出國報告（出國類別：國際會議）

第十八屆國際熊類研究及經營管理研討會

服務機關：國立屏科技大學野生動物保育研究所
姓名職稱：黃美秀　助理教授
派赴國家：墨西哥
出國期間：96 年 11 月 03 日至 96 年 11 月 18 日
報告日期：97 年 02 月 10 日

附件二

出國報告審核表

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（18th International Conference on Bear Research and Management）</td></tr>
<tr><td colspan="2">出國人姓名（2 人以上，以 1 人爲代表）</td><td>職稱</td><td>服務單位</td></tr>
<tr><td colspan="2">黃美秀</td><td>助理教授</td><td>國立屏東科技大學
野生動物保育研究所</td></tr>
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☐2.格式完整（本文必須具備「目的」、「過程」、「心得」、「建議事項」）
☐3.內容充實完備
☐4.建議具參考價值
☐5.送本機關參考或研辦
☐6.送上級機關參考
☐7.退回補正，原因：☐□不符原核定出國計畫　☐♜以外文撰寫或僅以所蒐集外文資料爲內容　☐+內容空洞簡略　☐⌒電子檔案未依格式辦理　☐●未於資訊網登錄提要資料及傳送出國報告電子檔
☐8.本報告除上傳至出國報告資訊網外，將採行之公開發表：
☐辦理本機關出國報告座談會（說明會），與同仁進行知識分享。
☐於本機關業務會報提出報告
☐9.其他處理意見及方式：</td></tr>
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☐3.其他處理意見：</td></tr>
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說明：

一、出國計畫主辦機關即層轉機關時，不需填寫「層轉機關審核意見」。

二、各機關可依需要自行增列審核項目內容，出國報告審核完畢本表請自行保存。

三、審核作業應儘速完成，以不影響出國人員上傳出國報告至「出國報告資訊網」爲原則。

摘 要

「國際熊類研究與經營管理研討會」是現今國際上針對世界上熊類的研究和保育最具規模的會議。筆者參與於 2007 年 11 月 4 至 10 日於墨西哥舉行的第十八屆研討會，旨在發表以「亞洲黑熊攝食及果實類型對於種子萌芽之影響」為題之口頭論文，以及以「圈養亞洲黑熊之幼獸行為發展及親子關係」為題之壁報論文。筆者並受邀擔任議程分組報告之主持人，並參與會後隨即舉行之世界自然保育聯盟（IUCN）之熊類專家群會議，交換促進熊類保育及研究之意見。此會議提供不僅提供有關熊類研究與保育的最新發展，也提供了各類專家學者及保育人是交流討論的平台，促成未來合作保育及研究熊類的機會。

目次

一、目的

「國際熊類研究與經營管理研討會」是現今國際上針對世界上熊類的研究和保育最正式且最具規模的會議。參與 2007 年 11 月 4 日至 10 日於墨西哥舉行的第十八屆研討會，筆者旨在發表以「亞洲黑熊攝食及果實類型對於種子萌芽之影響」（附錄一）爲題之口頭論文，以及以「圈養亞洲黑熊之幼獸行爲發展及親子關係」（附錄二）爲題之壁報論文。此外，筆者並受主辦單位邀請擔任議程分組報告之主持人。研討會後隨即舉行世界熊類專家群會議，由於筆者目前擔任世界自然保育聯盟（IUCN）物种存續委員會亞洲黑熊專家群之共同主席，故受邀參與，參與討論並提供個人意見，期促進亞洲地區熊類之保育。

二、過程

2007/11/3：

台灣飛往洛杉磯，轉機至墨西哥 Moterrey。

2007/11/4：

研討會議場(Moterrey；附錄三)註冊。

2007/11/5：

參與會議 Session 1（Bear Research, Management& Conservation in Mexico）、Session 2（Bear Foods & Nutrition）、Session 3 (Polar Bear)。14:40 筆者口頭發表論文－「亞洲黑熊攝食及果實類型對於種子萌芽之影響（附錄一，Effects of fruit types and consumption by Asiatic black bears on seed dispersal）」。

19:30-21:00參與遺傳研習會Genetics Workshop Part 1 - Density Estimation: DNA hair snag essentials, issues & strategies in DNA sampling, & Program MARK Overview Presented by John Boulanger, Integrated Ecological Research, Nelson, BC, CANADA; Gary White, Colorado State University, Ft. Collins, CO, USA; and Mike Proctor, Birchdale Ecological, Kaslo, BC, CANADA

2007/11/6：

上午參與會議 Session 4 (Population Estimation)

10:00-12:00 IBA 國際熊類學會會員會議

14:30-18:30 參與遺傳研習會（Genetics Workshop Part 2 - Monitoring Bear Population Trends in Forested Environments - Presented by *John Boulanger*, Integrated Ecological Research, Nelson, BC, CANADA; and *Mike Proctor*, Birchdale Ecological, Kaslo, BC, CANADA. Contributing scientists include *Rick Mace*, Montana Fish, Wildlife & Parks Department; *Dave Garshelis*, Minnesota Department of Natural Resources; and *Mark Boyce*, University of Alberta）

18:30-21:00 海報展示及解說（附錄四），發表論文：圈養亞洲黑熊之幼獸行爲發展及親子關係（附錄五，Infant Behavioral Development and Mother-Young Relationship of Captive Asiatic Black Bears）。

2007/11/7

白天(Field Trip)：國家公園戶外參訪。

18:30-21:00 Bear Observation Video & Informal Discussion，錄影帶觀賞，討論美洲黑熊行爲習性。

2007/11/8

參與會議Session 5 (Bear management and conservation)、Session 6 (Bear behavior)及Session 7 (Andean bear research, management and conservation)。18:30-21:00參與遺傳研習會Genetics Workshop Part 3 (Planning and Conducting Noninvasive Genetic Research, presented by Kate Kendall, Jeff Stetz, and Amy Macleod, Northern Divide Project, US Geological Survey, Glacier National Park, MT, USA.)

2007/11/9

參與會議 Session 8 (Human Bear Interaction / Conflict)、Session 9 (Bear Physiology)、Session 10A(Spatial Analysis & Spatio Temporal Relationships)。

12:00-13:30 亞洲黑熊專家群小組會談（附錄六 A）

15:10-16:50 筆者主持 Session 10A(Spatial Analysis & Spatio Temporal Relationships 之議程。

16:50-18:00 閉幕式

2007/11/10

7:30- 11:00 世界自然保育聯盟(IUCN)物种存續委員會熊類專家群(Bear Specialist Groups)會議(附錄六 B)。

13:00 - 17:00 La Pastora Zoo, Bear Anesthesia, Monitoring, & Handling Workshop(附錄七)

2007/11/11~11/16 個人參訪墨西哥生態保護區及保育學者。

2007/11/17~11/18 墨西哥 Monterry 搭機經洛杉磯，抵台北。

三、心得

「國際熊類研究與經營管理研討會」是現今國際上針對世界上熊類的研究和保育最正式且最具規模的會議。該會議每年分別在北美地區，以及世界上其他有熊類分佈的國家輪番舉行，參與者包括來自世界各地的熊類學者專家、自然資源管理及保育的政府機關、以及相關的保育組織和代表等數百人與會。

除了學界之外，參與者不乏其他非營利之民間保育保育機構，包括公、私立動物園、以及國際保育聯盟熊類專家群、野生動物貿易調查委員會、世界動物福利基金會等。此次會議內容涵蓋世界八種熊類，與會代表分別來自 26 個國家，包括 Argentina, Belgium, Bolivia, Canada, China, Colombia, Croatia, Ecuador, Estonia, Germany, Greece, India, Iran, Italy, Japan, Nepal, Mexico, Norway, Pakistan, Panama, Peru, Poland, Russia, South Korea, Sweden, Taiwan, Turkey, United Kingdom, United States, and Venezuela 等，發表論文涵蓋 55 篇口頭及 88 篇壁報論文（附錄八）。論文內容涵蓋文熊類保育及經管理、人熊關係（Bear/Human Interactions）、野外及實驗室研究技術、棲地評估及利用、族群估算、行爲生態。

和往年相較之下，雖說此屆國際熊類研討會的主題內容，已儘量試著兼顧世界所有熊類研究，但是多數的發表論文仍是出自於北美地區，我們仍是可以明顯的看到亞洲地區熊類研究及保育和其他地區的大幅落差。在世界八種熊類之中，除了北美地區，對於境內的美洲黑熊、棕熊、北極熊的研究和保育，已有超過三、四十年的研究歷史之外，近年來針對唯一分佈在南美洲的唯一一種熊類，即眼鏡熊，也已累積相當

多的研究者，其中更有許多計畫是由南、北美地區熊類學者的共同合作完成。此進展亦可由多篇有關眼鏡熊的口頭和壁報論文發表可見一般。甚至，在國際保育組織的參與下，「眼鏡熊保育行動綱領」亦甫完成並發表。

在口頭論文發表的題材上，相對於分佈於亞洲地區的四種熊類，成果發表卻只十分有限。僅有印度一篇關於懶熊救傷的報告，以及筆者發表一有關亞洲黑熊生態習性的報告一篇而已（附錄一）。此現象突顯出亞洲地區熊類研究和保育的的不成比例，也透露出語言上的可能隔閡，或許也是落實世界熊類研究和保育的限制因子。此外，更值得吾人重視的是，由於這些亞洲熊類的分佈範圍，許多都位於開發中國家，影響這些動物未來存續的威脅因子持續存在著，甚至情況在惡化之中，比如棲地破壞、人熊衝突、以及非法狩獵和買賣熊類等。加上這些分佈於亞洲地區的熊類，皆被列爲國際保育聯盟（IUCN）紅皮書上受威脅或易受傷害的物種，更透露出加強對這些物種保育和研究的急迫性。

除了學界之外，參與者不乏其他非營利之民間保育機構，包括公、私立動物園、以及國際保育機構。這些保育機構藉此機會，不僅瞭解有關熊類研究與保育的最新發展，更進一步直接與各專家學者討論，交換彼此的經驗和心得，也尋求未來可能合作的機會。筆者爲此不斷提昇的民間保育心力而感到欣慰，這股民間的參與力也是足資台灣借鏡之處。此會議提供不僅提供有關熊類研究與保育的最新發展，也提供了各類專家學者及保育人是交流討論的平台，促成未來合作的機會。故此會議遂成爲提升及影響國際熊類保育及研究水準最重要之會議。

四、建議

有鑑於保育資源（如人力、經費、技術等）的有限性，強調規劃保育議題之優先次序，遂成爲近年來在強調保護生物多樣性浪潮中的最重要話題。生物多樣性保育涉及層面和議題卻是十分龐雜，縱使各方對此意見紛歧不一，然其中所獲的一致結論便是：瀕臨絕種物種，庇護物種（Umbrella species），特有物種（Endemic species），以及明星物種（Flagship species）具有保育之優先性。在台灣，能同時符合這些保育優先順位條件者，台灣黑熊（*Ursus thibetanus formosanus*）便是一例。

台灣黑熊是亞洲黑熊分佈於台灣特有的亞種，也是台灣唯一原產的熊類。由於近年嚴重的開發與棲地破壞，野外台灣黑熊的族群及歷史分布縮減皆已逐漸縮減。此

物種於 1989 年依文化資產保存法被列爲瀕臨絕種的動物。牠們的地理分布主要侷限於缺乏人爲干擾、偏遠且地形崎嶇的山區。然而，在非法狩獵持續威脅其長期存續之餘，卻鮮有針對台灣黑熊所擬定的保育策略付諸行動。

台灣黑熊體型龐大，活動範圍廣泛，涵蓋了各種不同的生態環境梯度，爲保育學上的庇護物種(umbrella species)或地景物種(landscape species)。台灣黑熊於生態上及保育上所扮演的功能和角色，不僅攸關此物種於本島的保存，同時也將影響到更大範圍的生態系及所屬生物多樣性的保育。

由於政府及民間團體對於黑熊保育的逐漸重視，1994 年舉辦「台灣黑熊族群與棲地存續分析保育研習會」，國內外專家著手評估黑熊的棲地地用模式和族群存續性。在基於十分有限的資訊情境下，該報告指出台灣黑熊的族群處於「高度危險」的狀況，並粗略估計本島殘存數量計約爲 100-500 隻，遠遠低於種群永續發展所需的族群量。

瀕危物種的經營管理有其保育的優先性、必要性，尤其台灣黑熊同時身負旗鍵物種(keystone species)及庇護物種的角色。成功的黑熊保育除了有賴該物種生的物學資訊(包括物種生物學、棲息地需求、族群結構及數量、棲地破碎化、人類對棲地環境的利用)的累積之外，並且依賴社會、經濟、行政、組織等諸多因素的配合(圖 1)。

台灣黑熊的數量稀少且習性隱蔽，加上台灣山區研究環境相當艱惡，野外調查活動範圍廣泛的動物如黑熊十分困難，因此此物種現今於野外族群的分布、豐富度，以及生態習性依然不夠明朗，造成管理單位於擬定相關保育政策以及採取行動時的限制與障礙。然瀕危物種的保育工作有其急迫性，乃眾所周知的。就台灣黑熊而言，保育所需的資訊不僅受限於上述族群及台灣地理環境特色而累積緩慢，推展保育研究工作的順利與否也受限於研究人力和經費、缺乏政治組織的支持和管理單位對該物種的長遠保育規劃，以及社會大眾對此議題的認識不足。因此，筆者提出以下建議作爲未來台灣黑熊研究及保育之參考。

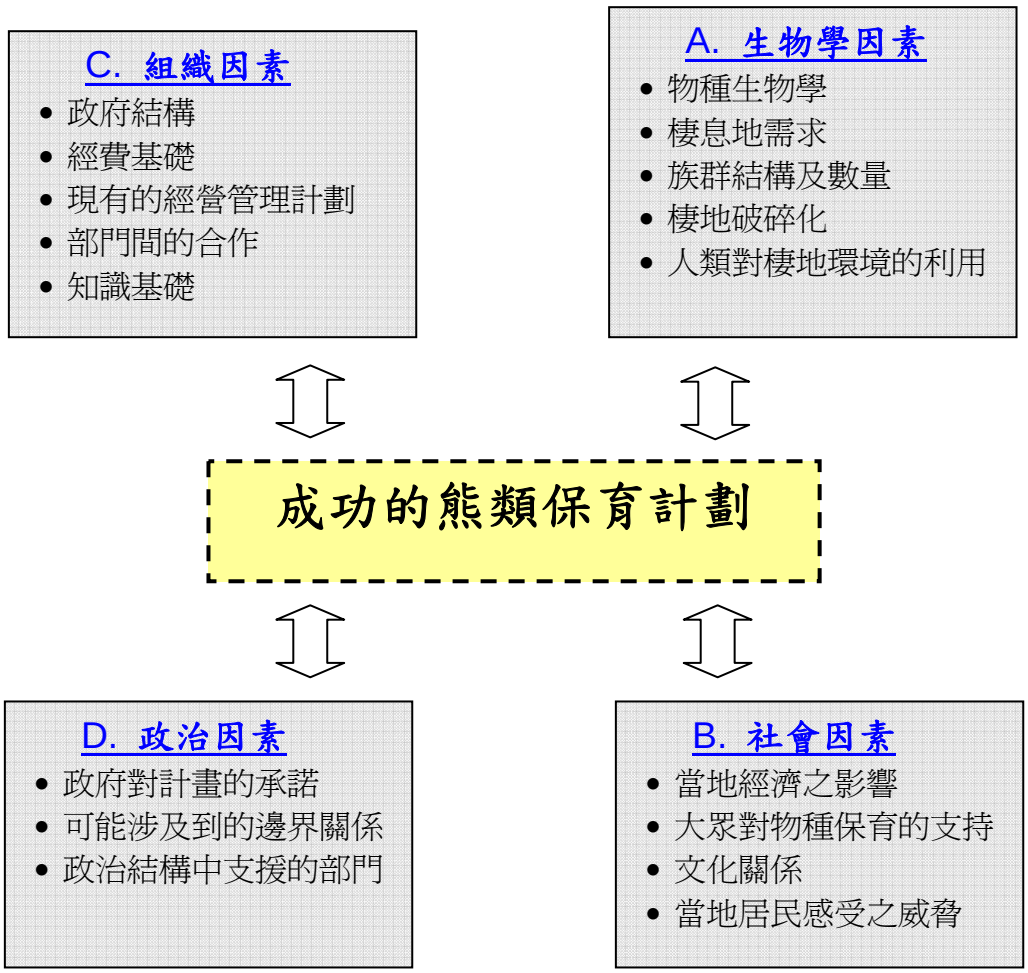

圖 1、成功的熊類保育計劃所應強調的議題及各項因素之關係圖

1. 整合研究資源，進行台灣黑熊之長期監測與研究

在台灣，野外研究較大型哺乳動物如台灣黑熊的困難度十分高。因爲這些動物通常習性隱蔽、活動範圍廣大，而且多分佈於在人爲干擾較少的偏遠山區；而這些地區則大多位於地形崎嶇、地貌複雜、植被茂密、交通不便之處。雖然這些大範圍活動的動物的野外研究，十分辛苦、也很困難，但卻非做不可，這更意味著研究者或相關單位應該集思廣益，整合資源和資訊，一起努力突破困境，累積台灣黑熊於生態學及保育上的相關資料。對於台灣黑熊相關的研究，較爲迫切者包括：黑熊族群於台灣全島分佈的現況；評估及尋找台灣黑熊分佈的熱點（Hot spots），進而加強該地區的生態監測和保育；加強對黑熊生態習性的瞭解，包括繁殖育幼、覓食策略、個體和社會行爲等；探討台灣黑熊的遺傳的多樣性，以及可能的關聯族群（meta-population）的分佈，藉以瞭解和是否有地理隔離的現象；加強瞭解非法狩獵黑熊的程度，以及其對黑

熊族群存續的影響；瞭解市場上，非法買、賣熊類產製品的現況。

2. 擬定台灣黑熊保育行動綱領（Conservation Action Plan）

與其他分佈於亞洲地區的熊類的窘境相似，由於人爲的各種開發及干擾活動，以及自然棲息環境的破壞，人與熊之間的衝突不斷增加，現今台灣黑熊的分布範圍不僅大幅縮減，其族群也處於受威脅的狀態。在台灣，黑熊被列爲瀕臨絕種的動物，也是華盛頓公約上附錄 I 的保育類動物，即除非特殊情況下，禁止國際間的貿易；牠們也被列爲 IUCN 紅皮書上的易受傷害物種 (Vulnerable species)。

然而，令筆者十分憂心的不外乎是，台灣的社會以及大部分相關的保育單位，對於台灣黑熊的危險處境多半察而不覺，或甚是不知情。針對瀕危物種的保育，最基本的作法之一，便是會集學者專家以及有興趣的相關單位和團體，擬定「保育行動綱領（**Conservation Action Plan**）」。有關其他熊類的保育行動綱領，已見於北極熊、美洲黑熊、棕熊、貓熊等物種，甚至是由南美洲四個國家共同策劃擬定的眼鏡熊保育策略也甫出爐。台灣的地理生態以及人文特色有別於其他國家，島上的台灣黑熊也有的獨特的生態習性，以及保育困境和議題。因此，擬定「台灣黑熊保育行動綱領」爲有效地保育該物種不可或缺的根本步驟。

3. 加強台灣黑熊保育教育的宣導

經由偶有所聞的非法獵殺黑熊的媒體報導可知，台灣現今的立法及執法似乎未能減輕台灣黑熊所遭受的存續威脅。非法狩獵對原本數量已經稀少的黑熊的未來存續，可能產生致命影響，實不容我們忽視。台灣黑熊保育的落實，至少需要從累積動物基本生態和族群資料，以及制止非法的市場供、需二方面著手。

台灣黑熊甚至是其他野生動物保育成敗之所繫，充其量也只不過是全體國民的保育意識能否提升罷了。但這「思想」的改革，往往也是最難的一步！除了加強對該物種基本生物學上的瞭解之外，我們也應該持續瞭解地方居民對黑熊及其狩獵的行爲和態度，人對熊體的利用方式和其經濟價值，以及原住民和其他一般社會大眾（是潛在的熊體消費者）二者的文化價值和社經因素的改變。此外，無論在保護區以內或之外的地區，提昇有效的執法，減少人類對黑熊的狩獵活動，監測黑熊族群和狩獵的影響，以及加強針對不同對象而設計的保育黑熊宣導教育，皆是不可或缺的保育手段。

保育台灣黑熊的宣導教育，旨在激發民眾對於台灣黑熊和生態保育的關心，而其

執行方式至少可以包括：成立「台灣黑熊保育基金會」，募集保育基金，推廣台灣黑熊保育和研究之進行；設置台灣黑熊保育的網頁，增加社會大眾對該物種的認識，以及對相關的保育議題的瞭解，例如非法狩獵及買賣黑熊等；充實及加強書面解說教育宣導品，比如黑熊保育折頁、手冊、書籍；進行有關熊類保育的大眾演講，尤其是在可能有獵熊活動發生的原住民部落，以及國中、小學校。

附錄一、口頭發表論文之摘要

EFFECTS OF FRUIT TYPES AND CONSUMPTION BY ASIATIC BLACK BEARS ON SEED DISPERSAL

中文：亞洲黑熊攝食及果實類型對於種子萌芽之影響

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Forest-dwelling bear species are opportunistic foragers and mainly consume vegetation. Bears have been suggested as potentially important seed dispersers, which influence the recruitment, structure, composition, and diversity of plant communities in ecosystems through seed dispersal. However, very little solid evidence is available, especially for the threatened Asiatic black bears (*Ursus thibetanus*). Our study objective was to explore the role of Asiatic black bears in the mechanism of seed dispersal by examining the effects of fruit types and bear feeding behavior on seed germination.

Seeds of seven fruits consumed by wild Asiatic black bears in Taiwan were extracted from fresh fruit (controls) and from scats of 4 captive adult Asiatic black bears (ingestion treatments). These fruits included various types: nut (*Cyclobalanopsis glauca*), prome (*Eriobotrya deflexa*, *Malus doumeri*), capsule (*Machilus zuihoensis*, *Prunus campanulata*, *Viburnum luzonicum*), and berry (*Diospyros oldhamii*). For each fruit species, each bear was fed the fruit every other day for 6 days. Germination tests for 3 of the fruit species were completed. Effects of the feeding process and fruit types on seed viability, germinability, and germination rate were measured against the controls. Germination tests of seeds, which required 3 months of chilling to break dormancy, were monitored for 3 months under incubator and green house conditions.

Our result showed that the level of seed damage caused both by bear foraging and the digestive processes varied by fruit type. For nuts, most seeds were broken and few whole seeds were extracted from scats. *Diospyros oldhamii* and *Machilus zuihoensis*, seeds ingested by bears germinated about two times earlier than control groups (including those with the pericarp and without the pericarp), i.e., from 3 to 6 weeks. For control groups, seeds with pericarps removed geminated earlier and had higher germination rate than those without pericarps removed partly because of fungi infection on the latter. Germination rates of ingested seeds negatively related to damage levels (n = 4) of seed testa. For non- or slight-damaged seeds, seeds covered with pericarp remnants had lower germination rates. Among all groups, seeds with serious damage had lowest germination rate. Mean retention time of different seeds in bear digestive tracts was 23-26 hours. We also found that the germination rate of *M. zuihoensis* seeds, non- and slight-damaged, increased with the retention duration (n = 3 periods, 83%~86%, 83%~91% respectively). This indicated that the digestive process of bears may simulate prewarming of seeds, which generally causes germination enhancement. Further analysis of tested seeds will be presented.

Because of the intensive movement and enormous consumption capacity of bears, their role in seed dispersal should not be underestimated. This study will help to evaluate the potential influence of this declining species in forest recruitment and will highlight this specie’s importance in future ecosystem management.

附錄二、發表論文（壁報）之摘要

INFANT BEHAVIORAL DEVELOPMENT AND MOTHER-YOUNG RELATIONSHIP OF CAPTIVE ASIATIC BLACK BEARS

中文：圈養亞洲黑熊之幼獸行爲發展及親子關係

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MEI-HSIU HWANG, Institute of Wildlife Conservation, National Pingtung University of Science and Technology, Pingtung, Taiwan
CHIEH-CHUNG YANG, Endemic Species Research Institute, Taiwan
TUNG-CHI HO, Endemic Species Research Institute, Taiwan

Abstract: Asiatic black bear (*Ursus thibetanus*) cubs are late-maturing, making maternal care important for cub growth and behavioral development. Our objective was to document cub growth and the mother-young relationship in captive Asiatic black bears during the first year of cubs' lives. We videotaped and made on-sight observations of one and two pairs of mother-cubs, for a total of 145 24-hr observation days, at the Shoushan Zoo and the low altitude experimental station of the Endemic Species Research Institute in Taiwan, respectively.

Bear cubs started to open their eyes at one-month old, crawl at 1.5-2 months and walk after two months old. Mothers seldom left dens until cubs were two months old. Both mothers and cubs were very inactive in the first two months, and then their daily active proportion increased over time. For both mothers and cubs, inactivity and play accounted for the largest (77.7% vs. 67.3%) and the second (5.7% vs. 13.6%) proportions of the daily activity budget, respectively. Both mothers and cubs were mainly diurnal, with activities peaked at dawn and dusk. Activity levels of mothers during daytime and nighttime were 37.6% and 8.6%, respectively, and those of cubs were 53.2% and 14.2%. Mother-cub body contacts were >50% during the first six months of a cub's life, indicating an intimate relationship between them during this period.

The daily average nursing bouts of bears were 8.8 (±2.7) for a total of 42.9 (±11.3) minutes. Daily nursing bouts and time were greater when cubs were 3-4 and 9-12 months old than 5-8 months old. This might be related to restricted supply of artificial food during the 9-12 month period, which may drive cubs to demand more food and milk from their mothers. Both feeding-related mother-cub agonistic behaviors and mother agonistic reactions toward cub's begging for milk increased with cub's age. The parent-offspring conflict was therefore asserted.

There were no significant differences in daily nursing bouts and time between the single cub and the twin. However, the twin spent more of each day playing and playing with other bears (20.1% and 15%, respectively) than the single cub did (17.3% and 9.6%, respectively). Besides, the twin played more with siblings (7.7%) than with their mother (2.2%). The single cub had less body contact (49.7%) and more no-reaction (47.8%) with the mother than the twin (64.4% and 19.3%, respectively), indicating a more intimate mother-cub relationship for twins than for single cubs.

The mother and cub kept in environmentally more complex and larger space provided with more food spent more time foraging, and less time in feeding anticipation and stereotypes. Bears kept in spatially richer environment and without a curfew also started their activities earlier in the morning. Our study suggested that both mother and cub behaviors and their interaction were affected by physical environment and management.

附錄三、第十五屆國際熊類研究與經營管理研討會會場

附錄四、第十五屆國際熊類研究與經營管理研討會海報論文展示會場

附錄五、筆者黃美秀及林依蓉等人所準備的「圈養亞洲黑熊之幼獸行爲發展及親子關係」的論文海報

Infant Behavioral Development and Mother-Young Relationship of Captive Asiatic Black Bears

Yi-Jung Lin[1], Mei-Hsiu Hwang[1], Chieh-Chung Yang[2], Tung-Chi Ho[2]
[1]Institute of Wildlife Conservation, National Pingtung University of Science and Technology,Taiwan
[2]Endemic Species Research Institute, Taiwan

INTRODUCTION

Asiatic black bear (*Ursus thibetanus*) cubs are late-maturing, making maternal care important for cub growth and behavioral development. We documented the cub growth and mother-young relationship in captive Asiatic black bears in Taiwan during the first year of each cubs' life.

METHODS

From 2001 to 2007, we videotaped and made on-sight observations 24-hr daily of four pairs of mother-cubs during the cubs' first year. Focal (every 2 mins) and behavioral samplings were used. Cubs and research periods are listed in Table 1.

Table 1. Age of captive Asiatic black bears, type of analysis, and number of days studied.

Site[1], cub sex[2], litter size	Month old 1 2 3 4 5 6 7 8 9 10 11 12	Analysis	Sample days
ESRI, M, 2	■ ■ ■	Mother-cub activity budget and interaction; nursing	16
ESRI, F, 1	■ ■ ■	Cub growth; mother-cub activity budget, activity pattern and interaction	28
ESRI, F, 2	■ ■ ■ ■ ■ ■ ■ ■ ■	Cub growth; mother-cub activity budget, activity pattern and interaction; nursing	47
SSZ, M, 1	■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■ ■	Cub growth; mother-cub activity budget, activity pattern and interaction; nursing	72

[1]ESRI: Endemic Species Research Institute, SSZ: Shoushan Zoo (Taiwan).
[2]M: male, F: female.

RESULTS AND DISCUSSION

CUB GROWTH

Cubs started to open their eyes at one month, crawl at 1.5-2 months, and walk after two months. When at the same age, weight of the SSZ male singleton was heavier than that of the ESRI female twins (Fig. 1). This was mainly due to sexual dimorphism and litter size, since the weight of the SSZ male singleton at 34 days (2.44 kg) was similar to that of 102 days old ESRI female twins (2.36kg and 2.39kg).

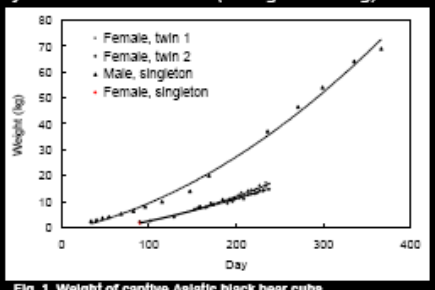


Fig. 1. Weight of captive Asiatic black bear cubs.

ACTIVITY BUDGET AND PATTERN

Inactivity (mothers: 77.9%; cubs: 68.5%) and play (mothers: 5.4%; cubs: 13.0%) accounted for the largest and the second proportions of the daily activity budget, respectively (n_m=129days, n_c=135days). Inactivity reached highest frequencies when cubs were two months old, later dropping to 75% (mothers) and 60-70% (cubs). Mother and cub locomotion, cub exploration, and mother stereotypy increased as aged. We did not find any stereotypic behavior in cubs during the research period (Fig. 2).

Daytime activity levels (mothers: 37.6%, n=120daytime; cubs: 53.2%, n=127) were much greater than nighttime activity levels (mothers: 8.6%, n=128nighttime; cubs: 14.2%, n=128). Activity peaked at dawn and dusk. Wild Asiatic black bears show similar patterns (Hwang and Garshelis, 2007).

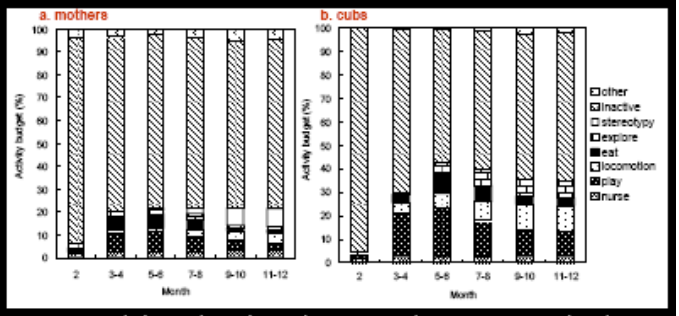


Fig. 2. Daily activity budget of captive Asiatic black bear mothers (a) and cubs (b) after birth.

MOTHER-CUB INTERACTION

We cataloged body contact, approach, eye contact, and no interaction. The largest proportion was mother-cub body contact (67.6%, n=157days). No interaction was second (28%). When cubs were 1-2 months old, mother-cub body contact was 99.0%; it was >50% for 3-6 month-old cubs. This indicated an especially intimate relationship during this period. These results were similar to those for captive polar bears (Greenwald and Dabek, 2003) and pandas (Snyder et al., 2003).

NURSING

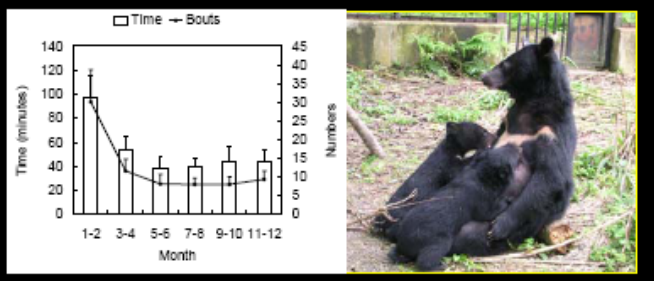


Fig. 3. Daily nursing bouts and duration for captive Asiatic black bears cubs aged 1-12 months.

There was an average of 11.2 nursing bouts each day, totaling 49.0 minutes (n=107days). Daily nursing bouts and time were greatest at 1-2 months old (bouts: 30; time: 96.9 min), followed by 3-4 months (bouts: 11; time: 53.7 min). That number and duration was greater at 9-12 months than 5-8 months might be related to restricted supply of food during the 9-12 month period. Increasing with cub age were feeding-related mother-cub agonistic behavior and agonistic reactions by mothers towards cubs begging for milk.

CONCLUSIONS

1. Weight of male singleton was heavier than that of female twins.
2. Mothers and cubs were inactive most of the time.
3. Body contact was the most frequent interaction during the first six months.
4. Nursing bouts and duration were highest during the first four months.

REFERENCES

Greenwald, K. R., and L. Dabek (2003) Behavioral development of a polar bear cub (*Ursus maritimus*) in captivity. Zoo Biology 22: 507-514.

Hwang, M-H., and D. L. Garshelis (2007) Activity patterns of Asiatic black bears (*Ursus thibetanus*) in the central mountains of Taiwan. Journal of Zoology 271: 203-209.

Snyder, R. J., A. J. Zhang, Z. H. Zhang, G. H. Li, Y. Z. Tian, X. M. Huang, L. Lou, M. A. Bloomsmith, D. L. Forthman, and T. L. Maple (2003) Behavioral and developmental consequences of early rearing experience for captive giant pandas (*Ailuropoda melanoleuca*). Journal of Comparative Psychology 117: 235-245.

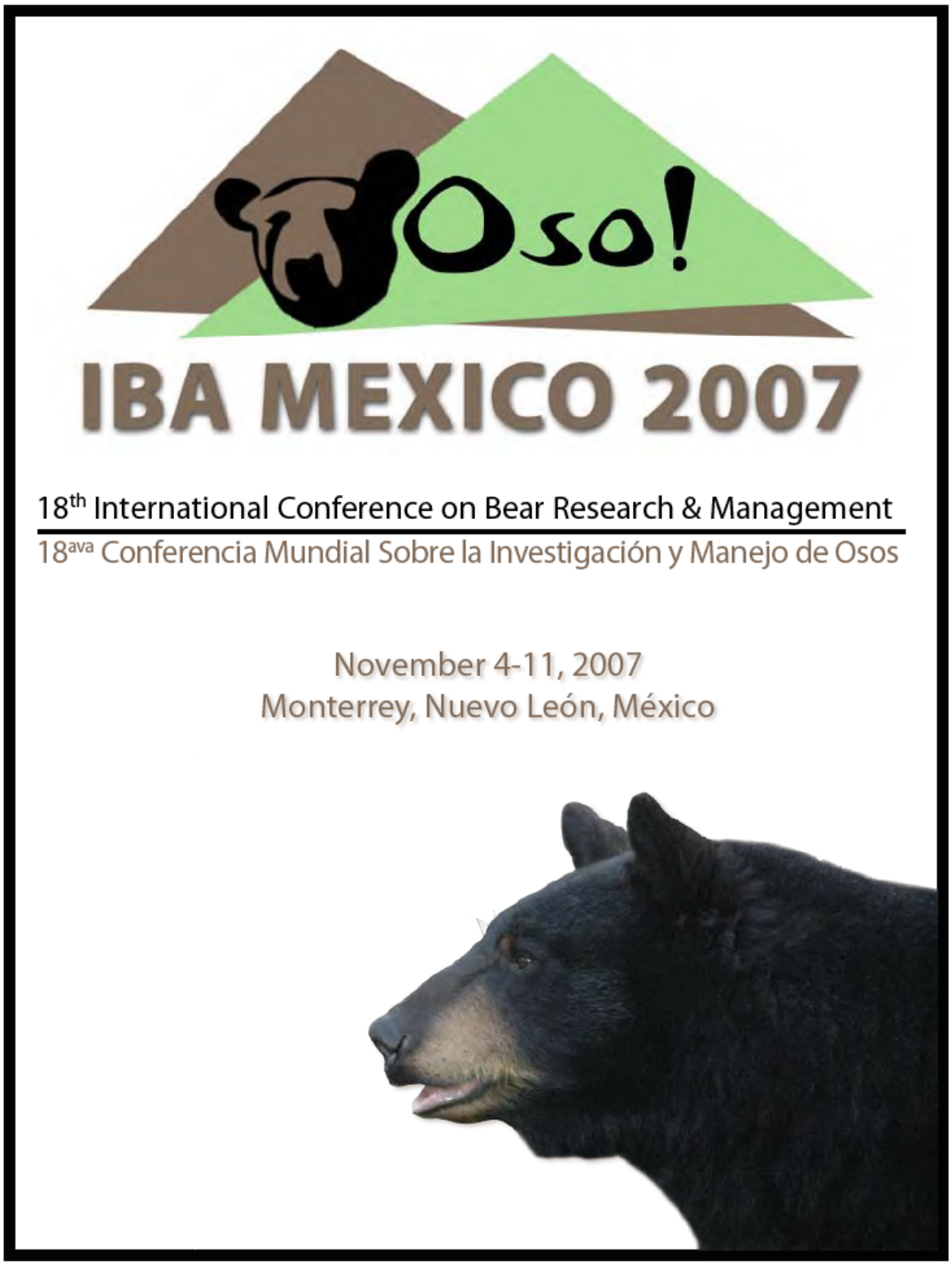
附錄六、世界自然保育聯盟（IUCN）物种存續委員會熊類專家群（Bear Specialist Groups）會議

（A）亞洲黑熊專家群組座談

（B）世界熊類專家群組（Bear Specialist Groups）會議

附錄七、熊類麻醉及保定處理研習會（La Pastora Zoov）

附錄八、第十五屆國際熊類研究與經營管理研討會議程



Time	Activity / Presentation Title	Location / Author	
	SUNDAY NOVEMBER 4		
All Day	Airport Shuttle	Holiday Inn, other hotels	
All Day	Vendor Setup	Canada (Expo Oso!)	
10:00 - 5:00 pm	IBA Council Meeting	Antarisuites Conference Room	
9:00am - 8:00 pm	Early Check-In	Holiday Inn Fundidora Lobby	
6:00pm - 9:00 pm	Cocktail Welcome	Museo El Obispado (pending)	
	MONDAY NOVEMBER 5		
All Day	Airport Shuttle	Holiday Inn, other hotels	
All Day	Registration Desk	Vestibule - Cintermex	
All Day	Translation Services Desk	Vestibule - Cintermex	
All Day	IBA Membership / URSUS Booth	Vestibule - Cintermex	
All Day	Assistance Table (Help Desk, Travel Information)	Vestibule - Cintermex	
All Day	Information TV Screens	Vestibule - Cintermex	
All Day	Small group discussion tables	Vestibule - Cintermex	
All Day	Expo Oso!	Canada Hall	
All Day	Poster Setup	Canada Hall	
All Day	Workroom, presentation practice room, meeting room	America Hall	
All Day	Presentation Downloads	Africa Hall	
All Day	Office, coordinator work room, storage room	Asia Hall	
SCIENTIFIC SESSIONS			
SESSION 1: BEAR RESEARCH, MANAGEMENT, & CONSERVATION IN MEXICO ***Diana Doan-Crider***		**USA Hall**	
8:30 -9:00 am	Welcome & Inauguration	Dr. Ernesto Enkerlin, Commissioner National Protected Areas of Mexico	
9:00 - 9:20 am	INVITED: Bears in Mexico: Yesterday, Today, and Tomorrow	Diana Doan-Crider, Gilberto Salgado Santos, & Oscar Infante Mercado	1
9:20 - 9:40 am	The Black Bear in a Tropical Cloud Forest: Local Community Participation in the El Cielo Biosphere Reserve Project	Sasha Carvajal Villarreal, David S. Maehr, Arturo Caso, and Guadalupe Marin Berrones	2
9:40 - 10:00 am	Population Dynamics and Corridor Protection for American Black Bears in Northern Coahuila, Mexico, Sky Island	Bonnie R. McKinney and Jonas Delgadillo Villalobos	3
10:00 - 10:20 am	The Use of Non-invasive Techniques to Study the Endangered Black Bear in the Sierra El Tigre, Sonora, Mexico	Cora Varas-Nelson, Carlos Gonzalez Lopez, Paul Krausman, and Melanie Culver	4
10:20 - 10:40 am	***Coffee Break***		
10:40 - 11:00 am	Spatio-temporal Distribution of the Black Bear Population in the State of Chihuahua, Mexico	Pedro Angel Calderon D., Enrique Carreon H., Albert Lafon T., and Juan Guzman A.	5

MONDAY NOVEMBER 5 (continued)			
SESSION 2: BEAR FOODS & NUTRITION - *Sean Farley*		**USA Hall**	
11:00 - 11:20 am	**INVITED:** Stable Isotopes	Merav Ben-David	6
11:20 - 11:45 am	Dietary and Spatial Overlap Between Sympatric Ursids Related to Salmon Use	Jennifer K. Fortin, Sean D. Farley, Karyn D. Rode, and Charles T. Robbins	7
11:45 - 2:00 pm	***Lunch - On Your Own***		
12:05 - 2:00 pm	***Student Lunch - Restaurant El Taco Buey (across from conference site)***		
2:00 - 2:20 pm	The Diet of Brown Bear in Estonia and Comparison with Other Regions in Europe	E. Vulla, M. Korsten, K. Hobson, M. Leht, A.J.Martin, H. Valdmann, P.Mannil, and U. Saarma	8
2:20 - 2:40 pm	Quantifying Berry Production Using Digital Imagery Analysis	Latham, Erin	9
2:40 - 3:00 pm	Effects of Fruit Types and Consumption by Asiatic Black Bears on Seed Dispersal	Mei-Hsiu Hwang and Yu-Cen Jhong	10
3:00 - 3:20 pm	Limits to Growth? Response in Skeletal Growth and Body Mass of Juvenile American Black Bears to Periods of Severe Food Shortage	Karen V. Noyce and David L. Garshelis	11
3:20 - 3:40 pm	***Coffee Break***		
3:40 - 4:00 pm	**INVITED:** Fatty Acid Signature Analysis in Polar Bears	Greg Thiemann	12
SESSION 3: POLAR BEARS - *Elizabeth Peacock*		**USA Hall**	
4:00 - 4:25 pm	**INVITED:** Polar Bears and Climate Change	Marty Obbard	13
4:25 - 4:45 pm	Changing Sea Ice-Scapes and Polar Bear Habitat in Foxe Basin, Nunavut Territory, Canada (1979-2004)	Vicki M. Sahanatien and Andrew E. Derocher	14
4:45 - 5:05 pm	Factors Influencing Spatial and Temporal Distribution of Polar Bears During the Fall Open-Water Period in the Southern Beaufort Sea	Scott Schliebe, Karyn D. Rode, Jeff S. Gleason, James Wilder, Kelly Proffitt, Tom J. Evans, and Susanne Miller	15
5:05 - 6:30 pm	***Dinner - on your own***		
6:30 - 9:00 pm	**Genetics Workshop Part 1 - Density Estimation:** DNA hair snag essentials, issues & strategies in DNA sampling, & Program MARK Overview	Mike Proctor, John Boulanger, and Gary White	

TUESDAY NOVEMBER 6		
All Day	Airport Shuttle	Holiday Inn, other hotels
All Day	Registration Desk	Vestibule - Cintermex
All Day	Translation Services Desk	Vestibule - Cintermex
All Day	IBA Membership / URSUS Booth	Vestibule - Cintermex
All Day	Assistance Table (Help Desk, Travel Information)	Vestibule - Cintermex
All Day	Information TV Screens	Vestibule - Cintermex
All Day	Small group discussion tables	Vestibule - Cintermex

TUESDAY NOVEMBER 6 (continued)			
All Day	Expo Oso!	Canada Hall	
All Day	Poster Setup	Canada Hall	
All Day	Workroom, presentation practice room, meeting room	America Hall	
All Day	Presentation Downloads	Africa Hall	
All Day	Office, coordinator work room, storage room	Asia Hall	
SCIENTIFIC SESSIONS			
SESSION 4: POPULATION ESTIMATION - *Marty Obbard*		**USA Hall**	
8:30 - 8:40 am	Announcements		
8:40 - 9:10 am	DNA-Based Density Estimate for Grizzly Bears in Glacier National Park, Montana	K.C. Kendall, J.B. Stetz, D.A. Roon, L.P. Waits, and J.B. Boulanger	16
9:10 - 9:30 am	Influence of Past Live Captures on Detection Probabilities of Grizzly Bears Using DNA Hair Snagging Methods	John Boulanger, Gary C. White, Gordon Stenhouse, Michael Proctor, Grant Machutchon, and Stefan Himmer	17
9:30 - 9:50 am	Optimal Allocation of Resources in a Hierarchical Sampling Design for Estimating Black Bear Density: A Case Study in Middle Georgia, USA	Jamie L. Skvarla Sanderlin and Michael J. Conroy	18
9:50 - 10:10 am	***Coffee Break***		
10:10 - 12:00 pm	***IBA MEMBERS MEETING***	USA Hall	
12:00 - 1:30 pm	***Lunch - On Your Own***		
12:00 - 1:30 pm	*Climate Change Study Group - Chris Servheen - Working Lunch, Invitation Only*	America Hall	
1:30 - 1:50 pm	Brown Bear Population Size and Distribution in Eastern Interior Alaska	Craig Gardner, Kalin Kellie, John Citta, and Xi Chen	19
1:50 - 2:10 pm	Estimating Reproductive Rates for Female Bears: Ratios Versus Transition Probabilities	Charles C. Schwartz and Gary C. White	20
2:10 - 2:30 pm	***Coffee Break***		
2:30 - 6:30 pm	**Genetics Workshop Part 2 - Monitoring**: DNA sampling basics & design, RT sampling and design, analysis & issues, joint analysis &	John Boulanger, Mike Proctor, Rick Mace, Dave Garshelis,	
6:30 - 7:30 pm	***Mexican Sampler / Dinner While You Visit***	Vestibule - Cintermex	
6:30 - 8:30 pm	***POSTER SESSION & Student Auction***	Canada Hall / America Hall	
WEDNESDAY NOVEMBER 7			
7:00am - 5:00pm	***Field Trips***	Depart from Holiday Inn	
9:00am - 5:00pm	**Black Bear Management Workshop: Emphasis Mexico**	Americas Hall am, Field pm	
6:00pm - 9:00pm	Expo Oso!	Canada Hall	
7:00pm - 8:30pm	Public Bear Night	USA Hall	
	:Spirit Bears - Wayne McCrory	USA Hall	
	:Polar Bears and the Inuit of Nunavut - Elizabeth Peacock	USA Hall	
	:Bears & Culture - Susanna Paisley	USA Hall	
6:30 - 8:30pm	Bear Observation Video & Informal Discussion Session - Ben	Africa Hall	
	Effects of Human Use of Bear Trails Informal Discussion Session -	Asia Hall	
	Kids N' Bears	Americas Hall	

附錄八、第十五屆國際熊類研究與經營管理研討會議程(續)

THURSDAY NOVEMBER 8			
All Day	Airport Shuttle	Holiday Inn, other hotels	
All Day	Registration Desk	Vestibule - Cintermex	
All Day	Translation Services Desk	Vestibule - Cintermex	
All Day	IBA Membership / URSUS Booth	Vestibule - Cintermex	
All Day	Assistance Table (Help Desk, Travel Information)	Vestibule - Cintermex	
All Day	Information TV Screens	Vestibule - Cintermex	
All Day	Small group meeting tables	Vestibule - Cintermex	
All Day	Expo Oso!	Canada Hall	
All Day	Workroom, presentation practice room, meeting room	America Hall	
All Day	Presentation Downloads	Africa Hall	
All Day	Office, coordinator work room, storage room	Asia Hall	
SCIENTIFIC SESSIONS			
SESSION 5: BEAR MANAGEMENT & CONSERVATION - *David Hewitt*		**USA Hall**	
8:30 - 8:40 am	Announcements	USA Room	
8:40 - 9:10 am	Brown (Grizzly) Bear Management in Alaska: Perspectives of Four Retired Alaska Fish and Game Department Biologists	Sterling Miller, John Schoen, Charles Schwartz, and Jim Faro	21
9:10 - 9:30 am	Regional-Based Research and Management of Small, Fragmented, and Threatened Canada-USA Trans-Border Grizzly Bear Populations	M. Proctor, J. Boulanger, C. Servheen, W.Kasworm, D. Paetkau, S. Nielsen, and M. Boyce	22
9:30 - 9:50 am	Vulnerability of Scandinavian Brown Bears to Hunting - What Distinguishes the More from the Less Vulnerable?	Richard Bischof, Jon E. Swenson, Atle Mysterud, Nigel G. Yoccoz, and Andreas Zedrosser	23
9:50 - 10:10 am	Translocation as an Engine of Conservation	Piero Genovesi, Claudio Groff, and Davide dal Piaz	24
10:10 - 10:30 am	***Coffee Break***		
10:30 - 10:50 am	Incorporating Demographic and Genetic Data to Project Genetic Diversity, Inbreeding and Viability of a Small Translocated Brown Bear Population	Marta de Barba, Lisette Waits, Piero Genovesi, Claudio Groff, and Ettore Randi	25
10:50 - 11:10 am	Rehabilitation and Release Guidelines for Orphan Cubs	J.J. Beecham, C. Parker, S. Pazhetnov, M. Danilova, V. Pazhetnov, and V. Watkins	26
11:10 - 11:30 am	Pragmatic Management Can Conserve Low Productive High-Altitude Brown Bears in Asia	Jon E. Swenson, Muhammad Ali Nawaz, and Vaqar Zakaria	27
11:30 - 11:50 am	Management of Chum Salmon for Brown Bears and Other Fish and Wildlife at McNeil River, Alaska	Joshua M. Peirce, Edward O. Otis, Mark S. Wipfli, and Erich H. Follmann	28
11:50 - 12:10 pm	Grizzly Bear Population Ecology in Denali National Park and Preserve	Pat Owen and Richard Mace	29
12:10 - 12:30 pm	Mapping Bear Distributions: Meshing Hard Data and Expert Opinion	David L. Garshelis, Karen Minkowski, and Eric W. Sanderson	30
12:30 - 2:30 pm	***Lunch***	On Your Own	
12:30 - 2:30 pm	***New IBA Council Lunch***	Holiday Inn Conference Room	

THURSDAY NOVEMBER 8 (continued)			
SESSION 6: BEAR BEHAVIOR - *Piero Genovesi*		**USA Hall**	
2:30 - 2:50 pm	Social Organization in the Brown Bear; Variations on the Theme of Territoriality	Jon E. Swenson, Ole-Gunnar Stoen, Bjorn Dahle, and Andreas Zedrosser	31
2:50 - 3:10 pm	Should I Stay or Should I Go? Natal Dispersal in the Brown Bear	Andreas Zedrosser, Ole-Gunnar Stoen, and Jon E. Swenson	32
3:10 - 3:30 pm	***Coffee Break***		
3:30 - 3:50 pm	Patterns of Scent Marking and Chemosignal Discrimination in Giant Pandas	Ronald R. Swaisgood, Xiaoping Zhou, and Zejun Zhang	33
3:50 - 4:10 pm	Marking Behavior of Brown Bears in Greece	Alexandros A. Karamanlidis, Dionisios Youlatos, Stefanos Sgardelis, and Zacharias Scouras	34
4:10 - 4:30	Advertising Dominance or Sexual Availability: The Use of Rub Trees by Brown Bears	Owen T. Nevin	35
SESSION 7: ANDEAN BEAR RESEARCH, MANAGEMENT, & CONSERVATION - *Shaenandoah Garcia-Rangel*		**USA Hall**	
4:30 - 4:50 pm	**Invited Paper:** Andean Bear Research & Conservation: a 3 Decade Overview	Isaac Goldstein	36
4:50 - 5:10 pm	Mark-Resight Population Estimates Derived from Observations of Andean Bears Using Water Holes in the Tropical Dry Forests of Peru	Robyn D. Appleton, Javier V. Guerrero, and Susanna Paisley	37
5:10 - 5:30 pm	A Risk Model to Determine the Effects of Human Expansion on the Habitat Distribution of Andean Bears Along the Eastern Slope of the Tropical Andes in Bolivia	Ximena Velez-Liendo	38
5:30 - 6:30 pm	***Dinner - on your own***		
6:30 - 8:30 pm	**Genetics Workshop Part 3 - Planning**: project design, implementation, & data management	Kate Kendall, Jeff Stetz, & Amy Macleod	

FRIDAY NOVEMBER 9		
All Day	Airport Shuttle	Holiday Inn, other hotels
All Day	Registration Desk	Vestibule - Cintermex
All Day	Translation Services Desk	Vestibule - Cintermex
All Day	IBA Membership / URSUS Booth	Vestibule - Cintermex
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All Day	Poster Break Down	Canada Hall
All Day	Vendor Break Down	Canada Hall
All Day	Workroom, presentation practice room, meeting room (by	America Hall
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FRIDAY NOVEMBER 9 (continued)			
SCIENTIFIC SESSIONS			
SESSION 8: HUMAN BEAR INTERACTION / CONFLICT - *Raymond Skiles*		**USA Hall**	
8:30 - 8:40 am	Announcements	USA Hall	
8:40 - 9:10 am	Effectiveness of Hazing in Reducing Bear-Human Conflicts in Alaska's North Slope Oilfields	Richard Shideler	39
9:10 - 9:30 am	Sloth Bear Cubs from the Forests to the Streets	Kartick Satyanarayan and Geeta Seshamani	40
SESSION 9: BEAR PHYSIOLOGY - *Jon Arnemo*		**USA Hall**	
9:30 - 9:50 am	Cardiac Adaptations in Hibernating Brown Bears	O. Lynne Nelson and Charles T. Robbins	41
9:50 - 10:10 am	Anesthesia of Grizzly and Black Bears Using Xylazine, Zolazepam, and Tiletamine and Its Reversal Using Yohimbine	Tom Radandt	42
10:10 - 10:30	Anesthetic protocol for free-ranging brown bears	Asa Fahlman and Jon Arnemo	43
10:30 - 10:50	***Coffee Break***		
SESSION 10A: SPATIAL ANALYSIS & SPATIO TEMPORAL RELATIONSHIPS - *Alexandros Karamanlidis*		**USA Hall**	
10:50 - 11:10 am	Seasonal and Daily Habitat Use and Movements by American Black Bears in Relations to Human Development, Roads, and Timber Harvest	Jesse S. Lewis, Janet L. Rachlow, Wayne L. Wakkinen, Jim Hayden, and Pete E. Zager	44
11:10 - 11:30 am	Identifying Potential Colonization Patterns for Reintroduced Bear Populations	Jared S. Laufenberg and Frank T. van Manen	45
11:30 - 11:50 am	The Study of Biogeographical Changes of Asiatic Black Bear in Iran by GIS at Recent Fifty and It's Threatened Factors	Gholam Reza Noori, Alireza Shahriari, Tayebeh Arbabi, and Alireza Rashki	46
11:50am - 1:30pm	***Lunch - On Your Own***		
1:30 - 1:50 pm	A New Technology Solution for the Study of Bear Movement and Habitat Use (Animal Pathfinder)	Andrew Hunter, Gordon Stenhouse, and Naswer El-Sheimy	47
1:50 - 2:10 pm	Modeling Variation in Grizzly Bear Density at the Landscape Scale	Tabitha A. Graves, Katherine C. Kendall, Jeffrey B. Stetz, and Amy C. Macleod	48
2:10 - 2:30 pm	Bait Use by American Black Bears in Northeastern Wisconsin: Applications of GIS, GPS Telemetry, and Remote Photography	Marci Johnson	49
2:30 - 2:50 pm	Activity and Resource Use of Male Grizzly Bears Detected by Global Positioning System Satellite Telemetry in Northern Alaska	Patricia E. Reynolds, Richard Shideler, and Harry V. Reynolds	50
2:50 - 3:10 pm	***Coffee Break***		
SESSION 10B: SPATIAL ANALYSIS & SPATIO TEMPORAL RELATIONSHIPS -*Mei-Hsiu Hwang*		**USA Hall**	
3:10 - 3:30 pm	Spatial-Temporal Movement Patterns of Grizzly Bears in an Industry Impacted Landscape	Barbara L. Schwab, Barry Boots, and Gordon B. Stenhouse	51

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