Journal of Threatened Taxa

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ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

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26 May 2021 | Vol. 13 | No. 6 | Pages: 18411–18418
DOI: 10.11609/jott.6343.13.6.18411-18418

Journal of Threatened Taxa | www.threatenedtaxa.org | 26 May 2021 | 13(6): 18411–18418

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

https://doi.org/10.11609/jott.6343.13.6.18411-18418

#6343 | Received 30 June 2020 | Final received 09 December 2020 | Finally accepted 06 April 2021

OPEN ACCESS

CONSERVATION APPLICATION

First attempt at rehabilitation of Asiatic Black Bear cubs to the wild in Thailand

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Abstract: Returning orphan bear cubs to the wild can benefit bear welfare and conservation but is hindered in Asia by the scarcity of documented experience. We experimented with rehabilitation of two Asiatic Black Bear cubs in Thailand using the assisted method of soft-release. We raised the 5-month old cubs for 11 months with minimal human contact in a remote enclosure in high quality habitat, letting cubs out periodically to walk with caretakers in the forest. The caretakers acted as surrogate mothers, allowing cubs to safely acquire foraging skills and familiarity with the forest. Supplementary feeding resulted in the cubs' rapid weight gain (average 157g/day), faster than would occur in the wild. Faster growth allowed the cubs to be released sooner, reducing the likelihood of long-term habituation. After three months of rehabilitation, the bear cubs started showing signs of being wary of the caretakers (e.g., cautious when we approached their enclosure) and their focus during walks switched from play to foraging. After seven months they began to spend nights away from their enclosure, thus declining the supplemental food. This sequence and timing of increasing separation and independence from people matched other assisted soft releases in the region. The cubs went missing in month 12, shortly before planned collaring and release. They were seen together 2.5 months later on a fruiting tree and ran away when approached. Assisted soft releases might be a promising option for bear rehabilitation in Asia but more data are needed to evaluate their effectiveness relative to other methods. This method affords direct observations of bears in the wild that can augment our knowledge of bear behavior and ecology.

Keywords: Reintroduction, soft release, *Ursus thibetanus*, walking with bears.

บทคัดย่อ: การปล่อยลูกหมีคืนสู่ธรรมชาติถือเป็นกระบวนการสำคัญที่เอื้อประโยชน์ด้านสวัสดิภาพและส่งเสริมการอนุรักษ์หมีในธรรมชาติ แต่อย่างไรก็ตาม ในภูมิภาคเอเชียยังมีการศึกษาเกี่ยวกับงานด้านนี้อยู่น้อยมาก สำหรับการศึกษาในอุทยานแห่งชาติแม่วงก์-ประเทศไทยครั้งนี้เป็นการทดลองการปล่อยลูกหมีควายจำนวน 2 ตัว คืนสู่ธรรมชาติโดยใช้วิธี assisted soft-release ตลอดระยะเวลา 11 เดือนลูกหมีควายอายุ 5 เดือนถูกเลี้ยงอยู่ในกรงที่ตั้งอยู่ในป่าเพื่อหลีกเลี่ยงการมีปฏิสัมพันธ์กับมนุษย์ แต่มีการปล่อยให้ลูกหมีได้ออกมานอกกรงเป็นระยะโดยมีพี่เลี้ยงดูแลอย่างใกล้ชิด พี่เลี้ยงจะทำหน้าที่เหมือนแม่หมีคอยดูแลและให้ลูกหมีได้ฝึกทักษะการหารอาหารและใช้ชีวิตในธรรมชาติ การให้อาหารเสริมช่วยให้ลูกหมีเติบโตอย่างรวดเร็ว (เฉลี่ย 157 กรัม/วัน) ซึ่งมีค่ามากกว่าการเจริญเติบโตของลูกหมีในธรรมชาติ การเติบโตที่รวดเร็วนี้จะช่วยให้กระบวนการปล่อยลูกหมีคืนสู่ธรรมชาติเป็นไปได้เร็วขึ้นและยังช่วยลดโอกาสที่ลูกหมีจะเชื่องหรือคุ้นเคยกับมนุษย์ได้อีกด้วย ภายหลังกระบวนการผ่านไปสามเดือนพบว่าลูกหมีเริ่มแสดงอาการระมัดระวังตัวเมื่อพี่เลี้ยงเข้าไปใกล้ หรือเปลี่ยนพฤติกรรมจากการเล่นเป็นการหาอาหาร แต่จากนั้นหลังเจ็ดเดือนลูกหมีก็ไม่กลับมาที่กรง ออกหากินเองตามธรรมชาติและกินอาหารเสริมน้อยลง กระบวนการและช่วงระยะเวลาในการแยกตัวและพยายามอยู่ห่างจากมนุษย์ของลูกหมีสอดคล้องกับผลการศึกษาในวิธีการเดียวกันจากพื้นที่อื่น ๆ ทั้งนี้ ลูกหมีได้หายตัวไปเมื่อเข้าสู่เดือนที่ 12 ก่อนที่จะมีการปล่อยคืนสู่ธรรมชาติและติดตามอย่างเป็นทางการ โดยลูกหมีทั้งสองตัวปรากฏตัวอีกครั้งหลังจากผ่านไปสองเดือนครึ่งบนต้นผลไม้และวิ่งหนีทันทีเมื่อมีคนเข้าไปใกล้ ดังนั้น การปล่อยหมีคืนสู่ธรรมชาติวิธีนี้อีกเป็นทางเลือกที่น่าสนใจในการฟื้นฟูประชากรของหมีในภูมิภาคเอเชีย แต่จำเป็นต้องมีข้อมูลเพิ่มเติมเพื่อนำมาประเมินผลเมื่อเทียบกับวิธีการปล่อยหมีแบบอื่น ๆ นอกจากนั้น วิธีการนี้ยังสามารถสังเกตพฤติกรรมหมีในธรรมชาติได้โดยตรง อันจะช่วยเพิ่มองค์ความรู้ในด้านพฤติกรรมและนิเวศวิทยาของหมีได้อีกด้วย

Editor: Anonymity requested. **Date of publication:** 26 May 2021 (online & print)

Citation: Steinmetz, R., W. Phumanee, R. Phoonjampa & S. Weingdow (2021). First attempt at rehabilitation of Asiatic Black Bear cubs to the wild in Thailand. *Journal of Threatened Taxa* 13(6): 18411–18418. https://doi.org/10.11609/jott.6343.13.6.18411-18418

Funding: WWF Sweden, WWF Germany.

Competing interests: The authors declare no competing interests.

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Author contribution: All authors contributed equally to the design and implementation of the project and writing of the paper.

Acknowledgements: We thank the Department of National Parks, Wildlife, and Plant Conservation for support. We thank the park staff Wirat Panprue, Sompong Kaewkhong, and Somsai Racha, who cared for and walked the bears with dedication. We thank John Beecham, David Garshelis, and Gabriella Fredriksson for advice at all stages of this project. We thank three reviewers for insightful assistance on earlier versions of the manuscript.

INTRODUCTION

Orphan bear cubs are common in southeastern Asia due to widespread hunting of adult females with cubs and trade in young bears as pets (Tumbelaka & Fredriksson 2006; Vinitpornsawan et al. 2006). Orphan cubs often end up at rescue centers, following confiscations and donations. In Thailand for example, one center (Banglamung) has 87 Asiatic Black Bears *Ursus thibetanus* and 26 Sun Bears *Helarctos malayanus*, and these numbers grow each year, straining available resources (P. Chotiwatpongchai pers. comm. 2016). This abundance of captive bears, combined with a desire to improve animal welfare and conserve wild bear populations, has generated widespread interest among governments and non-government organizations in the idea of reintroducing captive bears to the wild in southeastern Asia, but there is a scarcity of knowledge to guide this challenging undertaking.

Releases of Asiatic Black Bears to the wild have been conducted in Russia (Skripova 2013), South Korea (Han & Jung 2006), India (Ashraf et al. 2008), and Lao (Scotson & Hunt 2008). Both soft and hard release approaches have been used. In soft releases, bears are released after a period of acclimation and supplemental feeding, typically within an enclosure at the release site. In hard releases, bears are transported and released without acclimation to the release area. A few projects have experimented with both approaches and had greater success (higher post-release survival and lower conflict with humans) with soft releases. Two unique soft-release projects are those of Ashraf et al. (2008) with Asiatic Black Bears in India, and Fredriksson (2001) with Sun Bears in Indonesia. Both these projects employed an assisted soft release, a variant of a soft release, in which the bear cubs are held in an enclosure at the release site at night but regularly let out to forage and explore the surrounding forest under the protection of caretakers during the day (Beecham et al. 2016). This option, also called 'walking with bears', is less commonly employed than the other methods and its efficacy is relatively unstudied.

In February 2016 two orphan Asiatic Black Bear cubs, a male and female (presumably siblings), were found by park staff in Mae Wong National Park, Thailand. They were about three months old. The mother may have been killed by hunters or separated from the cubs during the extensive fires that occurred at the time. Such small cubs were unlikely to survive in the wild without protection by their mother. We (WWF and Mae Wong National Park) decided to rehabilitate them to the park using this assisted soft-release approach. Our goals were to: (i) take advantage of an opportunity to observe bear behavior in the wild, (ii) conserve the local bear population, (iii) generate lessons and experience in rehabilitation procedures that could inform future bear releases, and (iv) save the two bears from a lifetime in captivity.

Study site

The present orphan bear rehabilitation project was conducted in Mae Wong National Park, northwestern Thailand (99.07–99.37E, 15.65–16.10N; Fig. 1). The 894-km^2 park is covered with tropical evergreen and deciduous forest types and is inhabited by wild Asiatic Black Bears and Sun Bears. Elevations range 150–1,964 m; the area has a monsoonal climate with a dry season (November–May) and a wet season (May–October). Average annual rainfall is 1,200mm and mean temperature is 27°C.

MATERIALS AND METHODS

The cubs weighed about 3kg and appeared healthy (active, hungry, no injuries) when first acquired in February 2016. Before rehabilitation, the park staff had kept the bears for nine weeks at their park headquarters in a cage. They were fed rice, milk, and fruits. During this time, the bears received generous attention from the park staff, interacting daily with numerous people who played with them.

We initiated the rehabilitation program in April 2016. The cubs weighed 6.7 (female) and 4.2 kg (male) and were about five months old at this time. In subsequent months we could only visually estimate their weights, as they were too unruly to hold on a scale; thus, all but our first weight measurement are estimates, not actual weights. The cubs were transferred to a chain-link fence enclosure (3 × 1.5 m) at a remote site in the park, 20km away from the nearest village. In July 2016, we transferred the bears to an adjacent larger enclosure (16 × 8 m) as they had outgrown the space available in the initial one. The site was in mixed deciduous forest, a habitat that harbored many fruiting trees and other food items that bears feed in the wild (Steinmetz et al. 2013). Perennial streams were present. Wild bears occurred in the release area but were not abundant, as evident from the direct observation of bear signs. Leopards *Panthera pardus* and Tigers *Panthera tigris* also inhabited the surrounding forest, though we never encountered them directly at the rehab site.

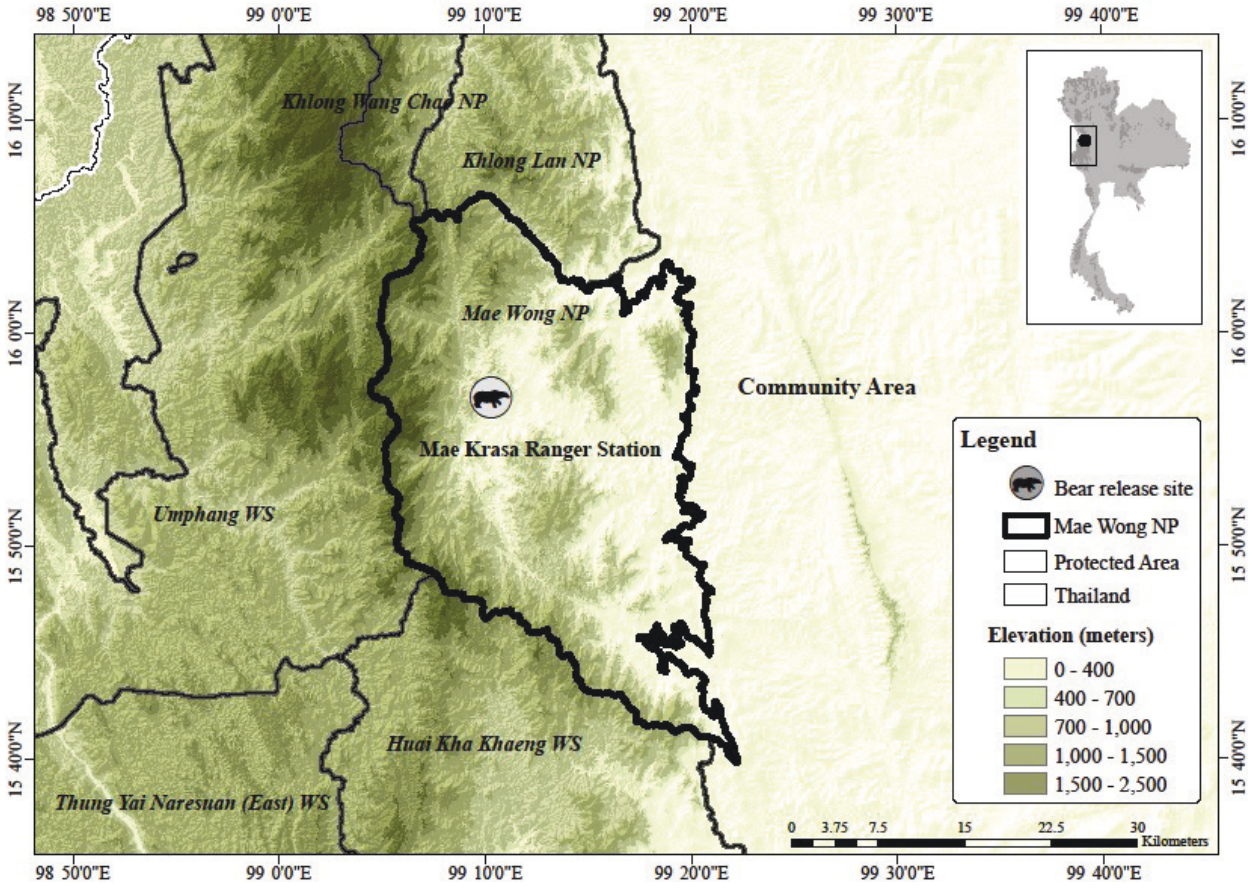

Figure 1. Map of Mae Wong National Park, Thailand, showing Asiatic Black Bear rehabilitation and release site.

The enclosures had a water trough for bathing. Logs and a raised wooden platform were available for climbing and resting, and plastic buckets and balls were used as enrichment to keep the bears occupied, promote cognitive development, and prevent stereotyped behaviors from developing (Beecham et al. 2016). Shade was available from surrounding trees. The two bears were kept together so they could socialize with each other.

The enclosures were 150m from a ranger station manned by three rangers. Together with the first two authors, these five people were the main caretakers of the bears. Because of the enclosure's proximity to the station, the bears were aware of human smells and sounds, but this proximity also gave us convenient access for daily feeding and other tasks.

Feeding

Rice was discontinued once rehabilitation began in April 2016. On days that we walked the bears, they were fed once, in the afternoon after their walk. On days without a walk, the bears were fed twice per day, in the morning and afternoon. Each meal was dry dog food and milk. Fruit or vegetables were also given 4–6 times per week (watermelon, pumpkin, papaya, banana). The milk was store-bought whole cow's milk meant for humans. Milk and dog food were poured into bamboo feeding troughs, whereas fruits and vegetables were scattered in the enclosure to stimulate foraging. In the first three months of rehab (bears 5–7 months old) we fed each bear about 3,000g of milk and 300g of dog food each day. In the next three months (bears 8–10 months old) we reduced milk to 2,000g/day and increased dog food to 800g/day. Thereafter (11–16 months old), we ceased milk and increased dog food to 1,000g/day/bear.

Rehabilitation

We employed an assisted soft-release approach to prepare the bears for eventual release. In this approach the bears were fed and cared for in an enclosure at their eventual release site, but periodically let out to forage and explore the surrounding forest under the watch of dedicated caretakers. After walks the bears were returned to the enclosure for the night. The caretakers

acted as surrogate mothers, allowing the cubs to safely acquire foraging skills and familiarity with their future home. Human contact was otherwise minimized, and limited to a small core group of caretakers. Caretakers did not receive formal training. Prior to the project, we familiarized ourselves with bear rehabilitation techniques by reading the literature (Beecham 2006; Beecham et al. 2016) and consulting with experienced rehabilitators.

We set the following protocol to minimize human contact. Five people interacted with the bears throughout the project: three rangers and the first two authors. The bear enclosure was surrounded by black netting to minimize the bears' view of the caretakers as they approached (Beecham et al. 2016). Talking to the bears or playing with them was not allowed. Food was funneled down a tube from outside the cage, behind the black netting.

We began walking the bears after two months in captivity, when they were about 7 months old (June 2016; Table 1). Two to four people walked the bears each time. We used a whistle to communicate with the bears, avoiding vocal communication. We carried bamboo poles to repel attempts by the bears to interact with us, prodding them away to prevent physical contact. We led the bears to food sources as available, including fruiting trees, termite and bee nests, and rotten logs (which hold insects). We made qualitative observations of their behavior inside their enclosure, and outside the enclosure during walks, noting their level of caution and wariness towards us, and whether their predominant activity was playing, foraging, or other (Table 1). During the walks, we also documented the food items they ate (Image 1).

We planned to radio-collar and release the bears in April 2017, which coincided with the start of the annual high-fruit season in this habitat (Steinmetz et al. 2013); however, the bears escaped on 14 March 2017, before we could collar them.

RESULTS

During the first three months of rehabilitation the bears consumed up to 3,500g of food per day in captivity, averaging approximately 29% of their body mass daily. During the six months that they were fed milk, average daily consumption was estimated at 20% of body weight. And over the course of the entire rehabilitation, average food consumption was estimated at 14% of body weight per day. The bears also foraged during walks but we could not quantify the mass of wild foods they ate. The bears grew rapidly, increasing from about 3kg to 50kg in 10 months (Fig. 2), an estimated average gain of 4.7kg/month, or 157g/day. We did not estimate their weights in the final two months, but by their escape in March 2017, when they were 16 months old, the bears appeared to weigh over 50kg.

At the time of escape, the bears appeared healthy, with thick glossy pelage, and a blocky appearance, full-bodied over all bony areas, with some fat over the rump and shoulders (Image 2). These physical characteristics correspond to a body condition score of 4 (out of 5) in the index used to assess the physical suitability of bears for release (Lintzenich et al. 2006); this score exceeded the level deemed suitable for release (Beecham et al. 2016).

We walked the bears 14 times in the 11 months (April 2016 to March 2017) before escape (Table 1). During walks the bears instinctively fed on foods such as termites, beetle larva, and fruits of *Ficus benjamina*, *Cassia fistula*, and *Dillenia indica*. They also fed on foods not previously documented in the species' diet in southeastern Asia: bamboo shoots, stems and leaves of wild ginger *Zingiber* sp., aroids (Araceae), the herb *Costus* sp., and tree seedlings of *Spondias* sp.

The bears became increasingly wary and independent over time (Table 1). In the first 3–4 four months, the bears eagerly approached us when we came near their enclosure and initiated repeated contacts with us (> 2 per walk) during walks, particularly attempts to smell or play with our legs. But in the later months, they appeared cautious when we approached the enclosure, and they became increasingly independent of us during walks, exploring under their own direction and initiating fewer contacts (0 or 1 per walk). Their focus of attention during walks also shifted during this time. In the initial four months, the bears spent most of their non-resting time playing with each other, both inside and outside the enclosure. By the 5th month of the rehab process (when the cubs aged nine months), however, their main interest during walks had switched to foraging, with bouts of play now intermittent (Table 1).

The bears repeatedly escaped from their enclosure after three months (July; Table 1), by clawing through the chain-link fence. After escapes, food was provided as usual inside the enclosure, and the bears entered for meals. After each escape, they slept in nearby trees (within 30m of the enclosure) until we repaired the enclosure and got them back inside. We continued to walk them after escapes, calling them down from their tree with a whistle to follow us. After the first two

Table 1. Behavior of two Asiatic Black Bear cubs during rehabilitation from April 2016 to March 2017, as observed inside and outside their enclosure. Behavior outside was observed during walks and whenever they escaped from the enclosure.

Month	Estimated bear age (months)	Number of walks	Behavior outside enclosure	Behavior inside enclosure
Apr 2016	5	0	n/a	Cubs approached caretakers eagerly.
May	6	0	n/a	Cubs approached caretakers eagerly.
Jun	7	1	· Predominant behavior is playing with each other (chasing, mock fighting, climbing trees). Some amount of foraging. · Follow us through forest. · Cubs made frequent attempts to interact with us.	Cubs approached caretakers eagerly.
Jul	8	10	· Escape from first enclosure. · Began sleeping on trees outside the enclosure; descend for feeding and walks. · During walks, bear cubs spent more time playing with each other. Limited foraging. · More independent than previous month- stayed further away from us and began exploring the forests on their own (we follow them). · Made fewer attempts to interact with us.	Cubs still approach caretakers eagerly. Soon moved into larger enclosure.
Aug	9	2	· Escape from second enclosure · Sleep in nearby trees as before; descend for feedings and walks · On walks, bears show little interest in us · Predominant behavior on walks has switched, from mostly play to mostly foraging. Frequently taste various plants.	Approach caretaker, but more cautiously than before.
Sep	10	0	· Enclosure repaired; bears back inside.	The cubs still approached caretaker, but cautiously.
Oct	11	1	· Escaped again. Using the nearby trees for sleeping. Would descend for daily feedings, but wait for caretakers to leave first.	n/a
Nov	12	0	· Bears forage on their own all day, returning to sleep in trees near enclosure at night. · We rarely saw the bears now; but they still come for meals inside enclosure (food disappears). · Bears begin to spend nights away from enclosure, including a 4-day period of complete absence (during which they did not come for meals). · Bears raid ranger station kitchen for two consecutive 2 nights.	n/a
Dec	13	0	· Enclosure repaired and bears enticed back in with food.	Cubs no longer approach the caretakers. Would move in the opposite direction when caretakers arrive.
Jan 2017	14	0	n/a	Cubs no longer approach the caretakers. Would move in the opposite direction when caretakers arrive.
Feb	15	0	n/a	Cubs no longer approach the caretakers. Would move in the opposite direction when caretakers arrive.
Mar	16	0	· Bears escape for final time, never to return again.	n/a

escapes (July, August), they spent most of their time (both day and night) in the nearby trees, descending mainly for meals and walks. In subsequent months, they foraged and explored on their own after escapes, but still returned to their regular sleeping trees in the evening. In month 8 (November) they began to occasionally sleep away from the enclosure altogether after escapes (not returning to their sleeping trees next to the enclosure), and declined to enter the enclosure for food for the first time. On one occasion, in the 8th month of acclimation, the bears raided the park ranger's station kitchen on two consecutive nights. Bear spray had little effect: the bears would retreat but return a short time later (American Black Bears have shown similar responses to bear spray (Herrero & Higgins 1998); however, no further raids occurred after this.

The bears went missing on 14 March 2017 before the radio-collars were ready. They were 16 months old. They broke through the enclosure and did not return. They were seen together 10 weeks later by a park ranger patrol, 1.5 km from the enclosure, feeding in the canopy of a fruiting tree. They descended the tree and ran away, a positive indication that they were not habituated and had acquired fear of people. They appeared healthy and were apparently sustaining themselves foraging in the wild. Despite their freedom and proximity to the ranger

Table 2. Key factors associated with successful bear releases, from Beecham (2006), and the degree to which they were achieved (subjectively ranked as high, medium, or low) in the rehabilitation and release of orphaned Asiatic Black Bears in Mae Wong National Park, Thailand, 2016–2017.

Key Factor	Level of achievement
1. Minimize frequency of contact and number of caretakers, particularly after weaning	**Medium-High**. Five people had primary contact with the bears during their captivity, whereas 1–2 people might have been ideal. After weaning, however, only two people regularly interacted with the bears (for feeding). Also, we implemented remote feeding techniques to minimize time at the enclosure during feeding.
2. Provide opportunity for cubs to socialize with other bears while in captivity	**High**. We were fortunate to have a pair of cubs—this is a crucial factor in preventing habituation.
3. Release bears close to age when family break-up occurs in wild	**Medium-High**. Our bears were released at about 16 months old, which is slightly earlier than they would naturally leave their mother in the wild. Bear releases have been successful with bears much younger, however, and our bears were large for their age, which aids survival prospects.
4. Release bears in good quality habitat	**High.** The release occurred in deciduous forest with bamboo. This habitat provides moderately abundant food, including fruit trees, bamboo, gingers, and insects.
5. Time release to coincide with availability of natural foods	**High.** The peak fruiting season began in April, soon after the bears were released.
6. Release bears when chance of encountering people is low	**High.** The release site is remote from villages. Occasional hikers pass through, but not until November, giving the bears eight months of immersion in the wild before possibly encountering people.

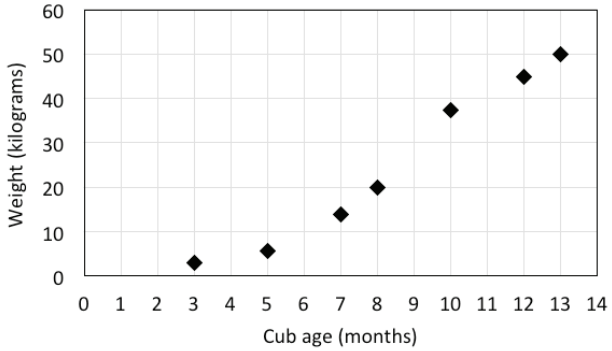

Figure 2. Weight gain of two Asiatic Black Bear cubs rehabilitated in Thailand, 2016–2017. Points are averages of estimated weights of the two cubs. Estimates were not made in some months so there are missing points.

station, the bears never raided the kitchen again.

DISCUSSION

Cub growth

Despite uncertainty in the visually-estimated weights of the bears, it was clear that the bears grew rapidly due to our feeding regimen. This was despite being fed cow's milk, which has substantially lower fat and protein, and higher carbohydrate content, than bear's milk (Oftedal & Gittleman 1989). Between the ages of 3 and 13 months, the bears gained an estimated 157g/day on average (Fig. 2), two times faster than the growth rate of wild American Black Bear *U. americanus* cubs (77g/day; Oftedal & Gittleman 1989). As a result, our cubs were roughly twice as heavy as wild bears would generally be at an equivalent age (e.g., Noyce & Garshelis 1998; Clark et al. 2002). Similar fast growth rates were observed for Brown Bears *U. arctos* and American Black Bears that were fed supplemental food (Rausch 1961; Huber et al. 1993; Komnenou et al. 2016).

Although orphan bear cubs can be released as early as 5 months old and survive, larger bears tend to have higher post-release survival rates and fewer conflicts with people (Beecham et al. 2015). An Asiatic Black Bear cub in Lao, which was rehabilitated using an assisted soft-release approach, was killed by a predator (possibly another bear) just weeks after release; its small size (< 30kg) might have rendered it particularly vulnerable to attack (Scotson & Hunt 2008). Our goal was thus to release heavy bears that could defend themselves, but we wanted to achieve this growth rapidly so bears could be released sooner and spend less time with humans, thereby minimizing the possibility of long-term habituation. Our effort appeared to have successfully balanced these goals.

Cub behavior and adaptation

Minimizing human contact is a critical determinant of successful bear releases. Bears that interact with too many people, or have too much human contact at the wrong time (after weaning), are more likely to become habituated to people, leading to conflict after release as they seek human food (Beecham 2006). Our bears began showing signs of wariness and independence after three months, and after seven months (at the age of 12 months), began to spend nights entirely outside the enclosure, foregoing their supplemental food. The timing of these behavioral changes corresponded to other assisted soft releases in Asia. In Lao, Asiatic Black Bear cubs showed wariness towards caretakers within four months of the rehabilitation process (Scotson & Hunt 2008). In India,

Image 1. Walking with two Asiatic Black Bear cubs during an assisted soft release in Thailand, 2016. The main purpose of walking with the bears is to prepare them for release to the wild. Walking with bears also affords the unique opportunity to observe bears in their natural habitat at close range, allowing researchers to obtain behavioral and ecological information that is not accessible otherwise. Here, caretakers observe foods the bears eat.

Image 2. Photo (January 2017) showing the healthy condition of two rehabilitated Asiatic Black Bears before final escape. The bears were about 14 months old in this photo. They were large for their age, with thick glossy pelage and full-bodied over all bony areas, indicating good body condition suitable for release.

cubs became reluctant to enter their enclosure after seven months of rehab (age 13–14 months) (Ashraf et al. 2008). And in Indonesia, Sun Bears refused to enter their enclosure after six months, choosing to live on their own in the forest but returning for food occasionally (Fredriksson 2001). In retrospect, we believe our bears were physically and behaviorally ready for release in month 8 of rehab (November 2016; they were about 45kg) but we kept them longer because natural food availability at that time of year was low (Steinmetz et al. 2013).

Caretakers in other assisted soft release projects typically walked their bears every day (Fredriksson 2001; Ashraf et al. 2008; Scotson & Hunt 2008). Our walking schedule was much less intensive, yet bears exhibited similar behavioral trends towards independence, separation, and wariness. Although our 'official' walks were more sporadic compared to other projects, the bears' frequent escapes allowed them to explore the forest on their own, which may have served a similar function as walks (but without protection afforded by the caretakers). Even including escapes, the bears spent more than two-thirds of their days completely inside the enclosure, far more than in other projects; thus, our project is a combination of soft release by acclimation at the release site and soft release by walking with the bears. Thus, it appeared that assisted soft releases can be successful with less intensive walking schedules than have been used previously. As long as cubs' habituation to humans declines over time (by minimizing contact), minor differences in rehabilitation methods appear to have little effect on the development of traits that cubs need to adapt to life in the wild after release (IFAW 2007; Beecham et al. 2015). Assisted soft-release projects should strive to have no more than 2–3 people interacting with the bears throughout the process (references above). Our project exceeded this, with five people interacting with the bears over time, due to changes in ranger staff at the rehab site. The fact that we had two bear cubs which could socialize with each other might have mitigated potential habituation problems arising from interacting with too many people. We recommend that number of caretakers be minimized as much as possible.

Socialization with other bears is a key factor underlying successful bear rehabilitation and release projects (Beecham 2006). A major asset in our project was having two bears of the same age to raise together. This allowed the bears constant opportunities for social interactions with each other, reducing attachment to caretakers at all stages of development (Beecham et al. 2016). A single cub might require more time in captivity to allow separation from caretaker to develop (Beecham 2006), although a single Asiatic Black Bear cub rehabilitated in Lao (Scotson & Hunt 2008) exhibited signs of separation at a pace similar to our two cubs.

During walks we observed the bears feeding on food items that were not documented in the literature on food habits of Asiatic Black Bear in the region (Steinmetz et al. 2013). The new foods observed were all herbaceous items, which are difficult to document without direct observation of feeding, because they do not leave

readily identifiable remains in scats (such as seeds or exoskeletons) and feeding signs associated with them are indistinct and not easily attributable to the bear species. Interestingly, bears fed on these plant materials in August when fruits (their main food) were naturally scarce (Steinmetz et al. 2013); these dietary items probably help to sustain the bears when their main food items are scarce. Assisted soft releases provide the unique opportunity to observe bears in their natural habitat at close range, allowing researchers to obtain behavioral and ecological information that is otherwise unavailable to researchers studying wild bears.

CONCLUSION

Two major limitations of our project were the small sample size (2 bears) and inability to assess long-term survival (because the bears escaped before we could collar or mark them). Their sighting 2.5 months after release and the fact that the bears did not come into conflict with resident humans, indicate that the bears were successfully finding food, avoiding people, and avoiding predators (other black bears, tigers, leopards). These can be considered as key longer-term indicators of post-release success. We rated our project against six key factors associated with successful bear releases (Beecham 2006). All factors were achieved to some degree. Scoring highest were: (i) socialization opportunities, (ii) release timing, and (iii) habitat quality at the release site (Table 2). But we caution that our project is not a definitive evaluation of the assisted soft release approach, especially given the small sample size and the lack of post-release monitoring data. More data are needed to draw conclusions about the value of this approach when compared to other rehab methods. Our intention is to document the experience, thereby contributing to the currently limited information available on bear rehabilitation in Asia.

Resources required for soft releases of bears, whether assisted or not, are similar in most respects: construction of an enclosure, purchase of sufficient food, dedicated staff, and telemetry equipment. An assisted soft release imposes an additional time cost on caretakers to walk the bears, although as we showed, the walking schedule need not be intensive. Assisted releases add the unique advantage of being able to closely observe bear behavior in the wild.

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Journal of Threatened Taxa

www.threatenedtaxa.org

ISSN 0974-7907 (Online) | ISSN 0974-7893 (Print)

May 2021 | Vol. 13 | No. 6 | Pages: 18411–18678
Date of Publication: 26 May 2021 (Online & Print)
DOI: 10.11609/jott.2021.13.6.18411-18678

Publisher & Host

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