

## FIRST OBSERVATION OF A PUMA (*PUMA CONCOLOR*) FEEDING ON A PINNIPED NEAR DEEP COVE, BRITISH COLUMBIA

MAXIMILIAN L ALLEN, CHRISTINE NORCROSS, PAULA L PERRIG

**ABSTRACT**—Apex carnivores, including Pumas (*Puma concolor*), play a key role in ecological communities. Pumas have variable foraging patterns across their extensive range and are known scavengers. A recent review of Puma diet and predation studies documented a total of 48 mammal prey types representing 9 of the 13 orders found in North America, but excluding marine mammals (Orders Cetacea and Sirenia, and Clade Pinnipedimorpha) or tapirs (Order Perissodactyla). This report documents what is, to the best of our knowledge, the 1st observation of a Puma feeding on a marine mammal, a Harbor Seal (*Phoca vitulina*). Pinnipeds, as hunted or scavenged prey, could be a significant resource for Pumas in coastal areas and should be a focus of future studies. Novel observations of prey items, such as this, are important to document as they expand our understanding of apex carnivores and the effects they have on ecological communities.

**Key words:** British Columbia, feeding ecology, foraging, *Phoca vitulina*, prey, *Puma concolor*, scavenging

Apex carnivores are integral to ecosystem health, and play a key role in the structure and functioning of ecological communities through direct (predation; Estes and Palmisano 1974) and indirect (fear of predation; Lima 1998) effects. Pumas (*Puma concolor*) have the widest distribution of any carnivore in the Americas and show high adaptability to local conditions, as evidenced by their variable foraging patterns (Iriarte and others 1990; Moss and others 2016). In the most extensive review of Puma diet and predation studies to date, Murphy and Ruth (2010) documented a total of 48 mammalian prey types (although potentially biased toward larger food resources), as well as birds and reptiles. Although ungulates were particularly important in their diet, being the most-consumed prey in 94 and 27% of studies reviewed in North, and Central and South America, respectively, Pumas predated upon 24 families of mammals, representing 9 of the 13 orders found in North America. In this diverse collection of prey items, there was no documentation of prey from the orders Cetacea, Sirenia, or Perissodac-

tyla, or the clade Pinnipedimorpha; in essence, no documented prey from marine mammals or tapirs. Herein, we describe for the 1st time an event of Puma predation upon a pinniped prey.

On 4 September 2016, at approximately 13:30, Christine Norcross (CN) was kayaking in the southern portion of Indian Arm, near the town of Deep Cove, British Columbia. Indian Arm is a glacial fjord, bordered by steep, forested mountains in the vicinity of Vancouver. While kayaking (at approximately UTM: Zone 10U, 505793E, 5463743N, WGS84), CN noticed a Puma resting along the shore on top of a large rock (Fig. 1). When the Puma became aware of CN, it roused itself from the rock and stretched, then moved to a nearby Harbor Seal (*Phoca vitulina*) carcass and began feeding (Fig. 2). Viewed from the kayak, the carcass appeared fresh, with no signs of bloating or damage from drifting in water, and there was no noticeable smell of rot. Contrary to most killed prey, which are pulled downhill (Allen and others 2015), the Puma appeared to have pulled the Harbor Seal uphill past the high-tide line into the edge of the forest. Enough of the prey had been consumed to suggest multiple feeding bouts, and the Puma appeared to be eating muscle mass during this feeding bout. Initially the Puma seemed to have chewed through the hide in the approximate area of the viscera and internal organs. The Puma continued to feed near the torso, but was lifting the entire carcass as it tore at the muscle mass with its teeth. This feeding behavior is typical of how Pumas consume large prey, first eating organs, and then moving on to large muscle masses (Shaw and others 2007).

Novel observations of prey items are important to document, as they help shape our understanding of apex carnivores and the effects they have on ecological communities. A notable exception of Puma prey items in the review by Murphy and Ruth (2010) were marine mammals, including pinnipeds. To the best of our knowledge, this report is the 1st known observation of a Puma having eaten a marine mammal. Harbor



FIGURE 1. Puma (*Puma concolor*) near Deep Cove, British Columbia, 4 September 2016, resting on rock near Harbor Seal (*Phoca vitulina*) carcass, which can be seen behind the rock (noted by yellow ellipse).

Seals and other pinnipeds often roost along the shore, and although they rest in groups to limit danger and increase vigilance, they could be an easy and profitable prey for Pumas (Wiesel 2010). Exploring if pinnipeds are actually a significant resource for Pumas as a killed or scavenged prey in the region or in other coastal areas would increase our understanding of Puma ecology and their effect on populations of pinnipeds and alternative prey. Future studies of Pumas in coastal environments should determine, then, if Harbor Seals or other pinnipeds are predated, and if so, to what extent.

Emerging technologies are making it easier to study wildlife (Pimm and others 2015) and to detect predation events (Elbroch and others



FIGURE 2. Puma (*Puma concolor*) feeding on a Harbor Seal (*Phoca vitulina*) pup, 4 September 2016, in the southern portion of Indian Arm, near the town of Deep Cove, British Columbia.

2014). For Pumas, fine-scale GPS cluster investigation has revealed smaller prey items than detected via traditional approaches, such as scat analysis (Allen and others 2015). However, novel observations of predation remain important to document, as they help reveal the ecology of species and their interactions. Integrating multiple sources of information is particularly important for studying cryptic apex predators such as Pumas.

*Acknowledgements.*—We thank the Illinois Natural History Survey, University of Illinois, and University of Wisconsin-Madison for their support.

#### LITERATURE CITED

- ALLEN ML, ELBROCH LM, CASADY DS, WITTMER HU. 2015. The feeding and spatial ecology of Mountain Lions (*Puma concolor*) in Mendocino National Forest, California. *California Fish and Game Journal* 101:51–65.
- ELBROCH LM, ALLEN ML, LOWERY BH, WITTMER HU. 2014. The difference between killing and eating: Understanding Puma energetic models. *Ecosphere* 5: Article 53.
- ESTES JA, PALMISANO JE. 1974. Sea Otters: Their role in structuring nearshore communities. *Science* 185:1058–1060.
- IRIARTE JA, FRANKLIN WL, JOHNSON WE, REDFORD KH. 1990. Biogeographic variation of food habits and body size of the America Puma. *Oecologia* 85:185–190.
- LIMA SL. 1998. Nonlethal effects in the ecology of predator-prey interactions. *BioScience* 48:25–34.
- MOSS WE, ALLDREDGE MW, LOGAN KA, PAULI JN. 2016. Human expansion precipitates niche expansion for an opportunistic apex predator (*Puma concolor*). *Scientific Reports* 6:39639.
- MURPHY K, RUTH TK. 2010. Diet and prey selection of a perfect predator. In: Hornocker M, Negri S, editors. *Cougar: Ecology and conservation*. Chicago, IL: University of Chicago Press. p 118–137.
- PIMM SL, ALIBHAI S, BERGL R, DEHGAN A, GIRI C, JEWELL Z, JOPPA L, KAYS R, LOARIE S. 2015. Emerging technologies to conserve biodiversity. *Trends in Ecology and Evolution* 30:685–696.
- SHAW H, BEIER P, CULVER M, GRIGIONE M. 2007. Puma field guide: A guide covering the biological considerations, general life history, identification, assessment, and management of *Puma concolor*. The Cougar Network. <https://www.cougarnet.org>.
- WIESEL I. 2010. Killing of Cape Fur Seal (*Arctocephalus pusillus pusillus*) pups by Brown Hyenas (*Parahyaena brunnea*) at mainland breeding colonies along the coastal Namib Desert. *Acta Ethologica* 13:93–100.

*Illinois Natural History Survey, University of Illinois, 1816 S Oak Street, Champaign, IL 61820 USA (MLA); maxallen@illinois.edu; Independent Researcher (CN); Department of Forest and Wildlife Ecology, University of Wisconsin-Madison, 1630 Linden Dr., Madison, WI 53706 USA (PLP). Submitted 11 May 2019, accepted 6 July 2019. Corresponding Editor: Robert Hoffman.*