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Compromised health and welfare of bears farmed for bile in China

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Abstract

*The practice of farming bears for bile extraction is legal in China and involves an estimated 10,000 to 12,000 animals, primarily Asiatic black bears (*Ursus thibetanus*). This study outlines the compromises to health and welfare suffered by bears on bile farms and is based on the results of visits to more than 50 bear farms; 15 years' worth of interviews with bear farmers, Chinese officials, practitioners of Traditional Chinese Medicine and vendors dealing in bear parts; and from the observation and care of approximately 250 bears that have been rescued from bile farms. Bears that have been rescued from farms display evidence of severe and chronic physical and psychological suffering. Medical complications arising from the husbandry and the gall bladder fistulation significantly, and often fatally, compromise bears' health.*

Keywords: *animal welfare, Asiatic black bear, bear bile, bile farming, China, gall bladder*

Introduction

Bear bile farming is legal in China and involves an estimated 10,000 to 12,000 bears, primarily Asiatic black bears (*Ursus thibetanus*). The species is indigenous to northern and central East Asia, with most of its range in China. Like American black bears (*Ursus americanus*), forested areas are favoured as is an omnivorous diet comprising mainly vegetation, fruits, berries and nuts. With the exception of mothers with dependent young and breeding pairs, adult Asiatic black bears tend to be observed as solitary individuals in the wild. Cubs remain with their mothers for approximately 18 months before dispersing. Asiatic black bears may live for 30 years or more in captivity, but are generally believed to be shorter-lived in the wild (Garshelis & Steinmetz 2008).

Bear bile is used in Traditional Chinese Medicine (TCM) for its 'bitter' and 'cold' properties to treat a variety of ailments (Lee 1999; Pong *et al* 1999; Liu 2004). The active ingredient in bear bile, ursodeoxycholic acid (UDCA), is also produced synthetically (eg, Ursofalk®, Axcan Pharma, Canada; Nuso®, Taiwan Tung Yang Chemical Industries, Taiwan; Ursolvan®, Sanofi-Aventis, France) and is used in allopathic medicine. The TCM pharmacopoeia lists more than 50 herbal products with which to treat the same conditions equally, if not more effectively (Pong *et al* 1999; Roberts 1999; Phillips & Wilson 2002; Liu 2004). Nonetheless, the cultural conviction of the supremacy of bear bile remains strong. Bear bile is now found in a large variety of products in which it serves no medical or traditional function, such as shampoos, tonics, face creams and wine. Thus, demand for bear bile has soared during China's 25 years of bear farming as a result of increased availability and the continuing rise of the Chinese, Japanese and South Korean economies, in particular.

International trade of CITES I-listed species, such as Asiatic black bears, and their products is illegal. Chinese law forbids the trade in any bear parts other than the domestic sale of products made of farmed bear bile. Nonetheless, whole gall bladders, bear meat, paws, pelt and fat are all readily available for purchase (Phillips & Wilson 2002; Vince 2002; Parry 2007). According to Government figures, China consumes 3,000 to 4,000 kg of farmed bear bile annually. Given the number and size of existing bear farms, annual production is estimated at approximately 10,000 kg per year. Surplus Chinese bear bile products feed illegal trade throughout North America, Europe, Japan and South-East Asia (eg Associated Press 2006; Chiang 2007; Diedrich 2007; Lee 2007; Mano & Ishii 2008). The foreign market brings an estimated US$30 million more per year than the bear products would gain on the Chinese domestic market (Phillips & Wilson 2002). A study conducted between 2000 and 2002, for example, found that a kilogram of bear bile powder cost as much as US$252,000 in Japan (Phillips & Wilson 2002). In a study carried out by the World Society for the Protection of Animals (WSPA) in 2006 and 2007, international prices quoted by sellers were found to range from $50 (San Francisco, USA) to nearly $113,000 (Japan) (WSPA, unpublished data).

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Bear bile production therefore feeds a lucrative, international trade that is largely illegal. Moreover, the practice raises questions about the degree of suffering imposed on the animals. The only laws that pertain to animals in China are those written to protect populations of certain free-living species. Once wild (or domestic) animals are placed in captivity, no laws or official requirements exist to ensure their proper care. Bear bile farming is meant to operate according to regulations drafted by the Government. These outline husbandry requirements and, since 1996, have included the mandate that all bile farm bears are to be fistulated with the free-dripping, as opposed to other, methods (see below). Having said this, however, regulations hold little authority and the observed practices on bear farms described in this study indicate that they are not enforced. The conditions under which bears are kept on bile farms are described along with the consequences of farming practices on the physical and psychological health of the bears.

Materials and methods

Information on bear bile farm practices was collected via a series of visits and interviews by investigators and veterinarians of the Animals Asia Foundation (AAF) to more than 50 Chinese bear farms between 1993 and 2008. These visits were made formally (by Chinese and non-Chinese investigators) and informally through Chinese investigators posing as tourists or potential buyers of bear bile (a total of eight investigators). The latter made possible a greater frequency of direct observations of the bear husbandry and bile extraction practices on the farms. The informal interviewing style encouraged bear farm workers and officials to engage in more frank discussion about these practices and the bear bile trade than would have been possible through formal interviews or questionnaires. Explanations of policies and regulations concerning bear bile farming are based on interviews with Chinese Government officials and bear bile farmers, and on official Chinese governmental documents. Information regarding the business of selling bear bile in China and abroad came from the findings of investigators in markets and from interviews with bear bile farmers, Government officials, and vendors dealing in bear bile and other wildlife parts.

Medical and behavioural data on the rescued bears are compiled from the AAF's 13 years of clinical records of 241 individuals (239 Asiatic black bears, one Eurasian brown bear [*Ursus arctos*] and one black bear/brown bear hybrid). On arrival at the AAF's China Bear Rescue Centre (CBRC), the bears were triaged and then anaesthetised for removal from the bear cage and medical evaluation. The latter included serum biochemical and complete blood count profiles, abdominal ultrasonography, examination of urine and faeces, as well as a detailed physical examination. Medical treatment was provided as needed, and cholecystectomy was scheduled over the following weeks or months, at which time males were also castrated. All physical examinations, veterinary procedures and post-mortem examinations were carried out by Western-trained veterinarians and veterinary nurses in accordance with up-to-date Western standards of medicine and surgery.

Bears were fed Mazuri® Omnivore diet (PMI Nutrition International, USA) and fresh produce at amounts calculated relative to each individual's physical condition. An intensive enrichment schedule and strict husbandry practices geared toward the minimisation of stress and optimisation of physical and psychological health were implemented immediately on the bears' arrival.

Once bears had recovered from surgery, they were moved into enclosures of gradually increasing size and integrated with other bears at a rate of comfort befitting each individual. Bears which experienced difficulty in adapting to increased space confined themselves to a small area (eg the sleeping basket) or performed stereotypic behaviours in one corner or against one wall. Increased efforts at behavioural and environmental enrichment, combined when necessary with pharmacological support (0.15–0.2 mg kg^{-1} depozuclopenthixol [Clopixol®, Lundbeck Ltd, Copenhagen, Denmark]) were made for these individuals to help them to adapt. Some bears were initially reluctant to advance into open space and onto grass. All bears were allowed to make the transition at their own pace, with daily options to go outdoors as they chose. Integrations were planned, according to each bear's temperament, personality, size and physical disability. Bears were first introduced through perforated barriers (eg fence or barred walls) as a means of assessing their readiness to socialise and their acceptance of specific individuals. They were then introduced in a controlled environment in which they could be readily separated if necessary. Integrations proceeded over the course of several weeks until individuals were comfortable in the group. Roaring, attacking, chasing or being chased, or cowering from the other bear were considered signs of incompatibility and stress, and integration strategies were adapted accordingly. Ultimately, the bears shared large, semi-natural enclosures in groups of compatible individuals, with free-choice opportunity to go outdoors or indoors during the day. During the night, bears were kept indoors in shared or individual dens, depending on individual animals' social or medical requirements. Grouped bears exhibited highly social behaviour that included play, apparent comfort with and preference for physical proximity, and demonstrated preferences among individuals as play partners and sleeping companions. The size and organisation of the enclosures gave bears the opportunity to choose whether they wanted to be alone or to interact with others. This social behaviour among captive bears is in direct contradiction of the notion of a solitary existence among wild individuals, and suggests a level of social complexity in the species that is, perhaps, yet to be fully understood. Alternatively, these differences may lie in an adaptive flexibility of Asiatic black bears to their social environment.

The bears' long-term care included a daily enrichment programme, close behavioural monitoring, annual health checks and intensive veterinary management. Enrichment included climbing structures, hiding and tunnelling areas, and pools that were embellished with daily changes (eg swings, tyres, hammocks, substrates for digging pits, and a variety of toys). At least half of the daily base diet (Mazuri®

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pellets) was distributed throughout the enclosures for the bears to seek and find. Two additional food-based enrichment events were offered each morning and afternoon, eg distribution of browse, nuts and seeds, fruit, ice-blocks and similar treats. For most of the bears, particularly for the males, a significant aspect of their enrichment was interactive play and other social behaviour.

Descriptions of gall bladder fistulation methods and general pathology are based on clinical findings from physical examinations, exploratory laparotomies, cholecystectomies, gross examinations of gall bladders and associated structures *in situ* and *ex situ*, and post-mortem examinations. Complications associated with the removal of bile from the fistulae were described to the AAF by bear farm staff, and corroborated by the evidence from examination of fistulae and catheters by AAF veterinarians.

Results and Discussion

Results are outlined below in relation to each of the Five Freedoms of Animal Welfare (Farm Animal Welfare Council 2007).

Results in relation to freedom from hunger and thirst

Ninety percent of the bears received at the CBRC were underweight or emaciated. They ate voraciously and drank excessively for several weeks before settling into a more relaxed feeding routine. For underweight bears, the difference in bodyweight between admission and stabilisation, one year later, varied between 150 and 240% (eg from 79 kg on intake to 190 kg after stabilisation). These bears' fur was rough, patchy and dull and their general demeanour was suggestive of long-standing malnutrition and food and water deprivation. With the exception of one bear farm visited, there was no access to water in cages. Water tended to be withheld and used to coerce bears into co-operating with bile extraction every one-to-three days (see below). Farmers tended to under-feed their bears; partly in order that more bile could be harvested from the gall bladder, and partly because feeding costs money.

Results in relation to freedom from discomfort and freedom to express normal behaviour

Chinese Government regulations state that bears are to be given space to move about at all times, except for the brief period every day when the bears enter the cages for bile extraction. Inspections of bear farms as well as bears' physical abnormalities (see below) indicated that the majority spend their entire lives in the extraction cages (see Figures 1 and 2). These cages tend only to be marginally bigger than the bears themselves, measuring in the range of 150 × 70 × 70 cm to 200 × 150 × 150 cm (length × width × height).

Cubs born on bear bile farms are weaned typically at three months or less; wild cubs remain with their mothers for 1.5 years. Weaned cubs are raised alone in cages or for a few months together with siblings, in an effort to manage infectious disease. Cubs on bile farms exhibit high levels of abnormal behaviour that often occupy nearly all time not spent resting. Such behaviours include the autonomous sucking of fur and paws, humming, and other stereotypic behaviours. Cubs housed together will often suckle on one another while emitting a low, humming vocalisation similar to the noise they would emit during suckling. These behaviours have been associated with the premature removal of young from their mothers (Mason 1996; Snyder *et al* 2003; Latham 2005; Bergeron *et al* 2006; Mason 2006a). We have observed the retention of this behaviour in bile farm bears into adulthood. Bears removed from cages demonstrated persistent physical and psychological abnormalities, even after rescue and intensive rehabilitation at the CBRC. The severely stunted and dwarf-like appearance of some bears suggested the possibility that stress-induced stunting or so-called 'stress dwarfism' may compound nutritional and space deprivation (Green *et al* 1984).

On arrival at the CBRC, 95% of the bears exhibited signs of stereotypic behaviour. These stereotypies included bar biting, head rolling, cage banging and, when space allowed, bobbing and weaving of the head and body, pacing, rocking, circling, and stepping from side-to-side or back and forth. Conversely, some bears were unusually unresponsive and slept excessively (Broom 1991). All but five of the bears demonstrated unusually aggressive behaviour, agitation or nervousness. Some of these behaviours resulted in self-injury. Teeth were prematurely worn and broken from chewing on cage bars in 69% of the bears. Continuous rubbing, banging, licking, sucking or plucking at specific body parts had, in some cases, resulted in loss of hair and damage to underlying skin (Figure 3). Ten bears had mutilated themselves to the extent that medical intervention was needed. One individual rescued by the AAF had to be euthanised because all medical efforts and behavioural modification strategies were unable to alleviate the animal's distress and prevent self-destruction.

In summary, our findings indicated that the physical and psychological health of bile farm bears is severely and chronically compromised and precludes their ability to engage in normal behaviour. Isolation of immature animals is particularly devastating in a species such as the black bear that normally undergoes long periods of social development in the family unit. The high incidence of stereotypic behaviour in bile farm bears is also a cause for concern. Stereotypies, including both kinetic and apathetic activities, are often understood to arise as a result of frustration and an effort to cope with a deleterious environment (Broom 1991; Vickery & Mason 2004; Mason 2006b). Long-term expression of these behaviours or exposure to their underlying causes even may result in a physical dysfunction of the central nervous system which, in turn, propagates the behaviour (Mason 2006b). This may explain the persistence of certain stereotypic behaviours, such as periodic pacing and head-swaying, at times of stress (eg feeding time) even after several years at the CBRC.

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Figure 1

A bear that has just been rescued from a bile farm in Sichuan province, 2008. The bear is emaciated and has lost most of its hair as a result of malnutrition, disease and self-mutilation. Raw wounds are visible on the face, flanks and all four limbs. The protruding abdominal mass is part of an advanced hepatobiliary tumour. The bear lived in this extraction cage.

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Figure 2

A bear in a crush cage visited by one of the authors (JR) on a bear farm in China. Chinese regulations state that these cages are to be used only for the few minutes each day during which bile is extracted. Frequently, however, bears live permanently in these cages, with the bear in the 'crushed' position for days and sometimes weeks on end.

Results in relation to freedom from fear and distress and freedom from pain, injury and disease

The extraction of bile from a bear's fistula causes pain to the bear. This is particularly true of free-dripping fistulae, where farmers often make repeated attempts to insert the extraction catheter. Bears emit vocalisations of distress during the procedure, and are observed to bite, kick, struggle and demonstrate other signs of discomfort and pain (Robinson 1994; Phillips & Wilson 2002; Li 2004). Some bile farmers explained that they sear the free-dripping wound with a 'red-hot metal probe' in an effort to scar the fistula such that it remains patent.

The bears' anxiety is also evident from their aggressive and intensely-fearful behaviour towards the farmer. The severity and consistency of these behaviours is implied by the measures that farmers must take to restrain the animals for the extraction procedure and to protect themselves. Workers on certain bear farms wear helmets during bile extraction. Bears may be pinned flat on their abdomens in crush cages that prevent any sort of movement during the extraction process. The AAF has observed bears being left in the crushed position for days and, according to a number of farmers themselves, weeks at a time (Figure 2). Canine teeth were sawn off in 6% of rescued bears, which exposes the pulp cavity and the nerve in the tooth root, and is extremely painful. Some farmers declaw their bears (5% of rescued bears), which involves the amputation of the distal bones of the digits.

Figure 3

The face of a bear which has scraped all of the hair away and suffered skin damage as a result of rubbing against cage bars. The skin is permanently damaged and this bear's face remains hairless six years after the cessation of the behaviour at the CBRC.

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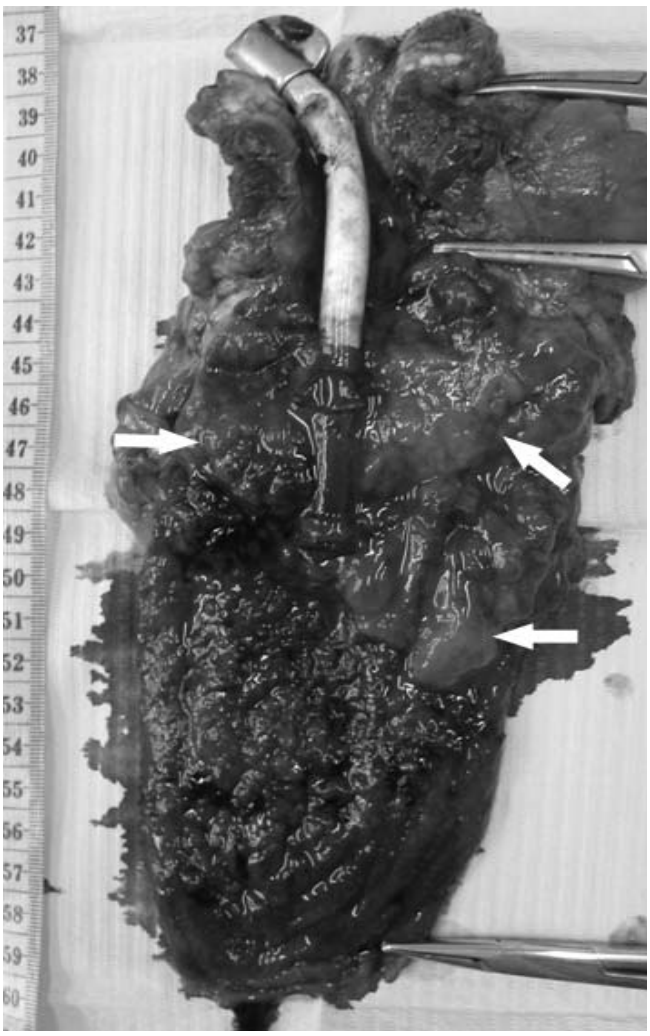
Figure 4



A gall bladder opened longitudinally with a latex catheter *in situ*. The upper and middle haemostats mark the distal and proximal aspect, respectively, of the duct connecting the fundus of the gall bladder to the ventral abdominal wall. The dermal layer is visible immediately above the upper haemostat. The lower haemostat marks the proximal end of the gall bladder where it opens from the cystic duct. The gall bladder wall is abnormally thick (4–5 mm) and the mucosal surface congested, haemorrhagic and cobbled with polypoid lesions. Large polyps (white arrows) have developed around the internal end of the catheter. These measure up to 7 cm in length among fistulated gall bladders. The latex catheter is joined to another piece of latex tubing with cotton string. The protruding end of the catheter is capped with a metal flange that prevents the catheter from slipping inside the gall bladder and discourages the bear from chewing on it. Tape on the left shows measurements in cm.

Examination of these paws has revealed that the bones were cut through as opposed to being disarticulated, and tracts of chronic osteomyelitis had been retained. In fact, it has been reported that paws have been severed from a live and awake bear in order to fulfil customer requests for bear paw soup (Phillips &Wilson 2002; Vince 2002).

Some bears appear to tolerate the daily bile extraction procedure better than others and it is these that are showcased for tourists and official visitors. These bears demonstrate a limited degree of discomfort at the insertion of the catheter and remain crouched into position, drinking water throughout the procedure. It is notable that water is the reward which elicits the co-operation of the bear. Misleading conclusions can be drawn from isolated observations of such 'demonstration bears'. Although Green *et al* (2006) concluded from their observation of a demonstration bear that "bile extraction appears rapid and painless," our observations indicate that in most cases the procedure causes pain.

Wounds, infections, bile-scalded skin and other pathological changes were found in every rescued bear (Figure 1) and are described below. The gall bladder fistulation methods are presented first as background to the pathological observations.

Gall bladder fistulation

A permanently-open fistula into the gall bladder is created by alignment of apertures of one-to-three cm diameter, excised from the ventral abdominal wall and the gall bladder fundus. The gall bladder is pulled ventrally from its normal position and fastened in place by one of four methods.

Originally, a long latex or rubber tube was anchored inside the gall bladder (Figure 4) and emerged through the fistula. The tube was threaded beneath the skin of the abdomen and flank, to exit at the bear's hip. The farmer drew bile through the tube once or twice a day via a syringe. Bile extraction by this method was frequently complicated by blockage of the long, narrow tube with precipitated bile and pus. A modified version drips bile constantly into a plastic bag which lies in the hinged flap of a heavy metal corset attached to the bear with metal and leather straps.

An alternative method uses a stainless steel catheter rather than a flexible latex tube. The catheter is 10-to-20 cm in length and is held in the gall bladder with metal discs. Some of these catheters have a metal spur at the protruding end to prevent the catheter from slipping into the gall bladder and to discourage the bear from chewing on it. Lint or strips of rag are stuffed into the catheter between extractions to prevent bile leakage.

The free-dripping fistula, a third method, utilises tissue from the bear's abdomen to construct a duct between the apertures in the gall bladder fundus and the ventral abdominal wall (Figure 5). The wound is meant to remain permanently open. Bears form granulation tissue to heal wounds with remarkable efficiency, and farmers resort to a variety of methods (eg burning the wound or frequent traumatisation with sharp tools) to keep the free-dripping fistula patent.

In 2005, investigators first began to see bears fistulated with the 'fake' free-dripping method, which farmers were using to circumvent the difficulties with the free-dripping fistula. A short Perspex catheter is positioned in the gall bladder in a manner similar to the stainless steel catheter. The external end of the catheter is cut flush with

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the surface of the abdomen or just beneath the skin so that it is virtually invisible. The invisibility is desirable because only the free-dripping method currently meets regulations for bear farming.

Pathology of gall bladders and other structures

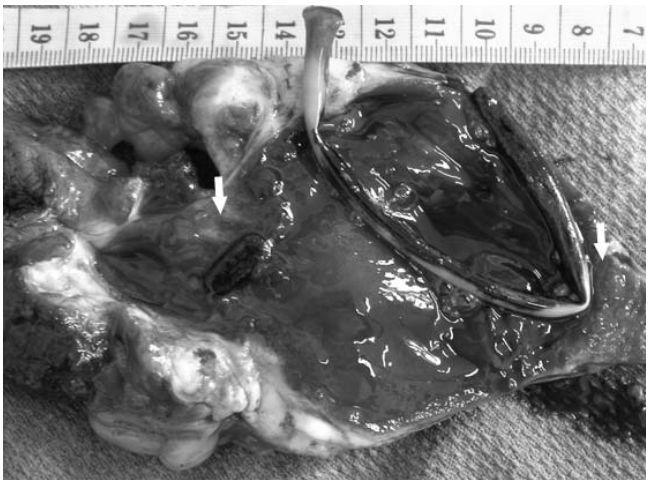
The latex, stainless steel and Perspex tubes may be sutured to the gall bladder wall with thick, braided, cotton fibre that elicits an inflammatory reaction and can serve as a nidus for development of infection and gall stones (Figure 5). Other methods involve the use of a variety of wire rings and flanges that jut into the structures surrounding the gall bladder. These devices incite an extensive reaction, such that masses of fibrous tissue, abscesses and adhesions that may measure 20 cm or more in diameter must be excised along with the gall bladder at the time of cholecystectomy. In one particular bear, a large wire ring had been used to hold the tube in place. The ring had been pierced through the xyphoid process of the sternum, where the chronic irritation had caused the normally cartilaginous tissue to ossify.

Experience in the early months of the AAF bear rescue project demonstrated that pathological changes in the gall bladder that are initiated on bear farms continue even after cessation of bile extraction and removal of catheters. Therefore, a complete cholecystectomy is now performed for each fistulated bear that arrives at the CBRC. Table 1 presents the common pathological changes found in these gall bladders and in surrounding abdominal structures. All but one of the 218 fistulated gall bladders showed evidence of cholecystitis (Figures 4 and 5). Polyps had developed on the mucosal surface of 71% of the gall bladders, particularly in the area of the fistula, in response to chronic trauma (Figures 4 and 5). Foreign objects, such as pieces of tubing, bits of wire, surgical swabs and suture material were found inside 19% of gall bladders (Figure 5). Bile in the gall bladder was mixed with pus in 11% of cases. Strictures in the gall bladder wall, obstruction of the cystic duct and partial herniation of the gall bladder wall were found in 5% of the bears.

Pathological changes in the gall bladder eventually limit the farmer's ability to harvest bile. In these circumstances, bears may be subjected to repeated surgeries, on-farm, to resect the most damaged part of the gall bladder and to re-establish a patent fistula (Figure 5). Here, gall bladders were found to be as short as 3 or 4 cm in length compared with the normal length of 16 to 20 cm.

Abdominal tissues other than the gall bladder were often also found to be diseased (Table 1). The most serious developments were peritonitis caused either by the leakage of bile into the abdominal cavity or infection, or both, and hepatobiliary cancer (6 and 14%, respectively, of bears received at CBRC). The latter accounts for close to 50% of deaths at the CBRC (Table 1). Chronic inflammation is known to be associated with the development of certain forms of cancer (eg Chapman 1999; Schottenfeld & Beebe-Dimmer 2006). We are investigating the hypothesis that the high rate of hepatobiliary cancer in these animals occurs as a direct result of the chronic disease and trauma to which the biliary system is subjected.

Figure 5



The opened gall bladder from a bear with a free-dripping fistula. The skin of the ventral abdomen where the fistula opened to the outside is visible on the far left. Between this and the white arrow is the duct connecting the apertures between the gall bladder fundus and the ventral abdominal wall. The arrow on the far right marks the junction between the proximal end of the gall bladder and the cystic duct. This gall bladder is approximately 35–40% of the length of a normal gall bladder, which suggests that the bear has undergone multiple fistulation surgeries. A length of old latex tubing was found inside the gall bladder. It either had been left there from a previous fistulation or had slipped inside the gall bladder when the farmer was trying to extract bile with it. An old piece of cotton suture material, encrusted with precipitated bile, is stuck to the gall bladder wall (object below left arrow). Cholecystitis is evident in the thickened and inflamed mucosal layer and the polyps located particularly at the fistular opening (the collar of tissue to the right of the left arrow).

Foreign objects, such as suture material, broken catheter tips and, in one case, a toothpick, were found embedded in the abdominal tissues or encased in abscesses that form around such objects to wall them off from the body (six cases). Abdominal abscesses outside of the gall bladder were found in 25% of fistulated bears. Inflammatory tissue reactions caused by poor surgical technique, infection or leakage of bile within the abdomen caused tissues or organs to adhere to one another. In 21 bears, organs were found to have been displaced by such adhesions or by the methods used in the construction of the free-dripping fistula. For example, organs normally positioned on the left side of the abdomen, such as stomach fundus and spleen, were found on the left, or loops of small intestine were entangled in tears in the mesentery. Herniation of the abdominal muscles had resulted in 30% of cases from poor surgical technique and/or infection following surgery. In nine bears, poorly-constructed fistulae had leaked bile under the skin of the abdomen, resulting in tracts of pooled bile and pus. Bile is caustic and severely irritates tissues outwith the gall bladder. Abdominal skin was found typically to be chronically inflamed and ulcerated from the leakage of bile from open fistulae and from the bile collection bags used with the corset system.

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Table 1 Number and percentage of common abnormalities found in bears rescued from bile farms in China, based on data from 241 bears.

Category	Hernia	Cholecystitis	Gall bladder polyps	Cholelithiasis	Foreign bodies in gall bladder	Fibrous mass around gall bladder	Abscesses in abdominal cavity	Adhesions between gall bladder and adjacent organs	Peritonitis	Major injury[2]	Hepatobiliary cancer	Hindlimb paralysis
Fistulated bears (n = 218)	66 (30%)	217 (99.5%)	154 (71%)	55 (27%)	38 (19%)	61 (28%)	58 (27%)	86 (39%)	13 (6%)	125 (57%)	30 (14%)	6 (3%)
Unfistulated bears (n = 23)[1]	0	–	–	0	0	0	0	0	0	9 (39%)	0	1 (4%)
Bears with FD (n = 163)	56 (34%)	162 (99%)	108 (66%)	35 (22%)	26 (16%)	29 (18%)	45 (28%)	55 (34%)	6 (4%)	98 (60%)	25 (15%)	4 (2%)
Bears with FFD (n = 4)	0	4 (100%)	2 (50%)	1 (25%)	0	3 (75%)	2 (50%)	3 (75%)	1 (33%)	3 (75%)	0	0
Bears with SSC (n = 40)	5 (13%)	40 (100%)	34 (85%)	16 (48%)	11 (39%)	20 (50%)	8 (20%)	19 (48%)	5 (13%)	18 (45%)	4 (10%)	2 (5%)
Bears with latex catheters (n = 11)	5 (45%)	11 (100%)	10 (91%)	3 (27%)	1 (13%)	9 (82%)	3 (27%)	9 (82%)	1 (9%)	6 (55%)	1 (9%)	0
Bears with non-FD system (n = 55)	10 (18%)*	55 (100%)	46 (84%)	20 (42%)*	12 (30%)*	32 (58%)*	13 (24%)	31 (56%)*	7 (13%)	27 (49%)	5 (9%)*	2 (4%)
Cause of death in fistulated bears (n = 69)	–	–	–	–	–	–	–	–	10 (15%)	–	31 (47%)	6 (9%)
Cause of death in unfistulated bears (n = 3)	–	–	–	–	–	–	–	–	0	–	0	1 (25%)

FD: free-dripping fistula; FFD: 'fake' free-dripping fistula; SSC: stainless steel catheter.
Death percentages are calculated as percent of total deaths at the CBRC.
[1] Cholecystitis and gall bladder polyps were not calculated for unfistulated bears, as these gall bladders were examined only ultrasonographically. There is no evidence of abnormalities in any of these gall bladders to date. Incidence of abdominal lesions are based on physical examination and ultrasonographic findings.
[2] Major injury: evidence of injury such as missing limbs or parts thereof, large scars on body, declawed, ingrown nails, foot pad damage, arthritis, and decreased range of motion of limbs. * Percentages significantly different between FD and non-FD systems ($\chi^2 \leq 0.05$).

Proponents of bear farming and farmers posing for official visitors assert that they have no problems with infections or other disease in their bears. However, our observations and unofficial interviews with workers on the bear farms indicate that such problems do occur and that some are prevalent. Catheters inserted daily into the fistula to extract bile are not cleaned and neither are bears' abdomens prior to insertion of the instrument. The extraction technique and the open nature of the fistulae result in the continual introduction of infectious organisms into the gall bladder. Antibiotics are used extensively to treat abdominal and other wounds as well as respiratory and gastrointestinal disease, particularly in cubs.

Bear bile farmers and Government officials have maintained that the free-dripping fistula precludes complications associated with previous methods and ensures a pain-free

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Figure 6

A bear which had been trapped in the wild after the 1989 ban on wild capture and has lost both front paws. The AAF estimates that 21% of its bears are wild-caught (all born after 1989).

bile extraction experience for the bear (Fan & Song 1999). The data presented above indicate that the free-dripping fistula is equally detrimental to the health and well-being of the bear as other methods of bile extraction. Regardless, many bear farmers ignored the 1996 mandate for free-dripping fistulae because of the expense of conversion surgeries, the risk of losing the bear to surgery and post-surgical complications, their preference for latex or stainless steel catheters and their confidence that the regulations are unlikely to be enforced. For example, a visit by the AAF in late 2006 to a bear farm in Jilin Province revealed that all of the three-hundred bears on the farm wore metal corsets and would therefore have latex catheters. Farmers at a farm in Yunnan Province, whose 530 bears had stainless steel catheters, told the AAF in 2005 that, although the farm had six full-time staff responsible for the health and fistulation surgeries of the bears, their efforts to convert stainless steel catheter systems to free-dripping fistulae in 70 bears failed and that they had stopped trying. Bear farmers refuse to share data on the post-surgical mortality rate of their bears. Investigators were told that if a bear is not worth the trouble of another surgery it is left to die from starvation or illness or is killed for the sale of the body parts (Li 2004).

It must be emphasised that a fistulated gall bladder establishes an open communication between a normally sterile abdominal organ and the outside environment. In many countries, this procedure and the subsequent state would be permitted only for research purposes in laboratory animals under strictly regulated conditions and in a clinically sterile post-operative environment. At the termination of the experiment, the animals would be euthanised due to the prohibitive expense and ethical considerations of maintaining living creatures with a gall bladder fistula.

Every bear that the AAF has seen on bear bile farms and that has been received at the CBRC shows evidence of disease and trauma beyond the gall bladder and abdominal cavity (Figure 1 and Table 1). Injuries to limbs include missing parts of limbs (Figure 6), snare wounds, mutilated digits from attempts at declawing, crushed paws, poorly healed bone fractures, claws that have grown so long as to curl back and pierce through the flesh of the paw, and reduced range of motion in the joints. Missing parts of limbs and snare wounds

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are usually a result of poaching methods, although injuries to limbs that result in amputation, or amputation of paws for sale, occur on the bear farms themselves as well. The paw pads of all the bears that arrive at the CBRC are hyperkeratotic with long-term disuse. Arthritic changes develop at relatively young ages, eg in bears younger than ten years of age. Spondylosis and intervertebral disc disease resulting in hindlimb paralysis necessitated euthanasia in seven bears (Table 1). In bears with latex hip catheters, the subcutaneous tract along the flank and hip was chronically infected. Healing these wounds required months of medical and surgical intervention. The metal corsets worn with the other latex catheter system leave extensive scars, as do other wounds. Bar chewing, cut canine teeth and malnutrition result in dental disease, as manifested by broken teeth, open root canals, apical abscesses and maxillary and mandibular osteomyelitis. Three of the bears which arrived at the CBRC with mandibular osteomyelitis were younger than three-years old.

Bear farmers have indicated that it is rare for their bears to reach ten years of age and that a 14-year old bear is considered 'very old'. Bears well cared for in Western facilities may live to beyond 30 years of age. The shortened lifespan reflects the serious health and welfare problems experienced by these bears.

Conclusion and animal welfare implications

Bear bile farming severely compromises the physical and psychological health of the bears. Meeting the environmental and psychological needs of captive bears requires the considerable expertise, resources and intensive management of skilled professionals even under the best circumstances and with highly-trained, empathetic animal caretaker staff (Carlstead *et al* 1991; Vickery & Mason 2004). Our calculations indicate that the cost of this care, particularly with the veterinary requirements of bile bears, would exceed the profit of bile farmers by some 25-fold. In short, the prolonged and severe welfare consequences of the findings outlined above lead to the conclusion that bear bile farming is an unacceptable and unsustainable practice.

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