Observations of Autumn Courtship and Breeding in Brown Bears, *Ursus arctos,* from Coastal British Columbia

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Over a period of four years, autumn courtship behaviour in Brown Bears (*Ursus arctos*) was observed on three separate occasions, with copulation observed once and two litters of cubs potentially resulting from autumn breeding. These are the first recorded observations of these behaviours.

Key Words: Brown Bear, *Ursus arctos*, reproduction, autumn, courtship, mating, British Columbia.

Brown Bears (*Ursus arctos*) mate in the spring from May to July. Once the fertilized eggs have developed to the blastocyst stage, further development is delayed until just before denning, typically November. At this time the blastocysts implant and a short pregnancy ensues with one to four cubs born during winter sleep, usually in February. This delayed implantation leads to an apparent gestation period of 6.5 – 8.5 months, although embryonic development occurs only in the last 6 – 8 weeks (Craighead et al. 1969; Hensel et al. 1969; Garshelis 2001).

Between August 1999 and May 2003, Brown Bears in the Glendale Cove area of British Columbia (50°41'N 125°44'W) were individually identified and observed as part of an ongoing study (Nevin 2003). Photo-identification techniques allowed individual bears to be distinguished. Coat coloration and scar patterns were recorded with sketches and descriptions on data sheets, supplemented by a catalogue of reference photographs. Each bear was given a unique numeric code. Sex was determined by urination pattern, direct observation of genitals or the presence of cubs (Nevin 2003; Nevin and Gilbert 2005a).

Autumn courtship was first observed in mid-September 1999; two large adult males (M003 and M004) were observed tracking a lone female (F005). While this close following and olfactory investigation of urine is typical of the breeding season, it was only in light of subsequent observations that this was recognized as out-of-season courtship behaviour.

Two weeks later, at the beginning of October 1999, one of these male bears (M003) was observed courting another lone female (F102). During the 40 minutes that the interactions of these bears were recorded, tracking was again observed; in addition, there was play fighting, genital sniffing and mounting.

In the same week one of the female bears (F009) lost two yearling cubs. The cubs were last seen on 3 October 1999 after which F009 was seen alone. F009 is a highly identifiable bear with distinctive scarring and a muzzle that twists to the right. After the loss of her cubs in 1999 she was not seen in 2000 but returned to the Glendale spawning channel in early September 2001. At this time she was accompanied by three yearling cubs; these cubs would have been born during the 1999-2000 hibernation. For this to happen, F009 must either have mated in the spring of 1999 while still with her yearling cubs or have mated in the autumn of 1999 after the loss of her cubs. Neither explanation would be considered typical behaviour.

In mid September 2001 M004 was again seen tracking F005; this is the same pairing seen in September 1999 and F005 still had no cubs. On this occasion they approached another female (F103) and her two-year-old cubs. F103 charged F005 and after a brief agonistic interaction F005, the larger of the females, backed away approximately 10 m and sat down. At this point F103 was approached by M004; after another brief agonistic interaction, F103 moved away from her cubs and offered no resistance to mounting by M004. Copulation began immediately and continued for at least 10 minutes at which time continued observation became impossible. This is the first recorded observation of autumn copulation in Brown Bears. It should be noted that F103 had been involved in courtship behaviour in the spring (e.g. 15 May 2001 with M301); she had separated from her cubs in late May and was seen mating with M301 in May and June. F103 and cubs had reunited by 16 September 2001. F103 was seen in May 2002 with two young-of-year cubs but it is not known whether these are from spring or autumn mating in 2001.

With only four observations over a period of four years during which 341 days of systematic behavioural observations were conducted for ongoing research projects (Nevin 2003; Nevin and Gilbert 2005a, b) on the approximately 40 individual bears using the area, we are clearly discussing rare events; during this period more than 30 breeding events were observed during the spring breeding season. It should be noted that although all the observations of autumn courtship and breeding involve one of two male bears (M003 and M004) these were two of the five largest males in the area.

Very little is known about the reproductive biology of any bear species and new insight into Brown Bear

breeding may have impacts on the conservation and management of other bear species, many of which are threatened or endangered (Spady 2002). The potential of successful autumn breeding will also add a new dimension to the ongoing debate on infanticide in Brown Bears (Wielgus et al. 2000, 2001; Swenson et al. 2001a, b; Dahle and Swenson 2003; Miller et al. 2003; Ben-David et al. 2004; Nevin and Gilbert 2005a, b). With the possibility of same-season breeding opportunities associated with cub-killing events throughout the non-denning period, the selective advantage associated with this behaviour would be much higher than it has been assumed to be under the prevailing view that breeding is restricted to the spring period.

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