

Health surveillance of thinhorn sheep (*Ovis dalli*) herds in British Columbia and Alaska

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ABSTRACT: The health of wildlife populations influences their sustainability in the face of ecological challenges. There is a paucity of information about the health status of free ranging thinhorn sheep populations (*Ovis dalli*), despite their economic, ecological, and cultural significance. Identification of health concerns in related species, bighorn sheep (*Ovis canadensis*), as well as concern from local communities, First Nations, hunters, and conservationists that thinhorn subpopulations may be declining in some areas, prompted the call for comprehensive thinhorn sheep herd health assessments. We used a standardized approach based on similar work on bighorn herd health and conducted herd health assessments of thinhorn sheep in five study herds across their range that included both subspecies, Dall's sheep (*O. dalli dalli*) and Stone's sheep (*O. dalli stonei*).

We used a broad definition of health and surveyed exposure to multiple pathogens common to domestic small ruminants and other wildlife species, and evaluated other comprehensive health measures including nutritional status, parasite burden, contaminant exposure, stress, pregnancy, and indices of body condition. From 2017 to 2020 we collected tissue and blood samples from 46 Stone's sheep ewes and immature rams live-captured in the Skeena and Peace regions of British Columbia (BC), and 67 Dall's sheep in the Talkeetna and Chugach mountains of Alaska (AK). We also analyzed samples from 63 hunter-harvested Stone's sheep rams from the Skeena region of BC from 2016 to 2019.

We found evidence of *Mycoplasma ovipneumoniae* exposure in Dall's sheep in Alaska and inconclusive results in Stone's sheep in BC. There was minimal evidence of exposure to other bacterial and viral respiratory pathogens in all subspecies and herds. A high seroprevalence to ovine herpesvirus ($P = 89.5\%$) was detected in all Stone's sheep. Parasite burdens were similar to previously reported results, including winter tick (*Dermacentor albipictus*) infestations of Stone's sheep sampled at low elevation along the Peace Arm of Williston reservoir. A high seroprevalence to *Toxoplasma gondii* was detected in sheep in Alaska ($P = 100\%$ in 2019, and 73.9% in 2020). Fecal glucocorticoid metabolite concentrations determined from hunter-harvested and live-captured sheep increased annually. Serum and tissue copper levels in some herds were in the range considered deficient for domestic sheep. Other trace minerals, including zinc and selenium, were deficient only in some study areas. Body condition of hunter-harvested rams decreased annually from 2016 to 2018.

Our findings confirm that thinhorn sheep, in general, are relatively naïve, and in some populations, very naïve, to diseases carried by domestic ruminants and other wildlife species. This information provides a baseline for thinhorn sheep herd health monitoring. If continued, it will allow for early detection of disease introductions and other population-limiting health factors. The results inform conservation and One Health decision making and can be incorporated into science-based management of thinhorn sheep in BC and Alaska.

Biennial Symposium of Northern Wild Sheep and Goat Council 22:31; 2020

KEY WORDS: *Mycoplasma ovipneumoniae*, One Health, *Ovis dalli*, *Pasteurellaceae*, respiratory disease, thinhorn sheep, wild sheep, wildlife health