

## Active American black bear dens adjacent to a marine beach used for foraging

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Hibernation and denning are essential to American black bears (*Ursus americanus*) throughout much of their range. Although den structure varies, it is generally agreed that dens provide the important functions of shelter and safety (Davis 1996). In coastal Alaska, studies indicate that most black bears den in upland areas and largely relied on large or old-growth trees (Erickson 1982, Hanson 1988). Studies of coastal areas that did not include shoreline habitats in Alaska and British Columbia (BC) suggest that black bears often den in upland areas or on slopes (e.g. Miller 1990, Davis 1996). Here, we report the opportunistic discovery of active black bear dens directly adjacent to a beach used for foraging.

### Study area and methods

Hazard Point (50°29'59"N, 128°01'47"W) is located in Forward Inlet, Quatsino Sound, on the northwest coast of Vancouver Island, British Columbia, Canada. The site is in the Coastal Western Hemlock biogeoclimatic zone, which is characterized by a cool and wet climate. The forest of Hazard Point was mostly hand-logged approximately 60 years ago but a small number (<10) of old-growth Sitka spruce (*Picea sitchensis*) remained near the shoreline during the study. Forests were composed primarily of second

growth Douglas-fir (*Pseudotsuga menziesii*), red alder (*Alnus rubra*), western red cedar (*Thuja plicata*), Sitka spruce, and western hemlock (*Tsuga heterophylla*). The moderately exposed cobble and boulder beach was estimated at 30–100 m wide at low tides. The supralittoral zone was relatively narrow, with a width estimated to vary between 1 and 3 m and largely composed of logs, wrack, and other marine detritus. The forest is located immediately adjacent to the supralittoral zone. Within this general area, we delineated at small study area of approximately 6 ha.

As part of a study focusing on wildlife foraging in the intertidal zone, our objective was to document, mark and collect wildlife scat and other prey remains in the forest. On 6 March 2009, 2 persons searched the entire terrestrial area of Hazard Point on foot. Each searcher walked parallel transects oriented perpendicular from the forest boundary to the beach. A total of 4 m of forest floor (2 m on each side of searcher) were searched per transect, and the area searched was adjacent to the previous transect.

We defined active dens as structures that showed evidence of recent use by black bears. Evidence of use included bear scats near or within a den site and black bear hairs inside the den. Anytime we heard a sound we interpreted as a bear, we defined the structure from which it came as an active den; we did not hear any sounds on 6 March but did so later. Dens we defined as active during the initial site survey (6 Mar), were monitored for activity during subsequent visits (17 Mar and 5, 9, 13, 23, 24 and 29 Apr 2009). We also monitored 5 structures that showed no signs of activity during the first site visit but that could have been used as dens during subsequent visits. We inferred the age of bear scats qualitatively by the amount of erosion from rain and snow and removed or marked them when encountered. Scats deposited within or near dens subsequent to our initial visit provided further evidence of use and were assessed for erosion and moistness to infer their age.

We measured the distance between dens and the nearest forest edge by counting our paces and estimating average pace length. On 17 March, we placed approximately 0.2 m duct tape in prominent locations inside 3 active dens at heights only accessible by large mammals and birds to collect hair samples.

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**Fig. 1.** Photograph of an active black bear den located in a large tree stump at Hazard Point, British Columbia.

During 3 March–29 April 2009, we placed 1 camera (Reconyx Silent Image™, Model RM30, Wisconsin, USA) equipped with an infrared motion detector and infrared illuminator perpendicular to a wildlife trail and adjacent to the supralittoral zone. A boat-based survey of Forward Inlet had determined beach observation sites in December 2008. Separately, beach-based observations by 1–2 persons were also undertaken at Hazard Point and 2 beaches that allowed for observation of Hazard Point at distances of approximately 1.5 and 2 km, beginning on 2 March 2009 and continuing until 29 April 2009. In this paper, we report only on the identity and general behavior of black bears at Hazard Point.

## Results

We found 5 active black bear dens at Hazard Point during the search on 6 March. Two dens were located in large stumps (Sitka spruce and western red cedar), 2 in large stump and root bole complexes (both western red cedar), and 1 in a live Sitka spruce with a

trunk abnormality (Fig. 1). An additional den that had no evidence of use in March was later identified as active from the presence of scats estimated to have been deposited within the structure during April. This den was identified as active on April 24 and consisted of a fallen Douglas-fir and root bole complex. Because this structure appeared to have been used in April only, we could not reject the possibility that it was only used as a post-emergence resting site. The mean distance of active dens from the shoreline was 13.5 m (SD = 8.7). Three active dens were close (<3 m) to each other, and the remaining 3 active dens were distributed throughout the forest, each with different trails that led to the beach and interior to the forest.

We did not observe bears in dens, but from the estimated age of scats that we found close to all dens, we infer that at least 1 bear was present during late fall or early winter, February, March, and April. On 17 March, we collected hair from the den in the large Sitka spruce stump. We also heard sounds that we interpreted as coming from bears outside the western

red cedar stump and root bole dens but, due to the nearness of these dens (<3 m) and their excavated nature, we could not visually detect black bears or determine the location of the sounds. The duct tape inside the Sitka spruce stump den was found in pieces outside the den on 5 April. We also found the skeletons of a small cub and of an adult black bear <2 m from several dens on 6 March. From the small size of the skeleton (skull length = 13.8 cm), we judged the cub to have died in spring; based on the degree of decomposition, we guessed that both bears died during 2007 or 2008.

During boat-based surveys on 6 December 2008, observers saw an adult black bear foraging in the intertidal zone at Hazard Point. The first bear in spring was observed foraging in the intertidal zone at Hazard Point on 31 March 2009, and the remote, motion-triggered camera at Hazard Point first captured an adult bear moving toward the beach on 2 April 2009. Subsequent beach-based observations at Hazard Point were all of a single, adult bear foraging in the intertidal zone, perching in shoreline trees adjacent to several dens, and resting on trails adjacent to the beach throughout April. We believe that all observations were of the same individual because of the animal's size and distinctive markings as well as movement patterns (frequent observations that the individual came from and returned to the forest where dens were located).

## Discussion

Reports of black bear dens close to marine shores are rare; our discovery of the dens was unexpected. Of the few den studies conducted along the Pacific coast of North America that note location or elevation, only one reported a den close to shore (Erickson 1982). A black bear den close to shore has also been observed elsewhere on Vancouver Island (A. Hamilton, British Columbia Ministry of Environment, Victoria, British Columbia, Canada, personal communication, 2009). Despite our lack of direct observations of a black bear occupying dens, multiple lines of evidence indicate that a black bear occupied a number of dens at Hazard Point over the denning period. Further, the presence of an adult and cub skeleton adjacent to several dens suggests earlier use of coastal dens.

In general, black bears display a trend toward reduced dormancy in regions with milder climates and longer periods of food availability (Hamilton and Marchington 1980). The Hazard Point area may offer a favorable environment with year-round, reliable supplies of intertidal food relative to upland sites. However, given the limited knowledge of coastal black bear dens, we cannot determine how the Hazard Point dens compare to other potential den sites in the area, and can make no statements about den site preference. We suggest that additional research into coastal black bear den site characteristics and selection is needed.

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