- Are welfare considerations an appropriate reason for releasing cubs where data are not available on the impacts of these releases on wild bear populations?

Practices to avoid

- Discourage releases in areas where the potential for human-bear conflicts are high.
- Discourage releases in areas where no legal protection exists for bears or the probability of success of bear establishment and survival is low.
- Discourage substandard practices in rehabilitation and release.
- Discourage close contact between the public and bear cubs in a rehabilitation environment.
- Discourage the release of underweight cubs or very young cubs (no bear cub before his time). Released bears should be large enough to defend themselves from predators (1.5 years of age and >25 kg.)
- Discourage unnecessary medical intervention or excessive handling to administer medical treatment.
- Do not release bears whose provenance of origin is unknown.
- Discourage releases of cubs without monitoring.
- Discourage releases in areas where there is public opposition.
- Discourage releases in areas where little information exists about the resident wild population of bears.

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Appendix I

Questions posed to participants for discussion during technical sessions 1-4.

Questions posed to participants for discussion during technical sessions 1-4.

1) What are the similarities in the approaches taken by the speakers?

2) What are the differences in the approaches taken by the speakers?

3) Are your methods significantly different, and if so, how?

4) Are there any successful or unsuccessful methods that you are aware of, which haven't been mentioned?

5) Do you have any questions?

Appendix II

Questions posed to participants in Session 5.

Questions posed to participants in Session 5.

1) Which outreach and education methods presented would be right for your situation?

2) What outreach and education techniques do you use, which are different to those presented?

3) What specific welfare and/or conservation issues does your activity address?

4) Do you have any questions?

Appendix III

List of Participants

Organizers

Name	Affiliation	Country
Karina Agaronyan	IFAW, Russia	Russia
John Beecham	Private Consultant	USA
AJ Cady	IFAW, USA	USA
Mila Danilova	IFAW, Russia	Russia
William Gasperini	IFAW, USA	USA
Valentin Pazhetnov	OBRP	Russia
Sergey Pazhetnov	OBRP	Russia
Anand Ramanathan	IFAW, USA	USA
Ian Robinson	IFAW, USA	USA
Maria Vorontsova	IFAW, Russia	Russia

Participants

Name	Affiliation	Country
N.V.K. Ashraf	Wildlife Trust of India	India
Leonardo Bereczky	Assoc. Conserving Natural Values	Romania
Vladimir Bologov	Central Forest Reserve	Russia
Curt Clumpner	Int. Bird Rescue Res. Ctr.	USA
Andrew Criswell	Thai Soc. Conserv. Wild Animals	Thailand
Kim Elmslie	IFAW, Canada	Canada
Gabriella Fredriksson	PANECO-YEL-SOCP	Indonesia
Tony Grant	Aspen Valley Wildl. Sanc.	Canada
Anatoly Khokhlov	Pasvik Nature Reserve	Russia
Djuro Huber	University of Zagreb	Croatia
Alison Hood	Born Free Foundation	UK
David Jackson	Andean Bear Project	Ecuador
Dong Hyuk Jeong	Species Restor. Ctr., NPS	S. Korea
Ben Kilham	Kilham Rehabilitation Ctr.	USA
Lee Bae Keun	Species Restor. Ctr., NPS	S. Korea
Edward Kruglov	Khabarovsk Rehab. Ctr.	Russia
John Knight	Vetcare Centers	UK

Angelika Langen	Northern Lights Rehab Ctr.	Canada
Kati Loeffler	Chengdu Res. Ctr. For Pandas	China
Olga Makarova	Pasvik Nature Reserve	Russia

Name	**Affiliation**	**Country**
Alexander Malev	Kazan Zoo	Russia
Peep Mannil	Ctr. Of Forest Protection and Silv.	Estonia
Nikita Ovsyanikov	Russian Academy of Sciences	Russia
Valentin Pazhetnov, Jr.	OBRP	Russia
Svetlana Pazhetnov	OBRP	Russia
Christopher Parker	Toronto Wildlife Center	Canada
Sergey Piziuk	Inst. Biology and Soil Sci.	Russia
Jeff Rohlman	Idaho Dept. Fish and Game	USA
Elena Sitnikova	Bryansky Nature Reserve	Russia
Kira Skripova	Ussuriisky Nature Reserve	Russia
Dianne Wittner	Alberta Inst. Wildlife Conserv.	Canada
Victor Watkins	WSPA	UK
Jackson Zee	IFAW, USA	USA

Interpreters

George Gause
Igor Sinicin
Saule Tuganbaeva
Vladimir Vetrov

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Veterinary considerations for rehabilitation and release of bear cubs (with emphasis on principles of anesthesia for bears)

Kati Loeffler, DVM, PhD

Director of Animal Health
Chengdu Research Base of Giant Panda Breeding
26# Panda Road, Fu Tou Shan, Northern Suburb
Chengdu, Sichuan Province, China 610081
Tel: +86 13980938242
katiloeffler@gmail.com

Current affiliation: International Fund for Animal Welfare, Beijing. Tel: +86 138 1080 7421, KATILOEFFLER@GMAIL.COM

Notes:
1. Drug doses recommended here are for Asiatic black bears, adapted in most cases from canine doses. Optimal doses for other species of bears may differ.
2. PO = per os (oral)
3. SQ = subcutaneous
4. IM = intramuscular
5. Analgesia: control of pain. Analgesics are drugs that control pain.
6. Peripheral perfusion refers to the blood circulation outside the body's core areas, e.g. in the extremities (arms and legs) and face.

Introduction

The aim in the rehabilitation of rescued bear cubs is to prepare them for release back into the wild as healthy individuals with an excellent chance to survive. Achievement of this aim depends in part on the degree of physical and emotional injury that the cubs have sustained and how well they are able to heal from the consequences of these injuries. This document provides an overview of the veterinary considerations for the rehabilitation of orphaned cubs to wild. Special emphasis has been placed on anesthesia, with a review of some of the important considerations for performing anesthetic procedures on any animal. While the involvement, or at least the input, of a qualified veterinarian is ideal, it is not always available. This document was written primarily for the lay person with a strong working knowledge of wildlife rehabilitation and common veterinary procedures. Some sections of this document supply details for veterinarians.

Initial Examination **-** At the time of rescue, the cub must be evaluated to establish his or her (for simplicity, henceforth 'his') need for emergency veterinary treatment. The cub's awareness of and responsiveness to external stimuli, his ability to move, physical coordination and signs of obvious injury should be assessed immediately. The necessity for anesthesia to carry out a physical examination and to administer treatment should be determined at this time. The need to use anesthesia to restrain a stressed and possibly compromised animal must be weighed against the safety needs of the human handlers and of the animal itself. If the cub appears stable and does not have life-threatening conditions that require immediate treatment, it is advisable to

delay anesthesia until he has had time to recover from the stress any physical trauma experienced prior to or during the rescue.

The information gained from the initial health check will determine to a significant degree how much human contact will be required during the rehabilitation process, immediate and long-term veterinary requirements, and the likelihood of the bear to be released following rehabilitation. The health check by a qualified veterinarian will likely include an evaluation of all major organ systems by physical examination and whatever diagnostic procedures are deemed necessary and feasible. Ideally, this includes a complete blood count (CBC) with white blood cell differential, serum biochemistry, serum antibody titers against endemic infectious diseases, fecal parasite exam and ultrasonography (Figure 1). Radiography, microbiology, skin scrapings or special assays may be performed as needed, based on the findings of the physical examination.

If a veterinarian is not available, the physical examination must be conducted as well as possible to assess the animal for obvious injuries or health related issues. The unavailability or expense of diagnostic tools under certain conditions and in some areas may limit the information that may be obtained during a health check. However, a great deal may be learned from a basic physical examination performed by a trained clinician with a stethoscope. A lack of laboratory facilities or tools like radiography and ultrasonography must not compromise the effort to establish the physical condition of the rescued animal. Capabilities in remote or developing areas may be expanded by establishing relationships with local human hospitals to perform basic serum biochemistry, hematology (red blood cell and white blood cell counts), fecal parasitology, microbiology and even radiography.

An important and difficult decision must be made about whether a cub not only can be saved (which depends largely on the available financial, technical and personnel resources available), but if the degree of handling that will be required to treat the cub will compromise his chance at success as a wild bear following reintroduction. This decision depends on the age of the cub, the intensity and duration of hands-on treatment that will be required, and the experience and skill of the rehabilitators to raise cubs for reintroduction.

Dehydration, shock, hypoglycemia (low blood sugar), and hypothermia (low body temperature) or hyperthermia (overheating) are the most common presentations that require emergency medical intervention in rescued cubs. Small cubs in particular will often be hypoglycemic and will present as weak, with or without neurologic signs, and may or may not appear hungry. Dextrose may be administered by stomach tube (known as a gastric gavage; 5% in normal (0.9%) saline), subcutaneously (under the skin, 2.5%) or intravenously (2.5%). This will also help to rehydrate the animal, as dehydration is a common adjunct to hypoglycemia. If only oral treatment is an option, 5% dextrose, corn syrup (e.g., Karo syrup) or glucose solution may be applied to the gums for rapid absorption and then via gastric gavage. Neurologic signs normally abate with restoration of blood glucose levels and rehydration but in severe cases may require treatment with anticonvulsant medication. A dehydrated animal will again be weak, with sunken eyes, tacky gums, and skin that “tents” when pinched at the nape of the neck. Dehydration is best treated with intravenous or subcutaneous fluids (normal (0.9%) saline or lactated Ringer’s solution), followed by oral dextrose or

human infant electrolytes (e.g., Pedialyte®). Gastric gavage should be performed only by experienced staff in order to avoid misplacement of the tube into the trachea. Care must also be taken to rehydrate at appropriate rates so as not to overfill the stomach or to overload cardiovascular capacity. Guidelines for evaluation of dehydration are outlined in Table 1; guidelines for calculation of fluid requirements are described in Figure 1.

Normal body temperature of cubs is 37° to 38°C. It may be lower (36°C) in very young cubs who are not yet able to thermoregulate. While gently warming the animal with warm water bottles and blankets, the accompanying dehydration, hypoglycemia and shock must be treated. Alternatively, hyperthermia, or heat stroke, is also a medical emergency. As the body is cooled with cold water or ice, the animal must be rehydrated and treated aggressively for shock.

Shock is caused by a loss of blood volume or circulation (e.g., bleeding or failure of cardiac function), or loss of fluid volume (e.g., dehydration). The animal will have a rapid heart rate with a weak and rapid pulse and rapid, shallow breathing. The gums and other mucous membranes will be pale or gray (or purple, depending on the cause of shock) with slowed capillary refill time. A finger pressed to the gums will make the area temporarily white. The capillary refill time, which is an indication of the strength of the blood circulation, or blood pressure, is the time that it takes for the spot on the gums to regain color. This is normally less than 2 seconds. The animal will be weak, may be vomiting, and may show neurologic signs or be unconscious. Following immediate treatment and stabilization, the cause of shock must be determined and treated specifically (or simultaneously, as in the case of hemorrhage). Treatment for shock requires intravenous fluids, antibiotics, monitoring CBC and clotting time for development of disseminated intravascular coagulation (a life-threatening crisis situation that may develop consequent to shock or infection), restoration of electrolyte imbalances, treatment of neurologic signs, medicine to control vomiting, supplemental oxygen, preparation for transfusion with whole blood or plasma if needed, medication to control pain, and possible additional treatments specific to the case. The consequences of shock (or its cause), such as inflammation of the blood vessels or compromise of kidney function, may not appear for another 24 to 48 hours, and the animal must be monitored closely.

Physical injuries in abandoned cubs are most commonly related to accidents, traps, gunshots and exposure. Again, care must be taken to stabilize the animal by treating shock, hemorrhage and dehydration before wound treatment or surgery. Wherever possible, radiographic evaluation of injured animals is advisable to ensure the identification of foreign objects (e.g., bullets and other penetrating objects) and broken bones. Some controversy exists over the management of gunshot wounds. If a bullet is lodged deep in soft tissue (e.g. muscle tissue) where it is unlikely to interfere with mobility or normal physiologic function, it may be advisable to manage the wound conservatively and to leave the bullet in place rather than to cause extensive tissue trauma in its removal.

Medication to control pain (analgesics) is an important component to treating injuries and should be administered as soon as possible. If injuries appear painful and surgery is considered unnecessary or cannot be performed right away, analgesics (e.g., carprofen 4.4 mg/kg once daily PO) are advised in addition to antibiotics or other

pertinent medications. Care must be taken to rehydrate the animal prior to administration of non-steroidal anti-inflammatory drugs that may compromise kidney function (e.g., carprofen or meloxicam).

The choice of antibiotics depends on the type of wound, concomitant infections (e.g., pneumonia) and the overall condition of the animal. Oral antibiotics are advisable, as they require less stress of handling for administration, but care must be taken over gastrointestinal health, particularly in young cubs. Supplementation with a probiotic or lactobacilli during antibiotic treatment is usually advisable.

Anesthesia- The anaesthetization of wild animals has become a relatively common procedure and some of its practitioners, particularly lay practitioners, have consequently developed a certain degree of complacency toward it. This is due in part to access to relatively "safe" anesthetic drugs, and the wide tolerance in most bears to these drugs and to less than ideal anesthetic conditions. Nonetheless, bears exhibit individual and circumstantial variation in their sensitivity and responses to anesthesia. It is important to recognize that every anesthetic event poses a risk to both the animal and personnel, and that a sound understanding of anesthetic principles, thorough preparation for emergencies, and experience with emergency response procedures are important prior to undertaking such a procedure.

Anesthesia may be considered in three steps: induction (going to "sleep"), maintenance and recovery (waking up). Induction and recovery are the most critical periods of an anesthetic procedure, during which most complications and injuries occur. Vomiting and aspiration (breathing vomit or saliva into the airway) are a common and serious risk, particularly if the animal has not been fasted prior to induction. Injuries to the animal and personnel occur when the bear is not adequately restrained prior to induction. Ideally, the bear is in a quiet, dark environment inside a cage that contains no potential threats for laceration, entrapment of head or limbs, or areas from which he can fall. The cage allows rapid access through doors at either end. Minimization of stress and external stimuli is critical.

If an animal is being anesthetized in the wild, these controlled conditions cannot be met. In these cases, potential complications must be anticipated. A protocol must be developed and preparations made in advance to guide the behavior and responsibilities of personnel in the event of such complications. An important factor in the choice of anesthetic agents under these conditions will be speed of induction and recovery. A contingency plan for personnel should include safe areas to which to retreat, communication strategies, and emergency medical care in the event of injury or inadvertent exposure of humans to the anesthetic drugs. The article by Osofsky and Hirsch (2000) provides an excellent list of equipment and drugs to have available for field immobilizations.

Induction- If possible, an adult bear will have been fasted for at least 12 hours prior to induction. With cubs, particularly very young cubs, this will be too long a period without food, and these should not be fasted for longer than four hours. Water should not be withheld. For individuals who have vomited in previous anesthetic events, pretreatment with ondansetron (0.06 mg/kg PO) 60-90 minutes prior to induction and,

if necessary, an additional IV dose (0.15 mg/kg, administered slowly over 10 minutes) upon induction has been proven effective (Loeffler, unpublished data).

Anesthesia is usually induced in bears by intramuscular injection with a pole syringe, dart, or, in the case of small cubs that can be manually restrained, hand syringe. In bears older than young cubs, the rump should be avoided as an injection site because of the large fat pad in that area. Drug absorption from fat is very slow and induction will be delayed or even ineffective. The upper arm (triceps area) is generally a good target for intramuscular injections with hand or pole syringes. The neck and shoulder are good sites for the placement of darts; if aiming for the triceps, missing the target may result in the dart entering the thoracic (chest) cavity. Emergency drugs, endotracheal tubes and oxygen should be prepared beforehand. External stimuli (noise, light, presence of people and activity) should be kept to an absolute minimum. With stimulation and stress, higher doses of anesthetic agent are required to induce and maintain anesthesia, which increases the risk of adverse effects. Moreover, during Stage 2 anesthesia (Table 2), the animal may demonstrate a heightened excitatory response, which again compromises induction and may result in injury.

The goal of induction is to bring the animal to the appropriate and safe plane of anesthesia (Table 2) that makes him or her safe to handle and that meets the requirements of unconsciousness, analgesia and skeletal muscle relaxation necessary for the procedure. If any surgery is to be performed, the animal must be in Stage 3 with appropriate analgesia. Depending on the procedure, additional analgesic agents may need to be administered (see below). For non-surgical procedures in a small, non-fractious bear cub, Stage 2 may suffice. Any animal older or larger than such a cub should, for the safety of the animal and the personnel, be in Stage 3 even for non-invasive procedures.

During induction, the animal should be monitored closely and as unobtrusively as possible. Respiration (breathing) should be watched carefully (Table 2). When the bear becomes recumbent (i.e., when they “go down”; Stage 2), he may go down with the neck turned in such a way as to compromise patency of the airway. This requires immediate assistance to prevent the animal from suffocating. A bear in Stage 2 anesthesia is potentially very dangerous and should be handled as though he were fully awake. Observation of personnel safety practices is paramount when trying to assist the bear during this phase of induction.

An important aspect of induction is knowing when to abort the attempt if the bear does not go down. This is where experience with the drugs and the species are invaluable. A maximum cumulative drug dose should be calculated prior to starting the induction: this will depend on the drug, its safety margin and the animal’s tolerance. Generally, if the bear is still in Stage 0 or 1, 10 or 15 minutes after the first injection, the dose may be repeated (full or partial dose, depending on the drug(s) used). A partial effect may be topped up with a partial repeat dose. Once the time and/or dose limit for induction has been reached and the bear is not safely anaesthetized, the procedure should be abandoned and reattempted another day. Environmental conditions, stress, sensitivity of the individual animal, the animal’s previous experience with anesthesia, and drug protocol may all affect the success of induction. All efforts should be made to determine why the effort failed and to correct the problem the next time.

Analgesia- If the bear is to undergo any surgery or treatment of a potentially painful condition, analgesic agents should be on board well before the onset of surgery, and continue thereafter. Carprofen (3.2 mg/kg SQ) may be administered immediately following induction of anesthesia, in order that it has taken effect by the time the animal wakes up. Butorphanol (0.075 – 0.1 mg/kg IM) or morphine (0.1 - 0.5 mg/kg IM or IV) may be administered ca. 15 minutes prior to the onset of surgery to provide analgesia during and after the procedure. Depending on the type and duration of surgery, and the choice of drugs, doses may be repeated. Carprofen may then be continued orally at 4.4 mg/kg once daily for as long as necessary.

Maintenance anesthesia- Once the bear has reached Stage 3 anesthetic plane, he may be removed from the induction cage. Minimization of the duration of anesthesia is the best way to avoid many anesthetic complications. The bear should be placed in lateral or dorsal recumbence (on its side or on its back, respectively) on an even, horizontal surface. Monitoring begins immediately, focusing on "ABC": Airway, Breathing, and Circulation. Vital signs are recorded every five minutes (Figure 3). While machines like pulse oximeter, capnograph and electrocardiogram are very helpful in the effective monitoring of anesthesia, the most important tools are the eyes, ears, nose, hands and observational skills of the anesthetist.

The following should be considered minimal monitoring parameters and require only basic equipment. Respiratory rate and quality: breaths should be deep and even, and the rate consistent with the normal for the species. Shallow or irregular breaths indicate respiratory complications, pain or a light plane of anesthesia. Certain anesthetic drugs (e.g., ketamine, morphine) may cause irregular or suppressed breathing. The airway must be straight and free of obstruction (including saliva and mucus). Placing an endotracheal tube as soon as possible helps to control the anesthesia (e.g., allows rapid delivery of oxygen or gas anesthesia if necessary) and protects the airway from fluids in the mouth. Heart rate and rhythm are monitored with a stethoscope and by feeling the pulse. Common areas in which to monitor the pulse are the femoral arteries (inner thigh), facial artery (side of the jaw or lateral mandible), dorsal metatarsal artery (distal hind limb near the paw) or carotid artery (either side of throat). As with respiration, potential effects of the anesthetic agent must be taken into account and observed closely. The pulse indicates the strength of the heart beat and blood pressure, and its rhythm should coincide with the heartbeat heard through the stethoscope. Unpigmented mucous membranes should be pink and capillary refill time less than 2 seconds. Blue or purplish mucous membranes indicate hypoxia (low blood oxygen levels) and should be treated as an emergency. Drugs like medetomidine will cause purplish mucous membranes; this is not necessarily an emergency situation that needs to be treated, but respiration must be monitored carefully with this drug. In this case, experience of the anesthetist is important to enable the determination of "normal" responses to drugs and a true problem. Pale mucous membranes suggest inadequate peripheral perfusion due to a problem with cardiac output (the amount of blood pumped by the heart) or low blood pressure, or anemia. Slow capillary refill time also indicates compromised peripheral perfusion. Complications with hypoxia, perfusion or blood pressure may of course be detected sooner with the instruments mentioned above. But a vigilant and experienced practitioner who knows the species with which s/he is working can detect

abnormalities and respond adequately. Again, lack of instrumentation is no reason for poor monitoring.

It is important to know the normal parameters for the species and the anticipated effects of the particular anesthetic agents that one is using. For example, a sinus arrhythmia (a type of irregular heart beat) is not uncommon in Asiatic black bears under tiletamine/zolazepam (Zoletil® or Telazol®) and does not appear to lead to further complications. An abnormal rhythm caused by the heart's ventricles (ventricular arrhythmia) or air in the chest cavity (pneumothorax), on the other hand, is a life-threatening emergency that must be treated immediately.

Intubation (placement of an endotracheal tube into the trachea) can be done as soon as Stage 3 anesthesia is reached. If the animal is drugged too lightly, e.g., in Stage 2, then there is the danger that he may bite the tube in half and then one has an ugly situation in having to extract the piece of tube from the trachea. An endotracheal tube of appropriate size should be ready in any event, should the animal require respiratory assistance. Intubation is most easily performed with the bear in ventral recumbence (lying on its stomach) and the head elevated to straighten the airway. An assistant standing over and straddling the bear's head may hold the head up and the mouth open with a rope placed just behind the upper canine teeth. In cubs of course this can easily be done as one would with a dog, i.e., without straddling and ropes. Some people feel more comfortable intubating a bear in a lateral position (on its side). Oxygen should also be available even if gas anesthesia is not used. If the bear is not intubated, oxygen is delivered at a gentle flow rate into the nostrils throughout the duration of anesthesia. Eyes should be lubricated, particularly if the bear is anesthetized with ketamine (ketamine hydrochloride). Under ketamine, the eyes remain open and will dry out because the animal cannot blink.

Body temperature should be monitored carefully, particularly in extreme temperatures and with very small cubs. Warm or cold water bottles, ice packs or electric heat pads may be used during anesthesia to help the animal maintain normal body temperature.

The placement of an intravenous catheter allows delivery of intravenous fluids and provides ready access to a vein in case of the need for emergency IV drugs. Intravenous fluids are recommended if the animal is in any way compromised, if the procedure involves invasive surgery, or if the animal will be anesthetized for more than about 20-30 minutes (again, this is particularly important in young animals). Flow rate will be relatively high in the first hour to replace fluids that were not taken in during the pre-induction fast. This is particularly important in young cubs, for which dextrose (2.5% or 5%, depending on blood glucose levels) may be added to the fluids as well. Maintenance fluid rate during surgery is generally calculated as 10ml/kg body weight/hour. For large bears during long procedures this rate will be slowed. A useful indicator of adequate hydration during longer procedures is the measurement of PCV (packed cell volume; the percentage of red blood cells in the blood) every 30 to 60 minutes. PCV should remain stable (if the bear is in normal physiologic condition): if it begins to drop, then the animal is becoming over-hydrated; if it rises, fluid rates need to be turned up.

Depth of anesthesia can be monitored by several parameters. Respiratory rate and heart rate tend to increase as the animal recovers from anesthesia or if it feels pain.

The jaw should remain slack and the tongue unresisting against gentle pull. The palpebral reflex is a blink in response to a gentle tap on the medial corner (near the nose) of the eye, being careful to avoid touching the cornea. The palpebral reflex should remain absent in Stage 3 anesthesia. There should be no movement other than breathing and visceral (heart, intestine) movements, and the animal should not respond to any physical manipulation of its body. When breathing is too slow and shallow, and heart rate slows below normal, the plane of anesthesia may be getting too deep.

The most frequent complications that may occur during anesthesia include hypotension (low blood pressure) and shock, respiratory depression (slow and/or shallow breathing), cardiac arrest, bronchospasm or laryngospasm (clenching of the airways), compromised circulation (e.g., arrhythmia, high or low blood pressure, high or low heart rate), neurologic complications (e.g., seizure) and vomiting and aspiration. Emergency drugs and trained personnel must be prepared for such events.

The maintenance of records throughout anesthesia is important for the accumulated documentation of experience with anesthetic procedures in individual animals and various drug protocols, and for any potential legal issues or disputes. An example of an anesthesia record form is found in Figure 3.

Recovery- Recovery is a particularly fractious period of anesthesia and trained personnel with emergency drugs and equipment should be present. Some anesthetic agents (e.g., medetomidine, xylazine, carfentanil) are reversible, which allows for rapid recoveries. Personnel must be prepared and safety measures put in place to allow for recoveries that may occur within as little as one minute following injection of the reversal agent.

The recovery cage or room should be free of any structures on which the bear might injure itself or get stuck or trapped. The animal should be monitored closely (continuously or at least checked every 5 minutes) until it is able to stand on its own. Time of placement in the recovery cage, time that the bear rights himself into the sternal position (on the chest) and the time that he stands up are recorded (Figure 3). Intravenous fluids should be kept going as long as is safe to do so. The animal must be kept warm or cool (particularly a small cub). The cuff of the endotracheal tube is deflated but the tube kept in place until the animal begins to swallow or cough. This indicates transition into Stage 2 anesthesia. The tube is removed immediately to avoid the bear biting it in half. Unless the bear is young enough to be handled directly, personnel should no longer be in range of unprotected contact with the bear at this point.

Complications for which to be prepared during recovery include seizures, vomiting, cardio respiratory arrest (heart or breathing stop) and self-injury. The administration of diazepam or midazolam prior to recovery is useful to prevent seizures in certain individuals prone to them or with certain anesthetic drugs that tend to induce them (e.g., ketamine). If the animal vomits before the pharyngeal muscles (muscles that control swallowing) are fully functional, aspiration of the vomit is a serious risk. The head should be positioned such that the fluids run out of the mouth rather than down the throat, and the mouth suctioned if possible. In extreme cases, the animal may need to be re-anaesthetized and intubated.

***Anesthetic agents*-** Several excellent publications discuss the use of various anesthetic drug combinations in different species of bears (Boever et al., 1977; Caulkett and Cattet, 1997; Caulkett and Cattet, 2002; Caulkett et al., 1999; Jalanka and Roeken, 1990; Mama et al., 2000; Osofsky and Hirsch, 2000; Ramsay et al., 1995). The degree and duration of the stages of anesthesia differ with each drug and may differ among species and even individual animals. Considerations when choosing an anesthetic protocol include the requirements for analgesia, muscle relaxation, the time and quality of induction and recovery, the size and temperament of the bear, physiologic or pathologic considerations of the individual, environmental conditions for induction and recovery (e.g., free-ranging or caged) and the duration of anesthesia that is required. It is important to remember that environmental conditions, stress, health status of the bear and individual sensitivity will affect the quality of anesthesia regardless of the drugs that are used. The following is a brief overview of some of the injectable anesthetic agents more commonly used with bears. Detailed protocols and further information may be found in the references listed at the end of this paper.

Ketamine combinations

Ketamine is a dissociative anesthetic, which means that the drug causes a loss in sensory perception and consciousness without actually inducing a sleep-like state. Convulsions, hyperthermia and sudden arousal are some of the risks associated with the use of ketamine alone. It produces poor muscle relaxation and only a superficial analgesia (no visceral analgesia, which means that surgery should never be performed on an animal anaesthetized with ketamine alone), but circulation remains good and laryngeal reflexes remain intact. Eyes remain open under ketamine anesthesia and should always be lubricated immediately that it is safe to handle the animal. The use of benzodiazepines (diazepam, midazolam, zolazepam) with ketamine reduces its convulsive properties and induces muscle relaxation. However, these drugs do not produce an analgesic effect.

The addition of xylazine to ketamine results in greater analgesia, muscle relaxation and sedation. It must be noted, however, that the analgesic effect of xylazine lasts only 15 to 30 minutes, relative to the sedative effect of one to two hours, so one cannot assume analgesia throughout the duration of anesthesia with this drug combination. The volume of ketamine required for anesthesia, when combined with xylazine, remains the same, however, and it does not decrease the convulsive properties of ketamine or the tendency for sudden recoveries.

Medetomidine is in the same class of drugs as xylazine (alpha-2 agonist) but is a more potent sedative. In combination with medetomidine, the volume of ketamine needed to produce anesthesia may be reduced by 50% to 75%. Alpha-2 agonists cause respiratory depression, and supplemental oxygen should be administered. They also produce an initial rise in blood pressure which is followed by an overall decrease in cardiac output, which in turn lowers blood pressure and tends to make the mucous membranes pale and slows peripheral perfusion. Hypothermia may result from muscle relaxation. Alpha-2 agonists are reversible, which allows for rapid recoveries. Xylazine is reversed with yohimbine, medetomidine with atipamezole.

Ketamine alone or in combination with xylazine or medetomidine produces an unreliable anesthesia, in that bears have been known to wake suddenly and without

warning. It is therefore best avoided with bears except for short procedures (20 minutes or less) in small cubs.

Tiletamine/zolazepam combinations
Tiletamine is a newer dissociative drug and is sold in combination with zolazepam (Zoletil® in Europe; Telazol® in the United States). In bears, tiletamine has a longer duration of action and a somewhat greater analgesic effect than ketamine, although for invasive or painful procedures, an additional analgesic should be administered. The zolazepam results in good muscle relaxation. The t/z combination produces a more reliable anesthesia than ketamine combinations in bears, with smoother, more predictable, albeit slower, recoveries. The heart rate and blood pressure may initially decrease, and then reflexly increase.

As with ketamine, medetomidine improves the analgesia of t/z alone and reduces the amount of t/z required. Because of its superior reliability, this combination is a safer option than ketamine combinations with large adult bears. Xylazine with t/z produces an effect similar to that of t/z with medetomidine, although generally higher amounts of t/z are required, which may prolong recoveries.

Carfentanil
Carfentanil is an anesthetic that may be administered orally in case injection is not a desirable option. When mixed with a sticky substance such as honey, it allows a rapid sublingual (under the tongue) absorption. Black bears immobilized with carfentanil experience tremors and rigidity, which may be avoided or relieved with the injection of diazepam or midazolam. Hypoxia (low blood oxygen) is an expected complication with carfentanil, as it is with all opiates, and the bear should be provided with supplemental oxygen. Atropine may be administered to counteract the hyper salivation (production of high amounts of saliva) seen with opiates. Carfentanil is reversible with the opioid antagonist naltrexone.

Common health complications of rescued bear cubs - Most rescued cubs are starved or have been on an inappropriate diet if they were already in the custody of inexperienced handlers. The transition from the bear sow's milk or a previous diet to an appropriate hand-rearing diet will, by necessity of the situation, be abrupt, which carries with it the risk of diarrhoea, constipation or bloating until the cub's system adapts to the new diet. The transition may be tempered by dilution of the formula 1:3 or 1:4 with 5% dextrose on the first day, and then gradually worked to full concentration over the course of a week. Management of diarrhoea and constipation are discussed below. Bloating may be managed with simethicone and should resolve within one or two days. If it persists, the diet should be reconsidered and underlying medical issues must be investigated.

Milk of black bears has higher levels of fat and protein, and lower levels of lactose than what is found in milk from cows. When choosing a milk substitute for hand-raising bear cubs, considerations of casein, whey, lactase and curd formation in the stomach are as important as fat, protein and carbohydrate composition. Recommended formulas are made of puppy milk replacer (Esbilac®, Multimilk®; PetAg), or Milk Matrix® (PetAg) products formulated for exotic species. Cow milk carries the risk of forming lactobezoars (concretions of milk solids) in the intestinal

tract of bear cubs, which can be a critical, if not life-threatening, issue. Sun bears, giant pandas, sloth bears and spectacled bears appear particularly prone to forming lactobezoars. It is imperative that if one's only option is to feed cow milk, it must be pre-digested with lactase prior to feeding. Cubs must be carefully monitored for bloating, inappetance, discomfort and constipation. Excellent reviews on hand-rearing bear cubs may be found in Hedberg, 2001; Papagerogiou et al., 2001; Beecham, 2006.

As the cubs develop, body weight and size should be monitored carefully. Weight gain that is too rapid or too slow may indicate the necessity for adjustment in nutritional components or quantities or, in the case of the latter, a potential behavioral or medical issue that requires attention. Observations of physical activity and play behavior are also very informative. The cubs' developing strength, coordination and endurance can be monitored in this way, as can their social and behavioral development. Explorative behavior; demonstrations of curiosity; response to novel items, space and sounds are all important points for assessment of cubs' development. The relationship of cubs to human caretakers must also be monitored and controlled. Over-familiarity and dependence on humans may compromise the ability of bears to form normal relationships and behaviors with conspecifics and may result in problematic behavior even if they remain in captivity.

The most common health issues with hand-raised bear cubs are constipation, diarrhea, lactobezoar formation and aspiration pneumonia (pneumonia caused by the aspiration of milk or other food into the lungs, usually during suckling). Constipation is more common than diarrhea in hand-raised bear cubs, and is usually due to dietary reasons: inappropriate type of milk, or too much or too little or the wrong type of solids. Physical obstruction by a lactobezoar or foreign object (e.g., a toy or other object that was accidentally swallowed) is also a consideration. If the cause is determined to be dietary, one can add a small amount of Karo syrup to the milk, which serves as a gentle osmotic laxative, or add bran or Metamucil to the food. Some rehabilitators, e.g., those working with polar bears, have found that the addition of a small amount of Karo syrup to every milk meal helps to prevent constipation (see Hedberg 2001). A warm water enema may be tried if absolutely necessary; avoid pharmacologic laxatives.

Diarrhea is also usually of dietary etiology. Bacterial infection (e.g., *Clostridium, Salmonella*), viral infection, parasites, drugs and toxins must of course also be ruled out. Inadequate intestinal flora may also cause diarrhea, although often cubs with this condition present as generally unthrifty rather than with outright diarrhea. For unthrifty, fussy cubs who don't appear to have anything clearly wrong with them, transfaunation with a slurry of fresh droppings from deer or moose feeding on grass has proven highly successful in American black bears (Kilham and Gray, 2002). Treatment of diarrhea must focus critically on rehydration and diagnosis and treatment of the underlying cause

Overfeeding is the most common cause of diarrhea in bear cubs. As a rule, it is much better to underfeed a little than to overfeed. Diarrhea can quickly become life-threatening due to dehydration, particularly in very small or young cubs. The number of daily feedings and volume per feeding depends on the size and age of the cub. The rule of thumb is to feed no more than 2/3 or 3/4 gastric (stomach) capacity per

feeding. Gastric capacity is 5% body weight (50 ml/kg body weight). Each feeding should therefore be no more than 30-35 ml/kg body weight.

Transitions from one type of food to another, e.g., at weaning, are another frequent cause of gastrointestinal upset. All changes of food should be made as gradually as possible, over several weeks.

Aspiration pneumonia occurs easily in young bear cubs because of the strength of the suckling reflex that can draw milk rapidly and forcefully from a bottle into the lungs. The type of nipple (flexibility of the rubber) and the size of the hole in the nipple are therefore critical to the safety of the cub. The holes should be made as small as possible. This allows milk to flow more slowly and decreases the chance for aspiration. Small nipple holes also increase the duration of nursing, which helps to satisfy a cub's psychological need to nurse. The longer cubs nurse their bottles, the less need they have to suck on their own or companions' fur and body parts. Should aspiration pneumonia develop, aggressive therapy that includes the correct antibiotic(s), coupage (percussion of the thorax to help remove secretions) and oxygen supplementation is required. The prognosis for these cubs is often poor.

Mange, ringworm and intestinal parasites are common in bear cubs. The first two are usually self-limiting as the health and nutrition of the cub stabilizes, but may require treatment if infections are severe or if cubs are too compromised to adequately cope with the infections. Mange is caused by mites, usually *Ursicoptes* or *Demodex*. The cubs may have a diffuse alopecia (hair loss) or patchy areas of fur loss. It is usually intensely pruritic (itchy). Diagnosis is made by skin scraping and identification of the mites, although it may be difficult to actually find the mites without multiple scrapings. Mild cases may be self-limiting as the cub gains condition and goes outside into sunny, dry weather. Denning bears often have mange lesions on emergence in the spring, and in healthy animals the condition should resolve with exposure to sun and dry air. That said, studies on free-ranging adult American black bears in the United States have documented an endemic occurrence of clinical mange in this species (Mannville, 1978; Yunker et al., 1980; Forrester et al., 1993).

Sarcoptic mange may be treated with ivermectin (0.3 mg/kg SQ, three injections given 3 weeks apart). In black bears, the condition appears to be somewhat resistant to ivermectin, in which case cubs may be treated with selamectin (6.0 mg/kg topically) or moxidectin (0.3 – 0.4 mg/kg PO). Sarcoptic mange is highly contagious, and affected cubs should be isolated. Demodectic mange is generally a sign of immunosuppression and treatment focuses on the underlying cause of this. It is imperative that therapy continue for two months at full dose beyond two sequentially negative, deep, multifocal skin scrapings taken one month apart. Improvement of clinical appearance alone cannot be used as an end point to discontinue treatment for mange. Antibiotic therapy for concomitant bacterial dermatitis may be warranted.

Ringworm, or dermatophytosis, is caused by a fungus, usually *Microsporum*, *Trichophyton* or *Epidermophyton* spp. It is contagious to other animals and to humans. Lesions on bears are usually circular patches of reddish or crusty skin and hair loss with or without purulent exudate and ulceration, but may look like any generalized skin infection. Dermatophytosis is usually not pruruitic in animals, unlike in people. Diagnosis is made by fungal culture. Mild cases will resolve on their own

as the cub gains condition and gets exposure to sunshine and dry environment, or may be treated with baths of lyme sulfur (2%, every 5-7 days), chlorhexidine (2% daily; shampoo every 5-7 days) or povidone iodine shampoo (1:4 dilution, daily). More severe cases may be treated with oral griseofulvin (10 mg/kg bid PO for a minimum of 3 weeks plus 10 days after the resolution of lesions) or itraconazole (5 mg/kg bid PO 5 days, then once daily for the duration indicated for griseofulvin). With both of these drugs, the cub should receive dietary support for intestinal flora, such as probiotic or lactobacilli. Griseofulvin also causes suppression of the white blood cell count, which should be monitored every two weeks throughout treatment.

The most common intestinal parasites of bears are roundworms, which usually respond to standard anthelminthic treatment (e.g., fenbendazole, mebendazole, ivermectin, pyrantel). Diagnosis is made by identification of eggs in fecal floatation. Routine deworming with one of the anthelminthics every one to six months may be warranted, depending on the climate and opportunity for reinfection. This will also serve to treat infection with other nematodes such as *Trichinella*. Coccidiosis and giardiasis (caused by protozoal parasites) may also occur and should be considered in cases of chronic, unresponsive diarrhea in the face of appropriate nutrition. Diagnosis is made by fecal examination for cysts. Cysts may be difficult to detect or shed sporadically, so multiple examinations should be made to avoid a false negative diagnosis. The highly contagious and zoonotic risk of these two organisms must also be taken into account. Tapeworm infections are also diagnosed by fecal floatation and are treated with praziquantel (7.5 mg/kg PO or SQ). Infection with filarial parasites, e.g., *Dirofilaria ursi* or *D. immitis*, has been documented in bears (e.g., Duffyl et al., 1994; Rogers, 1975; Yokohatal et al., 1990) but the author is not aware of clinical cases of heartworm disease in bears. The larval stages of filarial parasites are usually sensitive to ivermectin.

Infectious disease and vaccination - The decision of whether and how to vaccinate bear cubs is made on the basis of 1) the risk of contracting diseases commonly found in wildlife and domestic animals in the area, and 2) availability of suitable and safe vaccines. Most of the infectious diseases of carnivores (e.g., canine distemper virus, canine adenovirus, canine parvovirus, and rabies) may potentially be a risk factor for bear cubs, but information about the endemism of these diseases in local domestic and particularly wild animals may be lacking in many areas. Vaccination should be performed with killed or recombinant virus, and not with modified live virus. The use of a modified live virus vaccine that is made for one species (e.g., dog) carries the risk of inducing active disease in another species of unknown sensitivity to the virus or strain of virus. Tetanus may be a common problem in some regions and vaccination of cubs against this organism may be warranted. In any case, good hygiene is imperative to raising cubs successfully and safely. This includes maintaining dry, clean enclosures and bedding, good ventilation, quarantine of newly-arrived and sick cubs, and proper cleaning and sterilization of feeding equipment.

Prior to release - Prior to release, every effort is made to ensure that the bear is healthy and sound, is in good nutritional condition (with weight to lose if necessary), is protected against endemic contagious disease, and does not pose a disease threat to wild bears in the area. Depending on the environmental conditions into which the animal is released, the timing of release (e.g., winter) and his or her preparation for

survival, he may undergo a period of stress and privation before stabilizing in the new environment. The bear must therefore have optimal physiologic resources to withstand this transition period. Ideally, a complete physical examination is performed as described above a few days prior to release, to give the bear adequate time to recover from the anesthetic procedure. The bear should be dewormed, and, if warranted, vaccinated.

Table 1. Guidelines for evaluation of dehydration status

Dehydration	Mucous membranes	Loss of skin turgor	Eyes	Pulse	Consciousness
4-5%	Slightly dry	Mild	Moist, normal	Strong	Normal
6-7%	Dry	Moderate	Moist, normal	Strong	Normal
8-10%	Dry	High	Dry, retracted	Weak, rapid	Weak, depressed
12% +	Very dry	Complete	Severely retracted	weak, rapid	Unconscious or abnormal

Table 2: Characteristics of anesthetic stages.

Stage	Anesthetic plane	Characteristics
0	No effect	No difference from awake state
1	Analgesia stage	Drowsy appearance, slow to move or respond to stimulus, but conscious. Somewhat diminished perception of pain. Response to noise intensified.
2	Delirium or Excitatory Stage	Becoming unconscious but still responds reflexly to stimuli. Responses to stimuli may be exaggerated; animal potentially very excitable. Recumbent. Respiration irregular, breath holding possible. Pharyngeal muscles still functioning and animal still able to maintain its own airway. Eyes usually closing, pupils dilating, papillary light reflex (contraction of the pupil in response to bright light) intact.
3	Surgical anesthesia	Increasing degrees of muscular relaxation. Animal no longer able to protect its own airways (loss of control of pharyngeal muscles). No response to strong stimuli (e.g. firm poke with broom handle). No palpebral reflex, no papillary light reflex, jaw slack, no resistance of tongue when pulled. Respiration regular.
4	Medullary depression	Suppression of cardiovascular and respiratory centers in brain result in cardiovascular and respiratory collapse and death

Fluid replacement calculation and record

Animal identification: _____ Species: _____ Sex:_____

Weight: __ kg €estimated €actual Age:_____ €estimated €actual

DAY 1 Date_____ Fluid replacement start time _____

Maintenance: 50 ml/kg/day x _____ kg = _____ ml / day

Dehydration: ____ % x _____ kg = _____ ml

Fever: 20 ml/kg/day x _____ kg = _____ ml/day

Vomiting (ml loss per day): = _____ ml/day

Diarrhea (ml loss per day): = _____ ml/day

Total fluids needed in first 24 hours = _____ ml over first 24 hours

Type of fluids: LRS NaCl glucose ___%

Frequency:

IV infusion: total ÷ 24 = _____ ml per hour

2x per day: total ÷ 2 = _____ ml every 12 hours SQ oral

3x per day: total ÷ 3 = _____ ml every 8 hours SQ oral

4x per day: total ÷ 4 = _____ ml every 6 hours SQ oral

DAY 2 Date_____ Fluid replacement start time _____

Maintenance: 50 ml/kg/day x _____ kg = _____ ml / day

Fever: 20 ml/kg/day x _____ kg = _____ ml/day

Vomiting (ml loss per day): = _____ ml/day

Diarrhea (ml loss per day): = _____ ml/day

Total fluids needed in second 24 hours = _____ ml for 24 to 48 hrs

Type of fluids: LRS NaCl glucose ___%

Frequency:

IV infusion: total ÷ 24 = _____ ml per hour

2x per day: total ÷ 2 = _____ ml every 12 hours SQ oral

3x per day: total ÷ 3 = _____ ml every 8 hours SQ oral

4x per day: total ÷ 4 = _____ ml every 6 hours SQ oral

Figure 1. Worksheet for calculation of fluid replacement requirements for dehydrated or compromised animal in first 48 hours.

CLINICAL EXAMINATION RECORD

Identification #:_____ Species: _____ Sex:_____ Birthdate: _____

Date:_____ House Name:_____ Other ID (chip, band, tattoo): _____

History_____

_____

General Appearance: _____

Skin & fur: _____

Muscular & Skeletal System: _____

Nervous System: _____

Urinary System: _____

Genital System: _____

Digestive System: _____

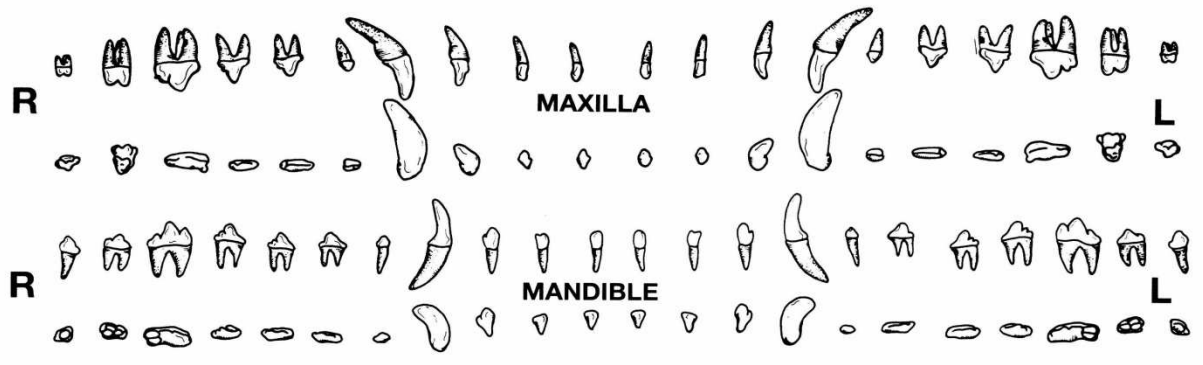
Heart & Lungs: _____

Lymphatic: _____

Ears: _____

Eyes: _____

Mouth & teeth: _____



■ Missing

X Extracted

Fractured

CA Carious Lesion

Clinical examination form Side 2

Animal ID_____ Date _____

Samples and diagnostics

Blood: time collected:_____ ml: _____ **Urine**: time: _____ cystocentesis [ ] voided [ ]

Hematology: [ ] EDTA [ ] Heparin [ ] Serum [ ] sediment [ ] Dipstick [ ]
Collection site: _____ **Feces**: voided [ ] rectal [ ] parasite [ ] other _____

Radiographs: _____ **Ultrasound**: _____ Microbiology: ____ **Skin scraping**: _____
Serology: _____ **Other** _____

Summary of diagnostic results:

CBC: _____

Serum chem.: _____

Urinalysis: _____

Fecal: _____

Microbiology: sample: _____

Result: _____

Skin scraping: _____

Radiographs: positions & areas: _____
Findings: _____
_____

Ultrasound: _____

Other: _____

Diagnosis: _____

Treatment & monitoring plan:
_____
_____
_____

Medications:
_____
_____

Figure 2. Sample clinical examination record.

ANIMAL SEDATION & ANAESTHESIA FORM

Identification #:_____ **Common Name:** _____ **Sex:**_____ **Birthdate:**_____

Date:_____**House Name:**_____**Species:**_____**Other ID (chip, band, tattoo):**_____

Health Status:
1 [ ] Normal
2 [ ] Abnormal

Fasting time:
1 [ ] <8 hours
2 [ ] 8-24 hours
3 [ ] 24-48 hours
4 [ ] >48 hours

Activity:
1 [ ] Calm
2 [ ] active
3 [ ] excited

Immobilizing Condition:
1 [ ] Free ranging
2 [ ] Large Enclosure
3 [ ] Small Enclosure
4 [ ] Squeeze Cage
5 [ ] Manual restraint

Condition: 1 [ ] Obese/fat 2 [ ] good 3 [ ] fair / thin 4 [ ] poor / emaciated

Initial Effect time: ____ Recumbancy time: ____ 1 [ ] isolated 2 [ ] in group

Weight: 1.[ ] kg 2.[ ] 1b 3.[ ] gm 4.[ ] actual 5.[ ] estimate

Endotracheal tube:___: ___ Time:___:

DOSE:
Preanesthetic
Immobilizing
Supplemental
Maintenance
Antagonist
Other

METHOD
Polesyringe
Blowdart
Metal dart
Hand syringe
Non=metal dart
Oral
Facemask
Chamber
Endotracheal tube
Venous Catheter

ROUTE:
M= intramuscular
V= intravenous
P= intraperitoneal
S=Subcutaneous

SUCCESS
Complete
Partial
None

EFFECT
0= no effect
1=mild sedation
2=heavy sedation
3=light anesthesia
4=surgical anesthesia
5=excessively deep
6=death

Dose	Drug given	Amount (mg or %)	Method & Route	Time Given	Success of Delivery	Effect (Stage)	Time of Effect	Bottle #

DRUGS ADMINISTERED	**Amount or Rate**	**Route**	**Time**

Recovery Data
Time___: Head Up:
Time___: Recumbent:
Time___: Standing:
Time___: Normal:

Complication:
1 [ ] None
2 [ ] Minor
3 [ ] Major
4 [ ] Fatal
5 [ ] Renarcotized

Recovery
1 [ ] Normal
2 [ ] Abnormal
3 [ ] Prolonged
4 [ ] Stormy

Veterinarian: _____

Recorded by: _____

Anesthesia Ratings: Excellent Good Fair Poor
Induction [ ] [ ] [ ] [ ]
Muscle relaxation [ ] [ ] [ ] [ ]
Overall [ ] [ ] [ ] [ ]
Catheter: size:_____ Placement Time:___:

Blood Sample Data:
Time collected:___: ___ Collected by:
Hematology: [ ] EDTA [ ] Heparin [ ] Serum [clot]
Site: [ ]Cardiac [ ]Cephalic [ ]Ear [ ]Femoral [ ]Jugular
[ ] Metatarsal Vein [ ] Saphenous vein [ ] Other

Circuit:	Blood pressure:	Capnograph or Pulse oximeter:	ECG:	Fluids:	Animal: Weight: Vet: Date: Nurse:

NOTES

Isoflurane	
Flow rate	
Time	
60	
55	
50	
45	
40	
35	
30	
25	
2	
105	
100	
95	
90	
85	
80	
75	
70	
65	
60	
Key	
HR	
RR	
Syst v	
MAP	
Diast	
ETCO²	
spO2	
15	
10	
5	
0	

Figure 3. Sample record form for monitoring anesthesia.

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Rescue, rehabilitation, release and post release monitoring of the Andean Spectacled bear (*Tremarctos ornatus*) in Ecuador, South America: A brief overview.

David Jackson and Armando Castellanos

Andean Bear Project
Fundación Espíritu del Bosque
Ecuador
Dave Jackson ocean_magik@hotmail.com
Armando Castellanos iznachi@yahoo.com.mx

Introduction

The Andean Spectacled Bear (*Tremarctos ornatus*) is the only member of the bear family occurring in South America. Their distribution spans the Andean mountain belt from western Venezuela to northern Argentina. Andean bears are opportunistic feeders, though their diet consists principally of plant material. They rely heavily on the cloud forest ecosystem for the majority of their sustenance**.** Unfortunately, due to widespread deforestation and hunting, Andean bear populations are declining throughout their range and the gene pool of the species is weakening. Consequently Andean bears are now listed by CITES as an Appendix I species, and by IUCN (1996) as Vulnerable across their entire range.

Twelve years ago, the Andean Bear Rehabilitation program was founded, and between 1995 and 2001, eight Andean bears were rehabilitated and reintroduced to the wild (Table 1). The program was a pioneering attempt to bolster wild Andean bear populations and considerable information was learned from these early experiences. We learned that: 1) we needed a better knowledge of wild bear ecology to optimize reintroduction success, and 2) rehabilitated Andean bears needed to be released into areas larger than the home range of wild bears to reduce the potential for conflict with humans.

As a result, a wild Andean bear research initiative was established in 2000. The primary goals of this research program were to facilitate the development of rehabilitation and release procedures and to provide grounds for the implementation and extension of protected areas. These wild bear studies are ongoing to date and have provided a great deal of important information on Andean bear diet, behavior, habitat preference, activity patterns, home range sizes and movement patterns. The wild bear findings have proved fundamental in advancing our rehabilitation techniques and also in selecting sites for releasing rehabilitated bears.

This paper is a brief overview of the techniques and procedures we use in rescuing, rehabilitating and releasing Andean bears back into the wild, and how we monitor them after their release.

Rescue

Every year orphaned bear cubs are rescued by the Andean bear project in Ecuador. Most often, the mothers are killed by farmers protecting their corn crops. Without their mothers, the orphaned cubs either die or are captured and kept as pets that are often malnourished and poorly cared for. Over the years we have built strong links with communities and authorities throughout Ecuador and frequently receive information about illegally kept or orphaned bear cubs. When we receive information about an illegally kept bear cub, our team immediately travels to the area, accompanied by our project veterinarian, Dr. Leonardo Arias, and the Ecuadorian environmental police force. Bear cubs are confiscated from their illegal owners and are given an initial examination by our veterinarian that includes examining the color and shine of fur, looking for obvious injuries and the general physical condition of the bear. We treat parasites and obvious minor injuries as necessary. . We then immobilize the bear to take blood samples for hematology and blood chemistry, to administer injectable vitamins and antibiotics, and to treat serious injuries.

Once it has been confirmed the bear is in good health condition for travel, he is transported directly to our veterinary clinic in the capital Quito for a more detailed examination. After successfully completing the preliminary health examination, bears are relocated to a rescue center. Bears in critical condition are kept in intensive care at the clinic until they are fit to be housed in a rescue center.

Criteria for accepting bears into rehabilitation programs

The primary concern of our rehabilitation program is the welfare of the released animals. Therefore, bears are not considered suitable candidates for release if we determine that releasing them into the wild would potentially prove detrimental to their welfare. The bears need to meet the following criteria before we admit them into our rehabilitation program:

1. Good physical condition with no permanent physical injury or condition that would limit its ability to survive in the wild
2. The bears fur, teeth and claws should be intact and in good condition.
3. Normal blood chemistry
4. Lack of hemoparasites/contagious diseases (mange).

Rehabilitation

Andean bear rehabilitation takes place in single, large (12m by 24m) natural enclosure with two caretakers providing all the necessary care during the rehabilitation process. Where possible, we house two bears in the enclosure at the rehabilitation center in order to provide the bears with the opportunity to display social behaviors and interact with one another, a vital skill required by bears once they are released to the wild. Our research on the free-ranging Andean bear population provides essential information which is crucial in making our rehabilitation program successful. Orphaned cubs are bottle fed a mixture of cows' milk, oats and pureed fruit until they are old enough to eat solids (5 to7 months of age). The first solid foods that the cubs are fed are oats, fruit and dog biscuits that are supplemented by natural foods such as suro (a type of bamboo), bromeliads, wild avocados, wild figs, berries, palm hearts, worms and insects. As rehabilitation progresses and the release date approaches, the natural food supply is gradually increased proportionally to a decrease in the quantity of oats and dog biscuits. The primary reason for incorporating natural foods in the bears' diets is to prepare their stomachs for digestion of their natural diet and to sharpen their food recognition skills. To maintain a degree of unpredictability in the rehabilitation enclosure, natural foods are hidden and planted in the ground to encourage natural foraging and food manipulation behavior. The enclosures are equipped with structural enrichment that allows the bears to perform climbing and scratching behaviors they will require in the wild.

During the rehabilitation process, we evaluate each bear's suitability for return to the wild. Their behavior is closely monitored during rehabilitation to ensure they are displaying normal behavioral patterns. Bears considered suitable for release must show strong evidence that they are able to recognize, find and manipulate their foods before they are released.

Prior to release, all bears are given a final medical examination to confirm they are still healthy, in good physical condition and do not carry transmittable diseases. If any of the bears have a treatable illness, they will be treated and considered for release at a later date. On the other hand, bears that have an incurable disease will be removed from the rehabilitation program.

All Andean bears reintroduced to the wild are a minimum of 18 months of age to ensure that they are less vulnerable to predation from larger bears, pumas and jaguars, which are resident to South American forests.

Release site selection

At the Andean bear project, we consider the selection of a suitable release site a major component in ensuring a successful reintroduction. From our previous experiences releasing bears in fragmented forest areas, we were able to determine that fragmented

forests were not good release locations because they often were heavily populated by humans and resulted in human-bear conflicts. In 2001 our team decided to conduct all our future releases in vast areas of primary habitat with no human settlements.

The release site selection process begins in the office by using maps, aerial photos and satellite images of the proposed site and the adjacent areas to ensure that there is an abundance of primary forest/paramo (high elevation grasslands) habitat. Additionally, we review ecological data and general literature on the chosen site to make sure that natural food sources for Andean bears are present.

Field trips are planned to proposed release areas. At least three visits are planned at different times of the year to ensure that there is an abundance of food in the region and that there is no seasonal food shortage. We look for evidence of bear activity such as scratch marks on trees, feeding activity, and scats to verify the existence of a resident population. We also use this evidence to ensure that the area is not overpopulated with bears to minimize the possibility of rejection of the released bear by the resident population. Familiar release sites are re-visited to ensure that no dramatic ecological changes have taken place. Farmers from surrounding villages are also consulted as they often hold vital information on the ecology of the region. We also check the farmers' perception of releasing bears keeping in mind that wariness and negative attitudes could lead to potential negative attitudes towards the project and project personnel.

Post-release monitoring

Reintroduced Andean bears are fitted with either VHF or GPS collars so their progress can be monitored. Because we release the bears in remote areas, they often have to be tracked from the air using light aircraft. Occasionally, the team monitors them on foot or on horseback, but this is difficult due to the mountainous terrain and remote nature of our release sites. Collecting data on reintroduced bears gives us an idea of how they are adapting to their new environment and to an extent how they are interacting with resident bear population. Capturing wild bears in the area would give us a better idea of the extent of home range overlap between wild and reintroduced bears and we may do this in the future should funds be available.

When bears are released in remote areas, GPS collars provide more monitoring data on bear movements. It is nearly impossible to locate released animals using VHF transmitters in this mountainous habitat. We found that the most productive method of data collection on released Andean bears was by combining the use of GPS collars with data collection every 2 to 3 months using a light aircraft. The collars our team uses have a motion sensor so we are also able to monitor the activity of the bears at any given moment, when we are in range. Consequently, we are able to compare the activity patterns of wild and reintroduced bears.

In the past four years we have released four more Andean bears back into the wild; three of them are known to be surviving and have established home ranges. Colleen, a female bear, has now been back in the wild for almost 24 months and has recently been sighted with cubs. Beto, a male bear released 14 months ago, has been detected approximately 20 kilometers from his release site. He is presumably in search of females and food, and is showing the characteristics of a wild bear. Sadly Leo, released at the same time as Beto, had to be returned to captivity after becoming involved in a conflict situation. Celine, another female, who was released in July 2007 is adapting to her new surroundings well after almost 3 months in the wild. Although it is premature to consider her release successful, all the early signs suggest her release may be successful.

With our current monitoring system, we are able to determine whether the bears are surviving, monitor their movements, and check if, in case of the females, they are reproducing and have had cubs. In the future, we would like to examine the effect that the reintroduced bears are having on resident bear population. We believe this is an important factor, which needs to be addressed and we intend to capture wild bears in the region of the release area, to take blood samples for DNA analysis in order to evaluate paternity from released bears.

Conclusions

Considerable progress has been made in optimizing Andean bear rehabilitation over the past twelve years. Not all our work has been successful, however we learned more from our failures than our successes. From each element of each rehabilitation case, there is something to be learned, ultimately leading to better rehabilitation techniques. We have found it vital to study wild bear ecology to advance our rehabilitation protocol. The next major step is to thoroughly evaluate rehabilitation success by using sophisticated post-release monitoring techniques (GPS collars) and conducting comparative ecological studies between wild and reintroduced bears. It is vital to test in more detail the effects released bears have on the resident bear populations to

ensure that the releases have a beneficial impact on Andean bear population dynamics in the release area.

We hope to evaluate the impacts of our efforts in the future and to continue successfully releasing bears into the wild in order to counter the declining Andean bear populations. However this will take time, effort, and funding. We are certainly not lacking in time and effort, yet funding, as always, is our major limitation. With our continued success with Andean bear rehabilitations, we hope to set a benchmark from which other Andean bear biologists may follow, ultimately reinforcing Andean bear populations throughout their range.

Orphan Bear Rehabilitation Project in the Romanian Carpathians

Leonardo Bereczky

Romanian Project Director
Association for Conserving Natural Values
climber@vipmail.hu

Introductory paragraph should lead into the article: objective, what the 'project' is, etc.

The Romanian orphan bear rehabilitation project is based on studies conducted on the ecology and behavior of brown bears in the Eastern Carpathians during the late 1990. Special attention was paid to behavioral patterns such as social interaction, defensive behaviors, feeding and foraging behaviors and hibernation. Examination of the behavior patterns of females with cubs indicated that the most important role of a mother was that of protecting her cubs. In bears, information such as recognition of natural food sources, hibernation, and other activities were innate and did not need to be learned from the mother. It is important to note, however, that cubs do learn certain behaviors from their mothers, and probably learn others more quickly based on their observations of their mothers behavior.

We conducted a case study, begun in 2000, on three orphaned cubs (two males and one female). They were raised near a remote cabin in the Carpathian Mountains approximately 150 km north of Brasov. The cubs were fed a diet of organically grown fruits and vegetables and occasionally meat from a local butcher shop in addition to the natural foods they were able to obtain inside their enclosure. No contact with people was permitted during the rehabilitation process except for the two caretakers at the facility. We investigated their development from the age of 30 days until two years. At the age of a few months, the bears were "walked" in the forest adjacent to their enclosure where they were able to obtain natural foods growing in the forest. The distance the cubs were walked away from the enclosure was increased gradually as they matured. The cubs spent more and more time in the wilderness, but were returned to their enclosure every day. The first hibernation occurred near the cabin. The following summer they spent more and more time in the forest, discovering for themselves different food sources and methods to obtain them. After their second hibernation the two males left the area, choosing a home range almost 100 km away. The female remained at home and continued visiting the cabin every week. The males started to visit mountain cabins and week end houses after a short time, and finally they were captured and relocated to zoos. The female also showed nuisance behavior and finally a permanent enclosure was built for her. The bears managed to find food for themselves but they did not avoid humans after being released. We concluded that rehabilitation of orphaned cubs can only be successful by applying a method where human presence during their development in facilities is restricted as much as possible.

In 2003, we started building the Orphan Bear Rehabilitation Center. The rehabilitation method developed in this project has three basic elements. The first of these is increasing the space available to the bears in a dynamic way in concordance with the ecological needs of the animal. This was solved with enclosures of different sizes, which were located adjacent to one another. After a quarantine of one week, the

animals were placed in a 0.5 hectare (ha) size enclosure (A), made of chain link and electric fence. Since the bear cubs encountered the electric fence for the first time in this enclosure, chain link was used to stop them from running through the fence at the first encounter. After 2 to 3 weeks, enclosure A was opened and the animals were moved into enclosure B; a 5 ha area surrounded by an electric fence (with no chain link fencing acting as a backup).

The natural vegetation and environment offered natural food and ideal places for hibernation and hiding. The natural vegetation of the enclosures consists of a mixture of spruce, willow, birch and beech trees with raspberry and blueberry shrubs. The natural food found in this enclosure included succulent plants and herbs, willow flowers and leaves in spring and first part of the summer, and raspberry and blueberry fruits in late summer. That enclosure provides approximately 35% of the necessary food to the bears.

The gate of enclosure B leads to enclosure C that is approximately 8 ha in size. After the first hibernation, the bears were moved into enclosure C where the natural vegetation is even more complex and offers 50 % of the necessary food in some periods of the year.

All the enclosures offered natural, high quality environment for the cubs to explore natural behaviors and physical activity. Vegetation was comprised of 50% old growth spruce forest mixed with young spruce and other tree species and 50% covered by shrubs, wild fruit bearing trees and shrubs, and grass. The facilities are oriented to the south-east and the presence of a good number of caves, holes and roots makes the place ideal for hibernating the cubs during the winter. During the growing season, the bears were allowed to leave the enclosure and forage in the surrounding area (which is very wild), following their handler (always the same person). Those bears who were ready to leave the facility (depends on the individual's development stage) were allowed to leave at will, while those who still needed the security provided by the facility returned to the enclosure and remained there until they were ready to disperse.

The second basic element of our program is the feeding protocol. After weaning, only natural food was offered to the bears and the food was always placed where the animals would normally find it in nature. For example fruits were often hung in trees, larvae were placed under rotted tree trunks or rocks, eggs under branches, seeds on the ground, etc. The cubs were encouraged to work to obtain their food, which was never placed in the same place. In the first part of the vegetation season (March, April, May) the amount of food provided to the bears was high (near 100% of their caloric needs), but in the summer the volume of food provided was decreased and the bears found it for themselves within the enclosure and, occasionally, outside the enclosure. In late fall food was slowly decreased until this, together with the other external factors, induced hibernation.

The third basic element of the method is the avoidance of human presence around the facilities. Only one handler placed food (meat, eggs, sunflower seeds, wheat, corn, apples, plums, bee larvae) in the enclosures, taking care that the bears never saw when it was done. Human access to the area was totally prohibited, so the animals grew up with minimal human contact.

After completing construction of the rehabilitation center, four cubs were accepted. The only criterion for accepting bear cubs into our center was that the bear needed to

be less than one year age. We also accepted habituated cubs if they were less than one year old.

One of four cubs died immediately from a Clostridium toxin. The remaining three individuals offered interesting case studies because of their unique backgrounds in captivity. The first cub (a female) displayed defensive behaviors because she had had limited contact with humans. The second cub (also female) was habituated to humans after being kept in a yard for 5 months and fed by people. The third bear cub (male) was kept in a dark stable for 6 months, and had minimal contact with people and no occasion to interact with other animals or external factors. Interestingly, he did not display any defensive behaviors and was quite friendly to our team.

The development of behaviors in the three bear cubs was interesting during the first year at our center. The first female remained wild and was released immediately after her first hibernation in April. Her behaviors were similar to those of free-ranging bears and she did not get close to human settlements or livestock. However, she was killed by a male bear in the mating season a month after her release.

The natural environment in the enclosure at our facility seemed to have a positive influence on the behavior on the second bear cub. She was released in June after the first hibernation. Unfortunately we could not monitor her for long because she lost her ear tag radio transmitter. We received reports of sightings of this bear after one year from foresters in the area. However, we received no reports of her approaching houses or livestock.

The third bear cub took a longer period of time to adapt to the natural environment provided in the enclosure at our facility. A possible explanation for this could have been the restricted environment he experienced before the rehabilitation. He did not climb trees in the facilities, and was less interactive with the other bears. He was radio collared and released after the second hibernation in May. The radio telemetry results showed that he never approached houses or other human settlements. After several months we found him dead. The carcass was already disintegrated due to the hot weather, but the bones were intact which suggested that the animal was not killed by a predator.

Our experience from the first three rehabilitation attempts lead us to conclude that the natural environment in the enclosures and the strict rehabilitation protocol followed helped in preparing the bears to behave naturally and to avoid human habitation and livestock. The bears that showed nuisance behavior (strong attachment to people, begging for food, and vocalizing when the handler left the enclosure) when they arrived at the facilities discarded this behavior during the one year of rehabilitation. The loss of two individuals probably was a result of the large predator density in the area when the bears were released and probably the wrong time to release small bears. We've decided that bears may have higher survival rates if, instead of releasing them during the breeding season (May-June), we release them in July when the wild berry fructification in the area is at its highest and threats from dominant males may be lower.

In 2005, one bear cub was brought to our facility in summer and four more were brought to us in the winter. The 4 bear cubs came from a garbage site located in a neighborhood at a large Transylvanian city. Before they arrived in our facility, the cubs were accustomed to visiting garbage cans near the city edge with their mother.

After losing their mother, they continued to visit this garbage site. After one year of rehabilitation all four were released and radio tracked using aerial radio telemetry. The habitat and home range used by the bears was closely observed to gain an understanding of the reasons why the animals used certain habitats. We were able to observe a spectacular change in their behavior. None of these bears approached human settlements. They primarily used forest covered areas and moved around considerably. All of the cubs moved more than100 km from the release site. Their strong association with garbage before they were brought to our facility and lack of use of garbage after being released lead us to believe that the bears were habituated to the location of the garbage and not the garbage itself. Changing the topographical setting and the absence of the cause of the conflict behavior (garbage in this case) also may have influenced them in developing a normal bear foraging behavior.

In 2007 only one bear was released, equipped with a GPS-GSM collar. His behavior and habitat use is currently being monitored and documented. Along with aerial observations, the GPS-GSM system is an excellent way to document the bear's behavior and movements. After receiving the locations of the animal, we fly over the indicated area and study its topographical and vegetative characteristics. This helps us understand why the bear visits those areas. Currently, 10 other individuals are housed at our rehabilitation center and they will be released soon.

From our experience we are able to conclude that each bear has a unique behavioral repertoire which influences his rehabilitation success. Generally bears can be rehabilitated with professional care. The sudden life style and environment change can generate success even if the animal was habituated to human presence. After the age of 6 months, the chance of rehabilitation decreases drastically with every week that the bear remains in an artificial environment. Bears born and raised near garbage sites do not necessarily use garbage after the rehabilitation process. The physical and ethological development of the animal, the characteristics of the release site, and the release period should be taken in consideration. The most dangerous time, from a predation point of view, is the breeding season when adult males try to kill bear cubs. Post release monitoring is very important to prove the success of our work and to get an accurate idea about the survival of released individuals. The most efficient method in this part of Romania to gather data and monitor rehabilitated bears is through the use of GPS technology, combined with a GSM system.

Rearing of orphan Asiatic black bear Cubs (*Ursus thibetanus)* for released back to the Wild

K.V. Skripova, Ph.D.

Senior Researcher,
Ussuri Nature Reserve of Far East Branch, Russian Academy of Sciences
692519, Ussuriisk, ul. Nekrasova h1
e-mail: medvedi_2003@rambler.ru

Introduction

To preserve the Asiatic black bear orphan cubs in the Primorsky Kray, in 1998, an agreement was signed between Goskomekologiya and Ussuri Reserve to establish a Center for the Rehabilitation of Orphan Bear Cubs in Russia (referred to as the Center). Funding was originally provided by the International Bear Foundation (Skripova, 2001a).

The study was based on data collected between 1999 and 2005, while rearing bear cubs at the Center in the Ussuriisky Reserve. Thirty-six bear cubs (22 females and 14 males), who were orphaned in Primorsky Krai when their mothers were poached, were brought into the facility and 30 were successfully released back into their natural environment. Five bears died (3 from predation by tigers; 1 from bronchial pneumonia; 1 from trauma) and one female was sent to the Ussuriisk city park zoo because she was too habituated to people. In 2004 and 2005, 12 bear cubs, which were genetically similar to Asiatic black bears from the Korean Peninsula, were sent to Jirisan National Park in South Korea as part of an international cooperative effort to restore Asiatic black bears in the Republic of Korea.

A variety of factors were considered in selecting animals for rehabilitation, including an assessment of their physical condition, behavior characteristics and general health. The method used to raise the cubs was patterned after the original studies conducted by Pazhetnov et al. (1999). During the rehabilitation process, we maintain minimal contact between the bear cubs and humans. Each animal was raised to have a sense of fear of potential enemies, including humans and domestic animals, in order to prepare them to live independently and to protect themselves in their natural habitat (Skripova 2000; Kotlyar and Skripova, 2000). We maintained the bear cubs in an environment which mimicked their natural habitat by excluding visitor presence to avoid habituation to humans.

Criteria for Selection of Bear Cubs for Rehabilitation

Our concept of rehabilitation includes a combination of measures aimed at returning the animals into the wild. Our approach involves providing the cubs with adequate food and water, shelter from the elements, and protection from large predators. At the same time, we strive to minimize the length of time the cubs are kept in the facility and keep human contact with the cubs to a minimum to avoid habituation of the cubs to their caretakers.

We recommend that only cubs under 4 months of age be admitted into rehabilitation programs. The age of Asiatic black bear cubs can be determined by their weight and appearance (Table 1). This definition is based on the description of the development of wild bear cubs given by G.F. Bromley (1965). Bear cubs that were maintained in captivity for long periods of time were unsuitable for release because of habituation related problems. According to zoo studies, the length of time captive animals spent begging for food from humans increases the chances that the animal was habituated (Gallager 1995). In zoos, hand feeding serves to establish close contact between the bear cubs and people, which subsequently leads to the bears becoming habituated to human presence, and this drawback cannot be rectified in many cases.

Health Conditions

When selecting the bear cubs for rehabilitation, the general condition of the animal, its weight, and hair condition is taken into account. One can determine the general condition of a bear cub by the condition of its eyes and the color of its mucosa.

Ear disorders are revealed by the presence of brownish-gray malodorous secretions, requiring intervention by a veterinarian. The bear cubs' paws are to be thoroughly examined for splinters or wounds and for the condition of the claws. The nose needs to be examined for scars, mucous and putrid secretions; the oral cavity for the presence of teeth and their condition; and the fur for luster, parasites, and for hair-loss. When the cubs are examined, one needs to be careful because injured cubs may bite or scratch in self-defense.

A healthy bear cub is active and alert, shy of strangers and sensitive to various sounds. The eyes are wide open, the nose is moist (with no secretions), and its fur is in good condition. A healthy bear cub urinates and defecates with no difficulty. Depending on the diet, the urine ranges from light-yellow to dark-brown in color. We do not recommend rearing cubs with injuries such as fractures of the limbs that call for constant human attention because they need regular human care during the course of which the animals tend to get habituated to humans.

Behavioral Features

The activity and the level of manifestation of various behavioral reactions can be useful in determining the suitability of a cub for rehabilitation and release. The defense reaction is assessed in terms of the animal's boldness and agility. If the bear cub is afraid of humans and attempts to escape or attack a person, it is suitable for rearing for future release. On the other hand, if the cub is not afraid of humans and begs for food, it is not recommended for rearing.

When selecting bear cubs from a group (e.g. of confiscated animals) aggressive or shy individuals should be preferred. It may be difficult to raise and successfully release cubs that are accustomed to playing with children, domestic animals, or feeding at refuse dumps.

Table 1. Assessment of the age of Asiatic black bears.

Age (Days)	Weight (g)	Body size (mm)	Description
7-10	680 to 718	Total length: 258 – 265; Length of the ear: 14; Chest circ.: 184 -189; Front paws: 35 x 23; Hind paws: 36,5x 21,5; Length of tail : 13	Bear cubs at this age have no teeth. They are of the right weight, and have a subcutaneous fat layer of 1.5 to 2 mm. Their body is covered with soft, sparse, dark fur of 3 to 4 mm long. The chin region on the neck is covered with darker fur with a brownish hue. The patches of white fur are on the chin, middle part of the throat and on the chest as two bands diverting from the middle towards the shoulders and to the neck. The eyes are not open. Their ears are closed and the auricles are devoid of fur. Their front feet have no fur. The digits have thin curved claws.
20	900	Total length : 321—329; Front paws: 47 x 38; Hind paws : 45 x 28; Length of tail : 25—26	The wrinkles on the snout are well-defined, as is the fur of 0.5 cm, which render the body dark-brownish in color. Some accumulation of subcutaneous fat may be preset in the groin region. .
25	950	Total length : 270	Cubs are weak and cannot move independently. The fur is 1 cm long
40	1200	No data	The entire body is covered with black fur and numerous wrinkles are formed on the snout and round the eyes. The front limbs with long and curved claws become markedly elongated. These cubs may still be unstable when they walk, and when they stand on their rear legs they try to grasp something with their front paws.
70-80	2000-2500	No data	Cubs deftly climb trees and run about on land. The fur is 14 to 22 mm long. The white chin and the white patch on the chest are distinguishable. The auricles are covered with fur to a greater extent.

Critical components of rearing and rehabilitation

Successful rearing depends on observing the rules of selection, maintenance and feeding. Normally, when information about an orphaned cub is received, the opportunity to arrive on the site and decide whether to accept it or not is rare. In this case, it is necessary to ask the following questions, which may be helpful in making the correct decision:

a. What is the age of the cub?
b. Under what circumstances did the cub lose its mother?
c. Under what conditions and for how much time was it maintained after it became an orphan?
d. What contacts did it have with humans and domestic animals?
e. Does the cub have injuries and how serious are they?

In rearing cubs, we applied the rules of maintenance, rearing and feeding that were developed previously (V. Pazhetnov, per comm.). From the time of rescue (March - April) and transfer to a den house (June), the cubs were maintained in a stationary house 300 m from the camp. Upon transfer to the den house (1000 m from the camp) the cubs ranged freely around the Rehabilitation Center. Between June and September, radio-tracking equipment supplied by Korean scientists was used to monitor the bears. As mentioned before, the bear cubs were reared with minimal human contact, so they remained fearful of potential enemies (humans, domestic animals) and were capable of independent existence (finding food and a hibernation site).

Selection Criteria for Release into the Wild

A bear cub is deemed fit for release when it is in good physical condition, has developed a natural behavioral repertoire which will help the cub to forage, explore and gather food, display social behaviors and defensive behaviors to protect itself.
According to V.S. Pazhetnov (1990), a brown bear cub in the first year of life is capable of accumulating sufficient body fat for hibernation. The Asiatic black bear in the first year of its life weighs about 20 kg, and brown bears may be 30 kg (Table 2). According to our studies (Skripova, 2004) the loss of body weight over the winter may be 21.4 to 40.4 % or from 6 to 10.9 kg (n=3).

The Asiatic black bear is characterized by a high growth rate. In fact, at an age of up to 3 months, the daily weight increment may be 20 to170 g (average 130±0.04). At an age of 4 months weight gain ranges from 20 to 256 g daily (average = 120±0.02 g). With the transition to vegetative supplemental feeding at an age of 5 to 9 months, weight increased as an average rate of 80 ±0.01g at 5 months and 110±0.04 g at 9 months.

Table 2. Mean body weight of young brown and Asiatic black bears**.**

Age (months)	Body weight of the bear (kg)	
	Brown (after Danilov, Tumanov, 1991; n=unknown)	Asiatic black (our own data , n=29)
2.5	4.6	3.3
3	6.4	4.3
3.5	8.8	5.4
4	11.1	6.6
4.5	12.3	10.8
9	30.0	20.8

Bear cubs show sexual dimorphism as early as 3 months of age. Males are bigger than females in terms of body weight (Fig. 1). There is a significant difference in the growth rates in male and female cubs, with males growing more quickly. It is important to note that the subsequent incremental dynamics of weight gain are not affected in bear cubs that are being hand reared. The physical development of hand reared cubs proceeds uniformly.

Figure 1. Dynamics of body weight of females and males in Asiatic lack bear cubs (n= 29) over the observation period between 2001 and 2005.

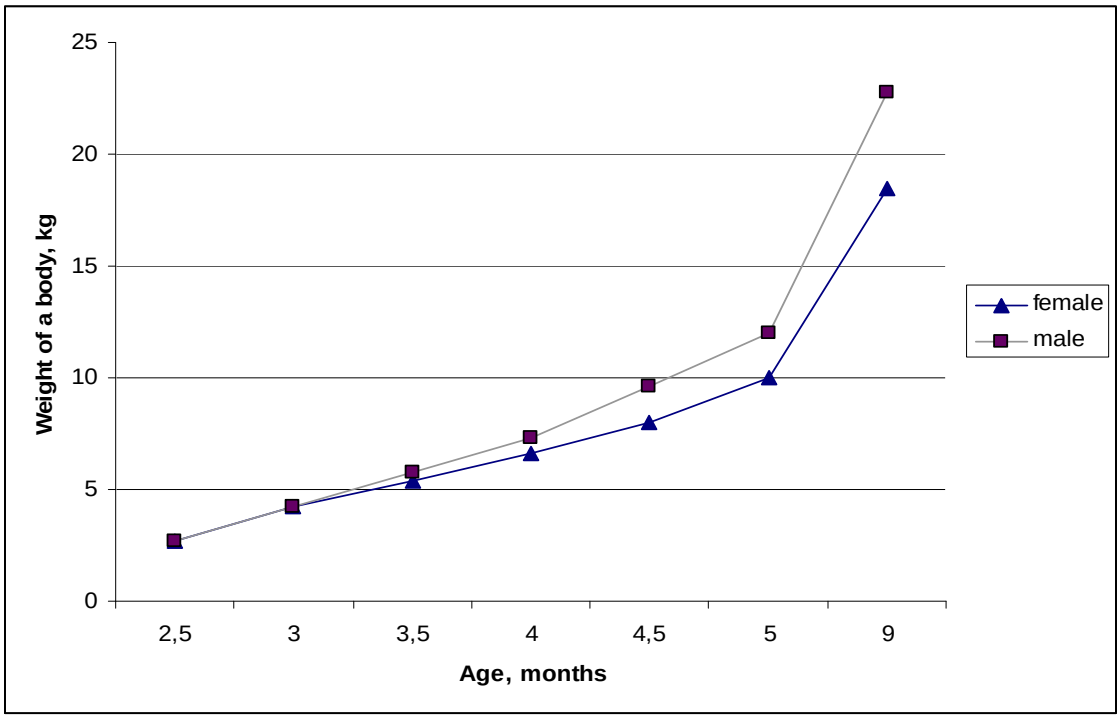

Table 3. Dynamics of the body weight as a function of age . Body size of Asiatic Black bears (n=18) during the observation period between 2001 and 2005.

Age (months)	Size (cm)		
	Body	Ear	Tail
3	56.5 (46.5 to 68.0)	5.4 (4.0 to 6.5)	3.4 (3.0 to 4.0)
4	63.6 (56.0 to 69.0)	6.3 (4.5 to 8.5)	3.7 (3.5 to 5.7)
5	71.7 (63.0 to 81.0)	8.1 (7.5 to 9.5)	5.5 (4.5 to 7.5)

Release and Monitoring

When observing bears, it can be very difficult to identify individuals. Often they can only be distinguished by the size and shape of the patch on their chest, and it is difficult to do that in the forest. Hence, we recommend marking the animals when transferring them to a larger enclosure (at an age of 4 to5 months), rather than when they are released into the wild. It is most feasible to use ear tags similar to the ones used on cattle. Tags that are shaped as bands or buttons with digital and other marks can also be used. The tags are

made of plastic and are inserted in the auricles using special pliers. They normally come in two sizes: 10 cm (rectangular) and 2 cm (round). The rectangular tag is small in size and most convenient use.

Monitoring the cubs is based on recording the traces of bear activity and sighting of the animals (Pazhetnov, 2002). To identify the animals sighted in the wild, in addition to ear tags, samples of individual odor of the feces are taken (Malev et al., 2002). However, the best method is to use radio tracking equipment to obtain information about survival and movements of cubs (Turbak, 2001). Our recommendation is to use radio-tracking equipment not only upon release but also in the course of rearing the cubs.

On the basis of studies performed between 1999 and 2005, it was revealed that the best time for attaching the transmitters is before the bear cubs are transferred to the den house. Cubs maintained in the den house enclosure can move about throughout the forest within the enclosure. Periodic monitoring after release provides data on daily movements, feeding, habitat selectivity, den period and, most importantly, the fate of the raised animal.

From our practical experience we found that at age 5 to 7 months it is best to use radio collars. The use of ear radio-tags during that period is not recommended as they are heavy and may cause deformation of the ear. At an age of 5 months radio-collars can be fixed on the cubs without using drugs to immobilize them. The collar is fixed tightly so that the cub cannot remove it. To prevent injury the equipment is checked repeatedly (once a week). If radio-tracking equipment cannot be used, it is necessary to examine the release area on a regular basis, recording the traces of the bear cub activity.

Cubs of the year leave similar signs of their presence as adult bears living in the wild. They leave well-trampled paths in tall grass, characteristic daily bedding in clearings with berry shrubs, claw marks on tree trunks which are quite visible, and they bend or break some small trees and shrubs. By mid-June some small nests made of branches characteristic of adult bears are usually found and a large number of dug up ant hills and torn up logs are also apparent.

Release

1. The Center of Ussuri Reserve uses two methods for release of bears:

    1. A hard release in late summer – early autumn, which allows the cubs to select their own den.
    2. Transfer of hibernating cubs in early spring from the Center to a pre-selected natural den.

Asiatic black bear cubs that were hard released preferred to den in tree hollows. It was revealed that occasionally they may hibernate in a group of two individuals in a single hollow, or they may select two nearby trees with hollows. The preferred tree species are the poplar and Manchurian fir. The hibernation period of the cubs coincides with that of hibernation of wild bears in reserves (Skripova, 2001a). The second method was used

only as an alternative release strategy in situations where it was impossible to use a free release.

2. The restoration of bears in Jirisan National Park, Republic of Korea.

Under a joint project to restore Asiatic black bear population numbers in the Republic of Korea, a total of 12 Asiatic black bear individuals were delivered to officials from Jirisan National Park, South Korea. Summary data has been presented in Table 4.

Table 4. Data on re-introduction of Asiatic black bears handed over from Russia to the Republic of Korea in 2004 – 2005.

Number of individuals/sex	Age when released	Date of release, site of release	Results
6 (♂3/♀3)	9 to 10 months	1.10.2004, Munsuri	Hibernation in dens from 01.01.2005 to 20.01.2005. Three dens were selected in the hollows, in rocks at 5 km from the site of release. Exit from the den from 01.04.2005 to 10.04.2005. Two of six cubs became conflict bears and were removed from the wild.
6 (♂2/♀4)	9 months	14.10.2005, Chibapmok Shelter	Upon release, the cubs remained in groups of two or three about 2 km from the release site. They separated before denning for the winter. The den period was from 05.12.2005 to 05.04.2006. One cub was lost.

Conclusions

1. The method used to raise orphaned black bear cubs for their subsequent release into the wild did not involve training the cubs. It primarily provided the cubs with the opportunity to develop a natural behavioral repertoire and other characteristics that would help them survive in wild. To increase their chance of survival in the wild, cubs that were not habituated to humans and that were not older than 4 months of age were selected for release. The rearing at the Center occurred in two stages: 1) in a stationary house and 2) in an enclosure located in the forest. Contact with humans during the entire maintenance period was confined to three people. Between 1999 and 2005, 30 (83%) of the 36 individuals entering the rehabilitation process were raised

and returned to the wild. Twelve (40%) of those bears were reintroduced into natural habitat in the Republic of Korea.

2. The release of cubs occurred at an age of 6 to 9 months in a group of 2 to 3 individuals using two approaches: 1) hard release in late summer – early autumn and 2) transfer of hibernating animals to a pre-selected den in early spring. In the former case the cubs were capable of finding a den on their own and preferred to use the hollows of oak-trees, poplars and firs. They sometimes hibernated in groups of two to three individuals. The second method was used only as an alternative release strategy in situations where it was impossible to use a free release.

3. The main method of monitoring the movement of cubs after the age of 5 months was by radio-tracking. This ensured minimal contact between the cubs and their caretakers and allowed the cubs to adapt to living in the natural environment. Upon release of the bears, radio-tracking permitted us to evaluate the success of the release, and to obtain data on their daily movements, habitat use in the area, and their choice of dens.

4. The development of some behavior patterns in young Asiatic black bears is closely associated with the size of arborous-shrub vegetation. Cubs start climbing trees when they are 2 months old. They climb to a height of at least 1.5 m, using trees of over 20 m in height and at least 60 cm in diameter.

5. The cubs used 51 plants for food as early as 2 months of age, and they preferred arborous and shrub vegetation (68%). Seasonal change of diet was observed in the released bear cubs. In spring, cubs consumed the leaves and shoots of arborous and shrub plants (20 species), the vegetative parts of herbaceous plants (9 species), whereas in summer the fruit of 17 species of arborous and shrub and 3 species of herbaceous plants were consumed.

6. The Asiatic black bear displayed play behavior at 2 months of age, and the 3 main forms of this behavior that were observed were attack, rolling over on the ground, and climbing up and down trees. The sequence of movement in play interactions was frequently incomplete, the play attack remaining unfinished, and the jaws were not closed

7. The movements of cubs in the course of rearing were associated with their search for food, while they were also exploring accessible habitats. The distance the cubs traveled in search of food resources and foraging sites increased with age. At an age of 5 months the cubs settled in an area within 400 m from the house den while after 6 months they remain within 1400 m of their den. After release, the animals remained in a group located at least 3 km from the human dwellings. The dynamics of the index of separation of individuals from a group indicates that the intra-group links in bear cubs are lost gradually, and the group is finally broken up shortly before or after the first hibernation period.

Reintroduction of Asiatic Black Bears (*Ursus thibetanus*) in Thailand

Andrew Renfrew Criswell, Ph.D.

Director of Research, Thai Society for the Conservation of Wild Animals
Professor, Graduate School, Bangkok University
Email: andrew.criswell@osir.hihm.no

Summary

Survey work in the Khlong Krua Wai Wildlife Sanctuary, Chanthaburi province, Thailand, and studies on the behavior of captive animals at Thai government facilities show the potential for reintroduction of Asiatic black bears (*U. thibetanus*) into this protected forest area. The location selected for the first stage of the reintroduction project is pristine uninhabited tropical rainforest, not open to the general public for either agricultural use or tourism activities.

Captive bears chosen for release need to satisfy the following criteria: (i), be of a genetic haplotype consistent with bears that would have historically been found in the release area, (ii) display behavioral patterns consistent with those of wild individuals and (iii), be free of any disease that could be transmitted to other organisms in the ecosystem of the release area or reduce the bear cubs' survivability and ability to successfully reproduce in the wild.

Prior to reintroduction, a large electric-fenced enclosure will be constructed at the release site to hold and observe bears prior to their release. If the bears meet established criteria, they will be released from the enclosure and will be allowed to roam freely in their natural habitat. The bears will be fitted with radio collars so their movement can be monitored and their survival, post-release, can be accurately ascertained.

Aims of the Project

The Thai Society for the Conservation of Wild Animals (TSCWA), working in conjunction with the Department of National Parks, Wildlife and Plant Conservation, aims to reintroduce a group of four previously captive adult Asiatic black bears (*U. thibetanus*) to the Khlong Krua Wai Wildlife Sanctuary. The objectives of this project strictly follow international guidelines established by the IUCN/SSC Reintroduction Specialist Group (IUCN 1994; IUCN 2000). The goal of the project is to eventually establish a viable, free-ranging population of Asiatic black bears in the wild within the species' former natural habitat that requires minimal long-term management (Walters and Holling 1990; Servheen 1999). This will enhance the long-term survival of the species

and restoration of natural biodiversity (Dahle and Swenson 2003; Hebblewhite et al. 2003; Preatoni et al. 2005).

The release site chosen is within the historic distributional range of the species and has long-term protection under Thai law. This helps to control some of the factors that caused the decline of Asiatic black bears in the area (Freedman et al. 2003; Larkin et al. 2004; Koehler and Pierce 2005; Brongo et al. 2005; Naves et al. 2006; Rodriguez-Clark and Sanchez-Mercado 2006). Attempts will be made to monitor bears by radio tracking in order to monitor movement, assess survival and monitor interaction, if any, with local villagers (Wong et al. 2004). However, our efforts in radio tracking and GPS tracking will be limited by the density of first generation tropical forest and thick tree canopy, respectively.

The Status of Wild Populations of Asiatic Black Bears

Asiatic black bear populations have been declining throughout their range for decades and, despite widespread official protection, the species remains on CITES Appendix I and is categorized "Vulnerable" (VU—A1cd) on the IUCN Red List, 2002. It is generally accepted that the cause of population decline was widespread poaching and degraded natural habitat (Carr et al. 2002; Hwang et al. 2002). In addition to the illegal wildlife trade, there is a boom in Southeast Asia for traditional and herbal Chinese medicines that use bear bile as the active ingredient. Farms stocked with large black bear populations exist in China, Vietnam and Korea—but not in Thailand—and the industry is expanding (Fredriksson 2005). Direct evidence of remnant Asiatic black bear populations is rare in Thailand. However, yearly bear cub confiscations by government authorities attest to their existence. These confiscations occur mostly in regions bordering Thailand so it is possible that the animals originate in Burma, Cambodia and Laos where wildlife protection is less effective.

Release Site

The site for the release of bear cubs is large enough to sustain a self-sustaining population and can be protected from human encroachment and associated hunting pressure (Merrill et al. 1999; Wieglus 2002; Mowat et al. 2005; Gaines et al 2005; Dahle et al. 2006). There is a dearth of information available on home ranges and population densities for Asiatic black bears. However, Wong et al. (2004) estimated the average home range for Malayan sun bears (*Helarctos malayanus*), to be 14.8 km^2 ranging between 6.2 and 20.6 km^2. For bears living in temperate climates in North America and Europe, more data are available (Koehler and Pierce 2003; Boulanger 2004; Romain-Bondi 2004; Brongo et al. 2005; Preatoni et al. 2006; Dahle et al. 2006). This research suggests that home ranges may extend up to 120 km^2 if there is a low concentration of high energy food sources. The home ranges of male bears will however still overlap the home ranges of several female bears even when food resources are scarce. The area both inside the Khlong Krua Wai Wildlife Sanctuary and the natural forest areas immediately surrounding its designated boundaries fits this criteria for a release site well and is further designated inaccessible to the public and is fully protected under current wildlife conservation laws.

Data compiled with the assistance of government officials and TSCWA staff at the Sanctuary indicates the presence of a wide range of native wild animals. Figure 1 displays a satellite image of the area north of Chanthaburi and the region bordering Cambodia with a GIS overlay of the Khlong Krua Wai Sanctuary. Figure 2 details a diverse range of wildlife sightings including small felids, primates, elephants, deer and rodents as marked by points along the major foot trail leading from the TSCWA base station to the release site and beyond. Over 24 months of observations failed to detect the presence of a sustainable wild population of Asiatic black bears despite stories heard from local villagers of occasional sightings.

The Status of Asiatic Black Bears in Captivity

The number of Asiatic black bears housed in Department of National Parks, Wildlife and Plant Conservation centers nationwide is approximately 150 and this number is steadily increasing. Beginning in 1996 at the Banglamung Wildlife Breeding Centre, many of these bears were moved to large electric-fenced semi-natural habitat enclosures built by TSCWA with funding from the World Society for the Protection of Animals (WSPA). Almost all of these animals were taken from the wild as cubs by poachers and then confiscated. Only three cubs are known to have been born in captivity. Asiatic black bears have an average life span of 20 years (Hwang et al. 2002).

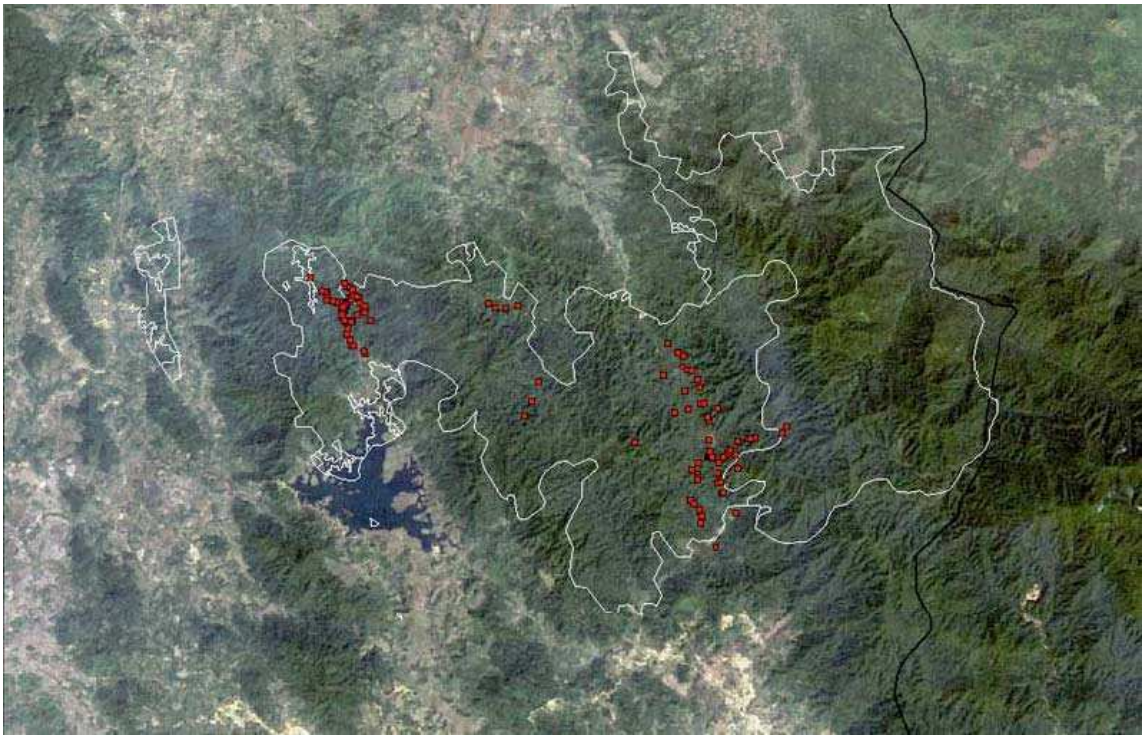

Fig. 1. Location of Khlong Krua Wai Sanctuary in eastern Thailand.

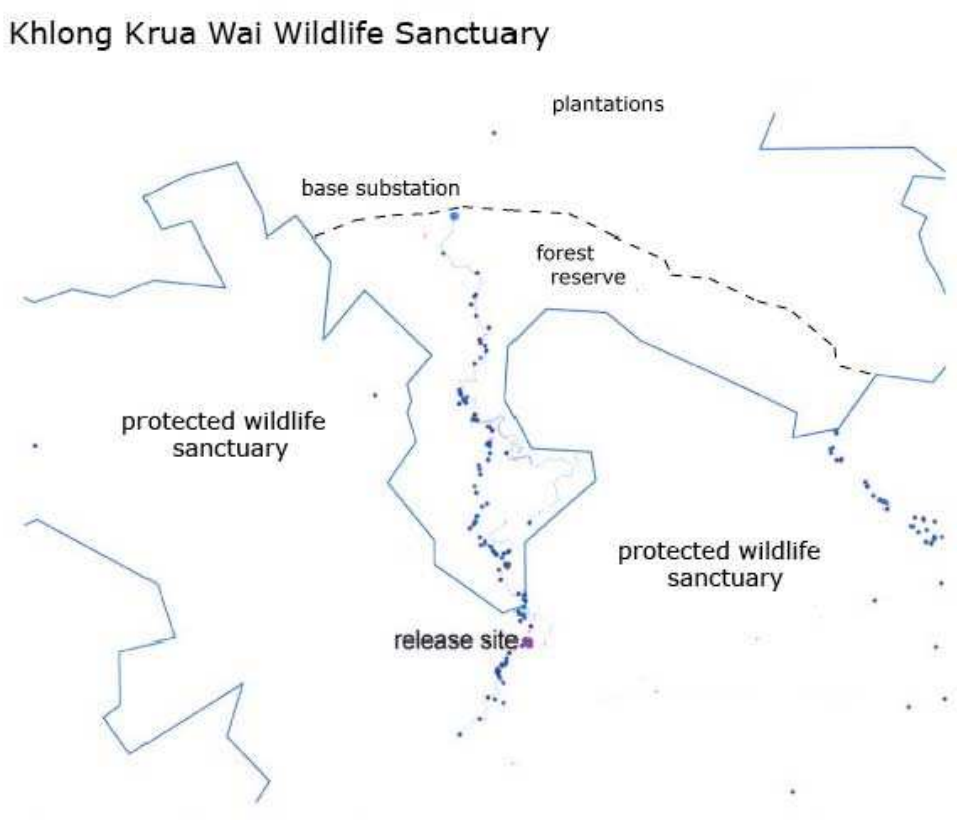

Fig. 2. Khlong Krua Wai Wildlife Sanctuary, Thailand.

At the rehabilitation center bear cubs will be monitored prior to release and only those displaying a greater proportion of natural behaviors such as foraging and resting behaviors will be selected for release (Grandia et al. 2001). Vickery and Mason (2003) argued that stereotypic behavior (repetitive, invariant behavior with no obvious function or purpose) in caged bears correlates with persistent abnormal behavior, indicating that caged bears make poor release candidates. However, Criswell and Galbreath (2005) demonstrated through their research, conducted at Banglamung Wildlife Breeding Centre, that the research conducted by Vickery and Mason (2003) had serious flaws in the methodology and protocols used rendering their results meaningless. Criswell and Fuller (2006) corrected these mistakes in experiments at Pang Thong 2 Wildlife Breeding Centre, Mae Hong Son province in 2004 to 2005 and found that bears released into large enclosures improved adaptive learning. These results are important, as caged bears will need to adapt rapidly upon release to forage for food sources and defend themselves from predators and competition (Hwang et al. 2002; Carr et al. 2002; Robbins et al. 2005; Naves et al. 2006).

Genetic Suitability

The genetic makeup of an animal determines its morphology and its suitability for existence in a specific environment (Paetkau et al. 1998; Solberg 2006). Therefore, it is an important aspect of release programs to match the genetic type of animals as closely as possible to those that existed previously in the area (Rode 2006). To achieve this, a total of 60 different samples from captive black bears known to have originated from areas within Thailand, Burma, Laos, and Cambodia have been subjected to DNA typing (Galbreath 2004). During this study a number of different genetic types of Asiatic black bears were identified corresponding to different geographical areas. It is reasonable to assume that bears that historically existed at the release site were of a similar genetic type (Paetkau et al. 1998; Saitoh 2001; Yu et al. 2004; Solberg 2006). Bears suitable for release with an "eastern Thai, Cambodian and Laotian" genotype have been determined and therefore should be suitable for release in the KhlongKhlong Krua Wai Wildlife Sanctuary area. Bears originating in the western areas of Thailand exhibit a different genetic makeup, and should be excluded from reintroduction into Thailand's eastern Forest Complex (Galbreath 2004).

Release Enclosure

It is proposed that battery-powered energizers will be able to provide an electric current to support a fenced enclosure measuring approximately 500 meters by 500 meters in the center of the release site. A design of six 10 kilowatt-charged wires insulated to steel posts fixed in cleared ground is proven to securely accommodate Asiatic black bears.

Based on existing TSCWA research and published literature, the area chosen for the enclosure will be a good example of a diversified natural habitat for Asiatic black bears. There is a dearth of information on the foods that form a natural diet for wild Asiatic black bears in this region of the world. Hence conclusive research on diets and food choices must be undertaken on the bears placed inside the enclosure and then applied to the overall release site prior to any actual bear release (Hwang et al. 2002; Carr et al. 2002; Robbins et al. 2005; Naves et al. 2006). A maximum of four animals will be housed in the enclosure until the Centre staff believes that the bears have an optimal chance of survival in the wild, in which case the bears are ready for release.

Future Impact

If our initial release has resulted in a successful reintroduction of Asiatic black bears into the Khlong Krua Wai Wildlife Sanctuary, then the following wide-ranging effects would have been established: 1) the return of bears into areas where they once were present and the possibility of the formation of sustainable wild populations of Asiatic black bears in Thailand; 2) the possibility of releasing more captive bears into other sanctuaries by using the same methods; 3) reducing the resources required to keep such a large population of confiscated bears in an unacceptable standard of captivity and, 4) providing information to improve the knowledge base of the Department of National Parks, Wildlife and Plant Conservation officials, staff and the general public on bear conservation issues.

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An Experiment of Returning Brown Bear Cubs into the Wild at the Northern Edge of the Brown Bear Range

Dr. A. M. Khokhlov and Dr. O.A. Makarova

The State Nature Reserve Pasvik
184404 Rayakoski, Pechenga District, Murmansk Region, Russia
ppasvik@rambler.ru

The State Nature Reserve Pasvik, established in 1992 by Russia jointly with Norwegians, is situated in the middle reaches of the Paz River (Pechenga District, Murmansk Region). The brown bear is a common animal in the Paz River valley (Makarova, 2002). The reserve is involved in a joint brown bear monitoring project which includes the collection of genetic material for DNA analysis.

In Murmansk Region, the active season for bears averages 200 days, from the first ten days of April to the end of October (Makarova and Yermolayev, 1986). Normally, females and cubs emerge later from the middle to late April. This is a difficult period in northern communities, particularly for female bears with young. Occasionally, cubs are abandoned by the mother or lost by her. Cubs are known to be born in the den in late January to early February. In our region (Tersky District), in 1996, a female bear with twins was killed. On February 4th, the newborn bears were taken to Murmansk and the next day were transferred to St. Petersburg. The weight of the male was 500 g and that of the female 450 and their eyes were still closed. During the same year in Norway a den was disturbed, and the female bear abandoned her two cubs. The male weighed 3.4 kg and the female weighed 3.1 kg. These cubs were euthanized and mounted for display. These individual examples are suggestive of the weight parameters of young bears at the northern edge of their range when they are born and before their exit from the den. Similarly, in the Ser-Varanger community a male bear cub that lost its mother was found. It was emaciated and had to be euthanized on May 30th. Its weight was 2.5 kg. The cub had been wandering around a building, evidently without food, suggesting that it had lived off its body reserves for at least a week (Makarova, 1998; 2003).

Below is a description of an experiment by Pasvik reserve employees of returning bear cubs to the wild. The experiment was carried out in the spring and summer of 2003, under harsh conditions when the cubs had lost their mothers (Makarova and Khokhlov, 2005). This experiment did not follow the procedures used by V.S. Pazhetnov (Pazhetnov et al. 1999), but provided another example of opportunities to preserve a big terrestrial carnivore in the northern taiga.

At the end of May 2003, employees of the Cascade of the Paz Hydroelectric Stations repeatedly saw two cubs when they were riding to work and back. The cubs were at the road side between the villages Rayakoski and Yanikoski. When no one got off the bus, the cubs would sit quietly at the trunk of an old pine tree or near it, about 50 to100 m from the highway. When humans tried to approach them, the cubs would run away and climb a tree. The situation was unusual. The cubs remained at the same spot for at least a

week. The hypothesis that the mother had died and its carcass was nearby was not confirmed. Presumably, the cubs had lost their mother.

An old ant hill was dug up, the earth dug up at the tree roots, and skinned trunks of old pines were suggestive that the cubs were trying to forage for food on their own. The spring season is known to be hard on bears, so it was decided to capture them and send them to a zoo. An attempt was made on June 5th, but was unsuccessful because the cubs were not present at that time. Then on the recommendation of the Murmansk Region Game Management Board, it was decided to make use of the Pazhetnov method (1999) for returning the bear cubs into the wild.

To find out whether the bears were in need of supplemental food, condensed milk was poured out on the leaves and grass where they usually seen. The next day the milk was thoroughly licked off and the earth in some place disturbed. The condensed milk can bore the marks of cub teeth.

Supplemental feeding was started on a regular basis after that. Between June 7th and 23rd, food was put out twice a day, morning and evening. The cubs ate everything that was provided to them. The diet was in conformity with Pazhetnov's recommendations and some of these details were communicated to us by him over the telephone. For some time the cubs would not eat oatmeal porridge willingly. Then the mixture was liquefied. Each meal contained 400 g of curd, 500 g oatmeal, 2 eggs, 2 g of salt, 5 g of sugar and 1 liter cow milk. M. Yu. Klorotkov, a reserve employee, prepared the mixture and added one tablespoon of vegetable oil per cub on the recommendation of Pazhetnov. In addition, we tried to add a mix of carrots and chopped cabbage to the mix (15 g), but the cubs never got used to eating vegetables (they would play with them and scatter them around). Eventually, we discontinued providing them with vegetables.

Gradually, the food bowls were moved further into the forest so the bears would not get habituated to people. The supplemental feeding was done by the same person, the vehicle driver A. A. Shilov. According to him, he would pour out the meal into the bowls and leave immediately. The bears would occasionally run out, but would not approach him. When other vehicles or other humans appeared, they would escape, hide or climb a tree.

All children and adults in the neighboring villages were asked to maintain a distance from the bears and were asked not to walk their dogs in the vicinity of the cubs. The military were also instructed respectively. There probably were instances when our instructions were not followed. However, there were cases where the intruders failed to see the cubs. Occasionally the cubs were spotted, but subsequently they would escape or would not come to their feeding site if they sensed strange odors or sounds. As they grew they learned to play with their bowls. Occasionally, they would take their bowls into the forest, and after a few days the plastic dishes were found at the original site with tooth marks. In late June, feeding was reduced to once per day. Normally, it was taken to them between 9 and 10 in the morning and put into plastic buckets. When those buckets were taken away by the bears and lost, the food was poured into a single enameled bowl. When that bowl was also lost, the food was put on the ground. The bears would regularly feed

on the supplemental food, but occasionally the cubs would take a long time before they would begin feeding, which suggested that they were not hungry.

It was noticed that by mid-June, they had notably grown and become stronger, and their juvenile coats were replaced by new fur. They became evenly brown, but the smaller cub had a light patch on the front of its neck. By July 14th more than a month had passed since the beginning of supplemental feeding. The blackberries and cloudberries had started ripening. But the bears still consumed the supplemental food. Occasionally when the bears did not find any berries, they remembered the site and the time the food was put out. On July 27th to 28th they had stopped consuming the supplemental food, but they continued to return to the site on a regular basis. The bowl and the bucket with food remained intact for several days running, but the bears would not approach them.

In August, the area in the vicinity of the supplemental feeding site was visually examined for evidence of activity by the cubs. There were no cubs around. However, we observed that the site where the cubs lived from May to August was trampled down. There were numerous paths leading from the site in various directions, which eventually disappeared in the forest and bog. One of them was fairly conspicuous crossing the road to get into a large boggy area where it disappeared. The trunk of the sloping pine, which they climbed and slid down, was worn. The base was also worn: presumably, the cubs slept and played there. The bases of several old pines were also worn. The cubs made a bed near a big, old ant hill, and half of the ant hill had been destroyed. The bear feces that were found contained the remains of beetles and also the remains from the contents of the ant hill. Although blackberries had been ripening, no berries were found in the feces. Subsequently, nobody saw bears in the area. On the advice of Valentin Pazhetnov, the supplemental feeding and monitoring of the animals was discontinued. It is not until September that the cubs, who were notably larger, were sighted by a bus driver on the road not far the feeding site. The driver reported the bears to have run in front of the vehicle for some time.

The next year at the end of May 2004, after the snow had melted, we examined the supplemental feeding sites, but no fresh traces of the presence of the animals were revealed. However, later, at the beginning of June a report from frontier guards came about two bears dwelling south of Yaniskosky, in the region of the Yivara Mountains. Again later they were sighted by some employees of the Cascade of the Paz hydroelectric stations at the same sites where they had been found the year before. The bears had grown up but were not as big as was expected. In any case, the cubs overwintered well enough. There are grounds to believe that the returning of the bears into the wild proved successful.

Every year, the reserve employees examine the bear supplemental feeding site. On the road near the feeding site and farther away evidence of the presence of the cubs was observed. There is no direct evidence available that those are the bears that received supplemental feeding in 2003. Still, we believe that this experiment of helping bear cubs to return into the wild proved successful. What many of us were afraid of, i.e., that the animals would become habituated to humans and subsequently be involved in human conflicts, was not observed even though bears were repeatedly seen in the area.

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Is rehabilitation of polar bear orphan cubs possible?

Nikita G. Ovsyanikov, Ph.D.

Institute of Problems of Ecology and Evolution, Russian Academy of Sciences/Wrangel Island State Nature Reserve.
nikita_ov@mail.ru

Introduction

Among all the bear species, polar bears may be considered the most challenging to rehabilitate as orphaned cubs. That is because polar bears are obligatory predators on marine mammals and their entire life cycle is strictly linked with dynamics of drifting pack ice in the Arctic. For their basic subsistence and breeding polar bears completely depend on hunting seals on the ice (LØnØ 1970; DeMaster and Stirling 1981; Amstrup and DeMaster 1988; Stirling 1988). When orphaned cubs are being rehabilitated other species-specific characteristics such as long-term maternal care (up to the third autumn of cub's life), the cubs' inability to hunt successfully on their own, cubs being cannibalized by adult bears and killed by other predators, could also prove as obstacles (Taylor et al. 1985; our observations, in prep.). Life as a predator on drifting ice and the inability to hibernate during the hardest winter months could also influence the rehabilitation process. With such biological features and under these ecological circumstances, is successful rehabilitation of orphaned polar bear cubs possible at all?

To consider this question, we have to review available information on polar bear social and hunting behavior in the wild, with particular emphasis on behavior differences between cubs who have received maternal care and those who have not. The considerations that have been made in this article are based on observations made during the course of my long-term study of polar bear behavioral ecology on Wrangel Island. Data on social, maternal and cub behavior were collected from 1990 to 1993 and from 1997 to 2007 during a total of 15 field seasons on Wrangel Island. Observations were carried out during spring (1990 to1993) and autumn (1990 to 1993, 1997 to 2007) seasons, when polar bears stayed on the island on a regular basis. The main behavioral methods used were direct visual observations of polar bear behavior, employing a combination of two types of protocols – "focal animal/group" (Altmann 1974) and "Group or Scan sampling" (Ovsyanikov 1993). Social encounters and individual activity of lone bears and groups that were visible were recorded by video whenever possible so as to be able to accurately identify the animals observed and to conduct detailed analysis of the observed behaviors. Bears were identified from a short distance using individual characteristics such as body conformation, facial features and behavior, and by individual-specific natural marks (scars, phenotypic variations). Additional features for short-range identification were coloration of skin and dirt spots on the skin. When observing family groups, the number, condition and general appearance of cubs was documented along with the mother's identification parameters.

Global environmental changes have resulted in the winter seasons becoming shorter and with the shrinking of ice sheets in the Arctic which have hampered the polar bears'

hunting success across their geographical range (see: Polar Bears. *Proceedings of the 14th Working Meeting of the IUCN/SSC Polar Bear Specialist Group, IUCN, №32*). We may reasonably assume that these conditions may facilitate more frequent orphaning of polar bear cubs. There is evidence that under such circumstances more polar bears go hungry as more of them become exposed to extremes of open sea environment (Ovsyanikov, 2006). The increasing proportion of Arctic ice melting each year suggests the possibility of a critical decrease of polar bear populations in the wild. Rehabilitation of polar bear cubs could prove to be a significant method for sustaining local populations of the species in the wild. Bears born and raised in captive or semi-captive environments could also be included in the rehabilitation process for subsequent release into the wild. Although such measures are ecologically and ethically controversial, it should not be excluded from the list of possible conservation efforts in support of the species' struggle to survive a critical period in its evolutionary path.

The objective of this article is to qualitatively evaluate observations of features of polar bear social and foraging behaviors that we made in the course of our study to identify key factors that would make rehabilitation of orphan cubs successful.

During the study period polar bears were observed in a various social situations (over 2000 extended episodes), from completely solitary foraging on sea ice to prolonged stranding on the shore and the gathering of polar bears into congregations of various sizes on the coast of Wrangel Island in late summer to autumn. Large congregations are formed, when 20 to 160 bears gather for days or weeks at one spot along the shore line of about 1 to 3 km in length. Normally, large, long standing congregations occur at traditional walrus haul-out sites, with or without walruses present. Smaller congregations are formed by bears gathering into smaller short-term bands at single walrus carcasses. During these gatherings, I observed social behaviors displayed by polar bears of both genders and all age categories in a variety of social contexts. In this paper, only social interactions that are important when considering issues of orphan cub rehabilitation are discussed.

Orphan cub occurrence in the wild

Our observations during a period of 17 years have shown that loss of polar bear cubs in the wild may occur at any stage of their post-natal ontogenesis after the family emerges from the maternity den. After emerging from the maternal dens, polar bear families spend the initial emergence period near their denning area before their move to the drifting ice. Natural loss of cubs during this initial emergence is unlikely due to the maternal care they receive, stability of environment and access to reliable shelters (maternal dens). During the initial adaptation for cubs, which normally takes 2 to 4 weeks, family groups are particularly sensitive to any kind of disturbances, such as intensive snowmobile activity (Ovsyanikov, 1996).

Although occasional natural loss of cubs cannot be fully excluded, all known cases occurred when yearlings were separated from their mothers during spring (n=3, 1991, 1994, 2006). The losses on Wrangel Island were caused when the family groups were

disturbed by intensive snowmobile or cross-land vehicle driving over denning areas or across bear passes to the ice. One cub was orphaned due to the death of its mother (n=1, 1980). Orphaned cubs at this age (their first spring-summer) do not survive long in the wild, unless they are adopted by another mother shortly after being orphaned. The probability of natural adoption should not be excluded and the existence of this phenomenon is supported by the fact that almost every autumn season on Wrangel Island, I have observed a family group of a mother with two cubs of clearly different ages, with one being a year older than the other.

During autumn seasons, I observed three single and one pair (siblings) of orphaned yearlings in 1990, 1998, 2006 and a 2002 respectively. In 1990, 2002 and 2006 these orphaned cubs appeared during "ice-free" conditions, while in 1998 the island was surrounded by pack ice throughout the autumn.

Occurrence of orphan yearlings is a common thing for the polar bear population in the Wrangel Island region. Every autumn, when polar bears are stranded onshore, I have observed several lone yearlings living on their own. The proportion of such sub-adult bears in the local population (a group of stranded bears, which in fact is a part of the local population) was not high, but still representative – in different years orphan yearlings comprised from 3 to 7.5% within a congregation of a few tens of bears. These orphaned yearlings were well capable of surviving within the polar bear community successfully and a majority of them were in good shape by autumn.

My observations of the local population of polar bears in late summer to early autumn recorded two-year-old cubs living without mother displaying social interactions more frequently than those living with their mothers. Cubs were also observed leaving their family groups by their third autumn (October – November). By this age bears are capable of independent living.

How do cubs get separated from their mothers?
Although direct observations of early separation of polar bear cubs from their mothers are rare (n=3, all temporary splitting with subsequent joining of the family), our general behavioral observations lead us to propose the most probable scenarios causing the separation (apart from mother's death) are:

1. Panic in the family group arising from being disturbed or chased. Some mothers, especially young inexperienced females, when disturbed, panic and run away immediately at a speed the cubs are unable to follow. Normally, even under duress, polar bear mothers protect their cubs and adjust their speed so that the cubs can follow. However, under severe threat if the mother has two cubs and one of them is weaker and has difficulty keeping in pace with the family, the mother may opt to run faster with one cub.

2. Cubs get lost in stormy open seas. When a family group with yearlings is swimming in a storm, one or more cubs may get separated from the mother since it is difficult for the mother to monitor her cubs in the storm and the wind may prevent the bears

from hearing or smelling each other. If they are not chased (by humans or another bear), they have better chances of reuniting.

In autumn 2002, at Cape Blossom, I observed a case of temporary splitting of a family group with three yearlings in the sea. On September 27th, in panic the mother escaped into the sea with one cub about 20 minutes before her other cubs, which swam together and came out of sea as a pair. The family re-joined approximately 0.5 km from the beach when the two cubs found their mother with the third sibling. The reunion was accompanied by an emotional reaction of the cubs and mother, particularly pronounced in the two cubs that were separated.

3. Cubs may get separated on drifting ice in blizzard. Drifting ice is a harsh environment and living on it for a family means sometimes getting out-of-sight from each other behind ice blocks and pressure ridges. It also means often crossing open leads and polynyas, which may be wide and wind may be forceful. In a blizzard, there is a lot of ice moving, degrading visibility. In these conditions it is also difficult for bears to communicate through the sense of smell and sound. I have not observed any evidence of this scenario, but logically, it seems possible.

4. Decreased obedience of cubs. Normally, a polar bear mother takes good care of her cubs and monitors and protects them even for a short period. Some cubs, however, show more initiative and in certain situations may behave rather independently and separate from the mother for a few minutes, going too far to explore their surroundings or approaching other bears. This situation was observed several times in congregations on the coast, especially, when there were various attractions in that area for bear cubs, such as other young bears and remains of killed walruses. In litters of three, two cubs may behave as a group, getting social support from each other and giving them the confidence to move farther away from their mother. The older and stronger a cub is, the more initiative it may take to move farther away from its family group.

There were several cases where sickness was observed, but it was never observed to be a reason for mother's leaving the cub. Even when a sick cub dies, the mother has been seen to remain near it for hours or days, while behaving nervously and guarding the cub's body.

Social status of orphaned cub in the population

In social encounters, cubs of any age behave as bears of the higher social status, compared to orphans of the same age. In agonistic encounters cubs strictly follow their mother's response; however, it is not rare that yearlings may take initiative in the family's aggressive lunge toward an approaching young bear, an adult female or another family group. Orphaned yearlings in such situations are particularly cautious and usually respond by retreating. The approach of an adult male may cause family groups to separate with the cubs escaping ahead of the mother. Orphan cubs tend to retreat when approached by another bear family group. However, if the bear (even adult

male) approaches suddenly or too close to a family group, the mother would likely exhibit defensive aggression, with her cubs hiding behind her.

A bear's personality seems to be the main factor determining how each individual responds in an encounter. As a general rule, all orphaned yearlings observed within a congregation of bears displayed good skills in managing social distance, demonstrating high sensitivity to immediate social situations, and an ability to take advantage of any chance to get access to available food (a carcass of dead walrus, a beached arctic cod, etc.). In the social context, orphaned cubs were showing more flexibility, freedom and initiative than cubs living in family groups. Some orphaned yearlings in certain situations behaved very confidently, even opposing adult bears, while attempting to feed at a walrus carcass.

Although rare cases of an orphaned cub attempting to hunt seals or a walrus were observed, none of them were successful. Hunting skills in young bears are age-related (Stirling and Latour 1978; our observations). There is no doubt that orphaned cubs in a polar bear population can survive successfully only as scavengers on kills made by adult bears. High social tolerance and communal use of carcasses of either killed or marine mammals found dead are important features of polar bear sociality for species survival in harsh environments (Ovsyanikov, 2005). This feature is important for the survival of orphaned cubs in wild polar bear populations.

In all three cases, when I observed single orphaned yearlings (n=3, in autumn), these cubs were observed for short periods of time (only a few minutes). In all cases the cubs were restlessly moving along the beach, apparently nervous and most likely hungry. One cub (1998), while passing my field cabin quickly explored a plastic box on the porch with his teeth and made a sharp short lunge toward a young arctic fox that happened to trot near the cabin.

Two lost siblings were observed in autumn 2002 and were followed for extended periods of time. They were a special case that provided my research with interesting behavioral information and evidence that even an orphaned yearling may have a chance to survive in the wild.

Case of Tuff

A couple of lost siblings were observed, for the first time, on the Cape Blossom spit on October 11th, 2002, at 17:30. By that time, there was a polar bear congregation on the spit of approximately 60 to 70 bears, of which approximately 40 to 45 remained on the spit while the rest dispersed within 2 to 3 km from the core area. The highest concentration of bears was constantly recorded at the end of the spit (approximately 450 m long x 200 m wide) and was up to 25 to 37 bears, with average density of up to 3 to 4 bears per ha. Locally, bears gathered in densities of up to 16 to 21 bears per ha.

At the first sighting, the lost siblings appeared in the crowd of bears, which gathered at the very tip of the spit after responding to a family group (a young female with one yearling that was disturbed, causing the mother to look back towards the tundra) and

then quickly running across the spit. Soon the panic spread over a part of the congregation, resulting in a partial bear gathering at the tip of the spit, with a few bears swimming into the sea, while the majority stopped on the beach close to each other. The two siblings were spotted within this group. They were screaming and grouping with each other, at the same time reacting nervously to any approaching bear. One female with two yearlings was attracted by the screaming orphaned cubs and tried to approach them. When she came up to 2 to 3 meters, the orphaned cubs made aggressive lunges toward her and the female with her cubs turned away. That evening, the siblings were observed on the spit displaying the same behavior – grouping together, screaming, and behaving nervously – while reacting to any approaching or passing bear with defensive aggression.

They were seen together without a mother for the next 5 days, walking back and forth over the spit, feeding on organic material along the surf line on the beach and avoiding contact with other bears. When they approached my cabin, my Samoyed dog Nanuk chased them away. The siblings quickly learned how to stop him by making aggressive lunges at him. When Nanuk chased them, they ran away, if the distance permitted their retreat in advance, or stopped him by making lunges, and then slowly retreated in a defensive profile.

On October 15th, filmmaker Arne Nevra arrived and joined me at the cabin to film a story about polar bears and our research at Cape Blossom. On October 16th, at 11:30, the siblings were seen together again, active and with no signs of sickness. They came to the cabin, hung around the cabin for a few minutes, until Nanuk chased them away and then went to the spit. Arne and I went to the spit a half hour later and observed the cubs in the wide end of the spit, about 1 km from the cabin. An hour and a half after we reached our observation point at the end of the spit, we spotted a mother bear accompanied by one yearling, swimming along the beach from the very end of the spit with a piece of flesh in her jaws. When she came out of sea near our observation shelter (a small metal cabin, 400 meters from the tip of the spit), we could see that the piece she carried was a paw of a polar bear cub. Then, on the low beach at the very end of the spit, we spotted a small group of bears eating something that looked like a fresh kill (bears were stained in bright red blood). There were only females and youngsters in the group at the remains, including a mother with 2 yearlings and two young, lone females. By that time, there were no males near the carcass, none near the end of the spit, and none within the group of bears eating the carcass. Later, when other bears left the spot, we went to the end of the spit to examine the remains of a freshly eaten yearling.

Since then, only one of these lost siblings was seen at Cape Blossom – on the spit, at the cabin, and on the tundra in the vicinity. Later, I discovered that the cub was a female. We filmed and photographed her constantly and her behavior during the rest of our autumn season. The story about her is included in the film titled “Polar Bear Alcatraz”. Since she was seen every day, regularly visited our cabin in search of any food and thus became a part of our lives, I named her – Tuff.

That autumn, walruses did not stop at the island and there were no walrus rookeries at Cape Blossom. As a result, there were no walrus carcasses available for bears in autumn 2002. Before ocean freezing, all bears, including Tuff, were feeding only on the remains of old walrus skins left from the past and on fresh organic material washed up on the beach by the surf, which was comprised of invertebrates and fish (arctic cod). On October 17th, Tuff found the carcass of a dead bird, chewed it, then picked up the remains of the bird's skin and carried it in her jaws along the beach. Later that day (October 17) she was seen 8 km east of our cabin, collecting organic material along the beach. As long as the ocean was ice free and organics were available on the beach, Tuff could manage to maintain normal body shape, did not look sick, but was apparently hungry. Tuff kept coming to the cabin and sometimes she tried to look inside our cold room where reindeer meat was stored.

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On October 24, I started feeding her occasionally with pieces of reindeer carcass. She hungrily accepted the food and since then started coming to us more often and staying by the cabin for longer time. I understood that my decision was controversial, but I could not see the cub suffering and my drive was rather sentimental as I could not believe that she would have a chance to survive the winter.

In 2002, the ocean at Cape Blossom started freezing about October 21st – that day the edge of young ice had reached Cape Blossom from North being blown by strong north-western blizzard. Active freezing began on October 23rd. Most of the bears moved to the ice on October 21st to 23rd as soon as the ice was hard enough to support them. By November 1st, there were no bears on the spit and only occasional short bear scouts along the shore line were recorded. Tuff did not leave and she kept living on the spit and regularly coming to the cabin. When she was by the cabin, I kept Nanuk inside, but occasionally they met and every time Nanuk chased Tuff away. She got used to that and easily managed to escape, stopping him by lunging at him, with no panic in her actions.

As we were preparing to finish the season and leave the cabin, I decided to give her the last gift and a chance, before she was to live completely on her own. During the late evening of November 2nd we gave her a whole reindeer carcass. She fed on it that evening and perhaps all night long, and was seen near it the next morning. Then Nanuk came out of the cabin and Tuff escaped from him onto the fresh ice. She slept on the ice and the next day (November 3rd) the ice, along with Tuff, was blown away to the sea. We did not see her again that autumn and left the island on November 21st.

The following year, autumn 2003, I was at Cape Blossom again. The behavior of polar bears was similar to that observed in 2002. A polar bear congregation of approximately 60 to 70 individuals was observed at Cape Blossom. There were no walruses hauling out on the beach that season and there was only a single walrus carcass washed up on the beach by the surf.

As usual, I was living alone in the same field cabin at Cape Blossom, observing bears in congregations and visiting to other nearby places. On September 17th, at 16:30, I

returned to the cabin (on ATV) after visiting the base camp at Doubtful (90 km from Cape Blossom). An hour later, three rangers drove to my cabin to bring me fuel. They had to stay overnight in my cabin. Just at the moment the vehicle arrived to the cabin and we started unloading, a polar bear cub, an orphaned yearling, came straight to the cabin, approaching the vehicle and humans at a very close distance of 1 to 2 meters, sniffing everything and looking for whatever we had for food. The cub was Tuff – I knew her face very well and would recognize her with no doubt. Her general appearance and face were well documented by photo and video in 2002. The park rangers had two dogs with them, which were in the vehicle's cabin. When the dogs were released, they immediately chased Tuff away. Her reaction toward the dogs was another confirmation of her identity because she was not terrified, did not panic, but turned against the dogs and managed to safely retreat by stopping their attacks. She behaved as if she was well acquainted with dog behavior and knew how to stop them by lunging at them. In 2003 Nanuk was not with me at Cape Blossom, but apparently his lessons were remembered by the cub.

The next day, the park rangers left, but Tuff remained on the spit and in the vicinity. I observed her continuously throughout the season. She was in good shape, not very fat, but well fed and looked healthy. Occasionally, she visited the cabin, but did not try to enter the door, and did not solicit food from me. While meeting me on the spit or around the cabin, she was not scared and did not run away in panic, as other sub-adult bears would, but at the same time, she did not show any particular attachment to me or to my cabin. In the social context, in 2003, she behaved as an ordinary orphaned yearling. There were 3 other orphaned yearlings in the congregation and in terms of social behavior Tuff did not behave differently. On October 3rd, I observed Tuff at the mouth of Thomas creek, 20 km north of Cape Blossom, within a small, temporary congregation of bears (21 animals) gathered around a fresh walrus carcass. Later she was seen again at Cape Blossom. I did not see her in 2004 or later, at least at distances close enough to make a reliable identification. Her further life history remains unknown.

The case of Tuff is evidence that even an orphaned yearling may have a chance to survive in the wild from the first autumn of its life under certain conditions, which include: 1) the cub is in good shape when it becomes an orphan, 2) feeding conditions in the region are favorable (successful hunts by adult bears often provide food for young, scavenging bears), and 3) the cub is wary and shies away from adult bears. I believe that (in addition to plentiful food sources) advanced sociality of polar bears and their high mental abilities are the key factors for successful survival of orphans in the harsh Arctic environment.

Ethical aspects for the rehabilitation of orphaned polar bear cubs

When polar bear cubs are being rehabilitated, ethical aspects in conducting this process precisely must be considered at every stage and this is a priority. The following are most important for rehabilitating bear cubs:

- There is a possibility that rehabilitation may allow a polar bear cub to become habituated to human presence and through this, sooner or later, expose them to

human-bear conflict, which could result in an injury or death to either the bear or a human.

- Occurrence of polar bear orphans in the wild may be a result of just bad luck or it could be a work of natural selection; if the latter, it may mean that rehabilitation efforts will be taken to act against the forces of nature.

In my view, both problems can be avoided by using appropriate rehabilitation methods. Regarding the first point, we should keep in mind that the main source of problem polar bear occurrences would not be a result of rehabilitating orphaned cubs, but mismanagement of human settlements, inappropriate behavior of humans (harassing bears with snowmobiles or feeding bears) and natural climatic changes, which force polar bears to search food everywhere, including in human settlements. Any wild bear may easily become a problem animal, if environmental conditions are right. To reduce the risk of undesirable behavioral patterns in rehabilitated polar bears, rehabilitation should use techniques to develop human avoidance in bears before release. This would help to reduce the probability that a released bear may turn into a conflict animal.

Regarding the second point, we can never be completely sure of actual reason of the occurrence of an orphaned cub. In my view, there is nothing bad in trying to help an orphaned cub and to give it another chance, providing resources are available. Any bear in the wild is subject to natural selection and a personal struggle for survival is unavoidable. However, rehabilitation techniques must not expose another bear family to trouble, which means that forced adoption of an orphaned cubs by another mother, that has her own offspring and own struggle for survival, should never be used. For a polar bear mother, it is not easy to raise cubs and adopting orphaned cubs would put more pressure on the mother and may reduce the chance of survival for her own offspring. Natural adoption, if it occurs, is the work of nature and the mother bears own choice.

Conclusions

Known facts of polar bear social behavior suggest that orphaned cubs can survive in the wild, after they are yearlings and, in rare cases, even after their first autumn. Natural adoption may take place allowing orphaned cub survival within a new family from even an earlier age. High sociality and intelligence of polar bears are considered the key factors allowing orphaned cubs to survive successfully on their own as scavengers.

Rehabilitation techniques for orphaned polar bear cub, if applied, should be based on raising orphans in semi-captive environments in a group of at least two conspecific cubs until their second summer of life (the earliest possible age for release) with contact with humans reduced to an absolute minimum. When the cubs are being released, they must be in very good health and body condition. They should be released in late spring into an area with abundant food resources and as far from any human settlements as possible. Pre-release treatment for human avoidance is highly recommended. A protocol based on the forced adoption of an orphan by another bear family is unacceptable for ethical reasons and should not be permitted.

From what we observed in polar bear populations in the wild, it is predicted that developing global climatic changes (Arctic pack ice disappearing) will result in increasing occurrence of orphaned cubs, in addition to other problems for polar bears. This may result in a greater number of situations requiring the rehabilitation of orphaned polar bear cubs. If it comes to this stage, possible role of zoos in this task may be considered, as well as creation of special semi-captive facilities.

At any rate, in terms of polar bear survival as a species in a rapidly changing environment, orphaned cub rehabilitation should be considered an important and additional measure. The main conservation measures to help polar bears survive the critical period as a species should be better protection for polar bears in the wild, effective law enforcement against any illegal shooting, better management of human-polar bear encounters to avoid the forced shooting of bears, territorial protection of areas that are important as terrestrial polar bear refuges, global international efforts to reduce pollution of the oceans and the global warming effects, and preventing the decrease of marine mammals, the main food source for polar bears.

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REHABILITATION OF BEARS

A humanitarian act or a valuable wildlife management tool?

Angelika Langen

Northern Lights Wildlife Rehabilitation Center
Smithers, B.C., Canada
angelika@mountainviewadventures.net

Rehabilitation of bears around the world is often not recognized as a valuable wildlife management tool by governments, even though it has been going on for centuries. The most common response is that rehabilitation of bears has no value for the wild population as a whole, but is rather a strictly an animal welfare issue. Therefore, such projects are not promoted by most governments, but grudgingly permitted when there is a strong public demand that cannot be ignored. Some cubs are then rescued and successfully released back into the wild, while others, unable to fend for themselves, are killed by predators, left to die a slow death from starvation or killed in conflict situations.

So what motivates rehabilitators around the world to tackle these issues in spite of this lack of support? The humanitarian aspect of the work cannot and should not be denied. Every rehabilitator gets drawn into this work primarily by feelings of compassion for these highly intelligent mammals. Recognizing the increasing threat to wild populations of bears is imperative in order to save them from going extinct. Diminishing habitats, conflict situations with humans, as well as unnatural death due to human encroachment often leaves orphaned cubs behind. Giving these animals a second chance at life should be a moral obligation since nine times out of ten a cub is orphaned or injured due to human causes. *"Managing the harvest"* and *"letting nature takes its course"* are two phrases often used to justify government policy that is simply outdated. However a large proportion of deaths is due to human causes that fall outside of "harvest management", such as a mother bear killed by a car, truck or train, or being shot legally or illegally.

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Bear rehabilitation is more than doing what's right from an animal welfare perspective. Around the world, rehabilitation of bears is taking on a new meaning because globally most species of bears are endangered as a result of human encroachment and climate change. We are now discussing the survival of bears as species, and not just as individual animals.

This year, IFAW sponsored the 2007 *International Bear Rehabilitation Conference* in Russia. Rehabilitators from around the world shared their thoughts and experiences. The outcome was incredible. Rehabilitators found that no matter where they came from, the difficulties, doubts and successes were similar.

Although individual methods for rehabilitation differed slightly, the outcomes were mostly the same. It was very interesting to learn that whether the cubs had no or minimal human contact with humans or whether a "human" mother walked with them in the bush, the success of reintroduction to the wild was similar. This suggested that rehabilitation works.

Critics of bear rehabilitation state a number of concerns in defense of their outdated views. The most common arguments are:

1. Cubs will be habituated and seek out humans after release, which will lead to more conflict bears or possible attacks on humans
2. Cubs are unable to survive on their own after being released
3. Cubs are unable to reproduce and rear their young, as they have not learned this from their mother
4. Rehabilitating bears takes away funding from other important bear research projects, such as habitat conservation and conflict management
5. Rehabilitation of bears has no value for the wild population as a whole and is strictly an animal welfare issue.

Are these concerns justified or are they a leftover of old beliefs and misinformation?

1. Early attempts to rehabilitate animals were certainly conducted on a purely humanitarian basis, and occasionally resulted in improper handling of animals, with subsequent habituation to humans that resulted in human conflict situations. Rehabilitation methods have evolved from those early stages and now incorporate the animal's natural behaviors into the process of preparing them for survival in the wild. In the rehabilitation of bears, their social behavior and the period when they leave their family group have a great impact on the timeline of rehabilitation. Young bears need a certain amount of protection to develop their skills and to grow into an animal that can care for itself. Upon the death of a mother, cubs often lack these important factors in their life. This is where rehabilitation steps in by providing a safe haven until such a time that the cub can take care of itself. This requires suitable species-specific enclosures and food, as well as caretakers knowledgeable and experienced in rehabilitating bears. Release times will differ from species to species, but usually run along the timeline of natural family breakups. Proper handling ensures that habituation to humans diminishes after weaning.

   Once the cubs are released, they adapt quickly to their new surroundings and rarely come into contact with humans again. If they do, it may have been because the release site was inappropriate. It is the responsibility of each rehabilitator to identify such individuals that are unsuitable for release because they exhibit behaviors that might create conflict situations in the future. Bears have strong personalities and every once in a while rehabilitators will encounter animals that show a strong inclination to

become more interactive with humans than is desired. These bears are found in the wild, too and so do not necessarily reflect the management practices of the rehabilitation center. It is of great importance to recognize such animals and to prevent their release, as one bad situation can put the whole program in question. Such animals can either become ambassadors for their kind in human care or need to be humanly euthanized.

2. Studies across the world have proven that cubs adapt to the wild very quickly and have strong survival skills. Though efforts are made to provide natural food during rehabilitation, this is not always possible. However, cubs instinctively know what constitutes their natural food supply. When given their favorite non-natural food and the choice of natural food in season, they select the natural food source.

   Their instinctive response of flight to avoid threatening situations is also strongly developed and needs to be supported by enclosures that allow them to act on their natural instincts. Depending on the species of bear, this means providing hiding places or climbing opportunities. Natural surroundings will encourage and allow the cub to develop and maintain such natural behaviors. Keeping cubs in unsuitable enclosures that do not allow such natural behaviors to develop may result in bears displaying abnormal behaviors that may prove detrimental after the animal is released.

   Natural surroundings are also important in the search for food. Some species dig for roots or forage for fruits in shrubs and trees. Such natural food sources have to be provided (or at the very least mimicked) to support the natural desire to explore, forage and climb.

3. Studies have proven that rehabilitated bears have no trouble reproducing in the wild and that the females make good mothers. Unfortunately funding often does not allow such long term studies and therefore most of this evidence comes from anecdotal accounts. On the other hand, there are no studies as of yet that prove otherwise.

4. Most projects on the rescue and rehabilitation of bear cubs run on a nonprofit basis and, therefore, have no or very little impact on government funded projects. However, in areas where these projects are funded by the governmental entities, it should be recognized that a considerable proportion of the work can be done in conjunction with other projects and studies and these should be combined to make them financially feasible and viable. The lack of communication between research projects is the most common factor which results in several projects and groups working on similar issues that ideally should have been handled under the same umbrella.

5. Rehabilitation of only one cub can and always has an impact on the wild population in a great number of ways. I would like to create an example to demonstrate the opportunities that rehabilitation can provide for the wild population. For example, if a female bear is killed in a car accident and her cub is orphaned and placed in a rehabilitation center, the following have been accomplished:

    - The cub's life is saved which usually has a positive impact on public perception of government management practices, and at the same time preserves the genetic line of the cub's parents.

    - With the public interest raised by the media about the death of its mother and subsequent rescue, this cub is an excellent vehicle for building public understanding and support on issues of biodiversity, habitat management, and human-wildlife interaction.

    - By placing the cub in rehabilitation, we provide an opportunity to learn more about bear behavior and biology. This is a fact that is not utilized sufficiently in the current bear management issues. Cubs in human care do not only provide an excellent opportunity to raise public awareness about bear conservation and rehabilitation, but also provide a chance to answer a number of scientific questions.

    - Once the rehabilitation period is completed, the cub will be released into the same population from which it came, and therefore does not affect the natural population structure. In cases where cubs are released elsewhere, this is usually done to reintroduce or support a dwindling natural population in affected areas and the cub has now become a tool in preserving the species.

    It is clear that rehabilitation of bear cubs supports the wild bear population and in some cases may play an important role toward this end.

The key issues for successful rehabilitation are:

- A cub needs suitable housing and care until it reaches the age at which it can be self-sufficient.

- The cub must be released into a suitable habitat.

- The cub should be released during a time when there is maximum food availability in order to ease the transition back into the wild.

- The cub should be of an age at which free-ranging cubs naturally leave their families in the wild.

Supported by the public, bear rehabilitation is a valuable tool in wildlife management to protect both threatened and non-threatened species. It offers us a unique opportunity to learn about bear behavior, which then allows us to assist in the management of the species through an increased level of understanding. In this way, we hope to protect and maintain healthy numbers of animals in both threatened and non-threatened species. Those in the field of bear rehabilitation are highly motivated and knowledgeable individuals who have a special bond with these animals and are driven by a desire to give them a fair chance at life. Bear rehabilitation has a lot to offer not only to the scientific community but to society as a whole.