

Small Animals with Big Data: An Application of Microfaunal Analysis at the Bugas-Holding

Site to Interpret Past Environment and Ecology

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The presence of microfaunal remains at the Bugas-Holding site in northwestern Wyoming provides an exceptional window into the ecological context and seasonal environment in which past human groups lived. Excavations here revealed a single occupational event centered on bighorn sheep (*Ovis canadensis*) and bison (*Bison bison*) hunting, indicating a winter camp of four to five months duration. Taxonomic identifications of associated mammalian and avifaunal remains corroborate this interpretation. By integrating zooarchaeological data with the documented seasonal behaviors of these species, we build a compelling case for winter use of Bugas-Holding. We also compare recovered avifaunal remains with modern avian populations recorded through summer bird counts conducted by the GRSLE Project between 2023 and 2025. This comparative approach highlights the differences between past and present avifaunal communities while situating Bugas-Holding within its broader ecological setting. This study demonstrates the value of interdisciplinary approaches for refining interpretations of site seasonality and human-environment interactions.

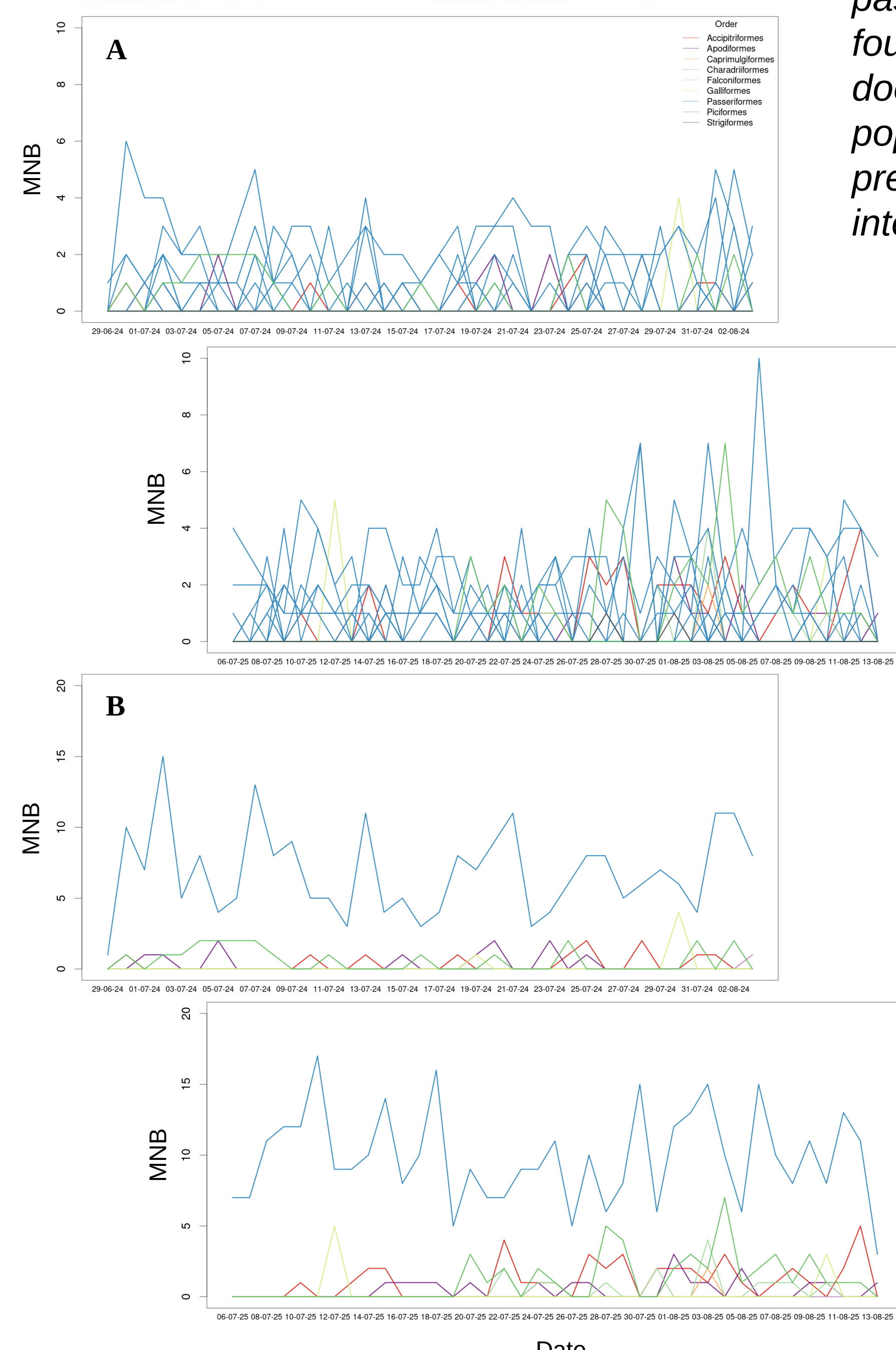


Figure 1) Passive bird counts for the 2024 and 2025 GRSLE field seasons at Castle Creek and Pickett Creek respectively. Figures are offset to align dates between the two years and dates are represented in day-month-year format. In A each line represents a single taxon and are colored by taxonomic Order, while B is summed for each Order.

| Lowest Taxonomic Level | NISP | Total MNE | MNI |
|--------------------------------|------|-----------|-----|
| Aves | 7 | 3 | 1 |
| Passeriformes | 2 | 2 | 1 |
| <i>Turdus migratorius</i> | 2 | 2 | 1 |
| Phasianidae | 11 | 9 | 2 |
| <i>Dendragapus obscurus</i> | 1 | 1 | 1 |
| Caprimulgiformes | 4 | 3 | 1 |
| Mammalia | 106 | 11 | 1 |
| Artiodactyla | 1 | 1 | 1 |
| <i>Ovis canadensis</i> | 1 | 1 | 1 |
| Lagomorpha | 3 | 3 | 1 |
| Leporidae | 16 | 12 | 2 |
| <i>Lepus americanus</i> | 11 | 11 | 1 |
| Rodentia | 580 | 327 | 16 |
| Sciuridae | 5 | 4 | 1 |
| <i>Marmota flaviventris</i> | 1 | 1 | 1 |
| <i>Tamiasciurus hudsonicus</i> | 5 | 5 | 1 |
| Cricetidae | 3 | 2 | 1 |
| <i>Peromyscus</i> sp. | 20 | 14 | 5 |
| <i>Microtus</i> sp. | 111 | 96 | 10 |
| <i>Neotoma cinerea</i> | 5 | 4 | 2 |
| <i>Perognathus</i> sp. | 3 | 3 | 1 |
| <i>Thomomys</i> sp. | 8 | 8 | 2 |
| <i>Thomomys talpoides</i> | 2 | 2 | 1 |
| cf. <i>Erethizon dorsatum</i> | 1 | 1 | 1 |
| <i>Sorex</i> sp. | 10 | 10 | 3 |
| Canidae | 1 | 1 | 1 |
| Vertebrata | 158 | 3 | 1 |

Table 1) Counts of elements from Bugas-Holding for the lowest identified taxonomic group. Counts are provided as Number of Identified Specimens (NISP), the summed Minimum number of Elements (Total MNE) across all elements, and the Minimum Number of Individuals (MNI). Light blue indicates winter residential taxa in the Absarokas and light red winter migrants.

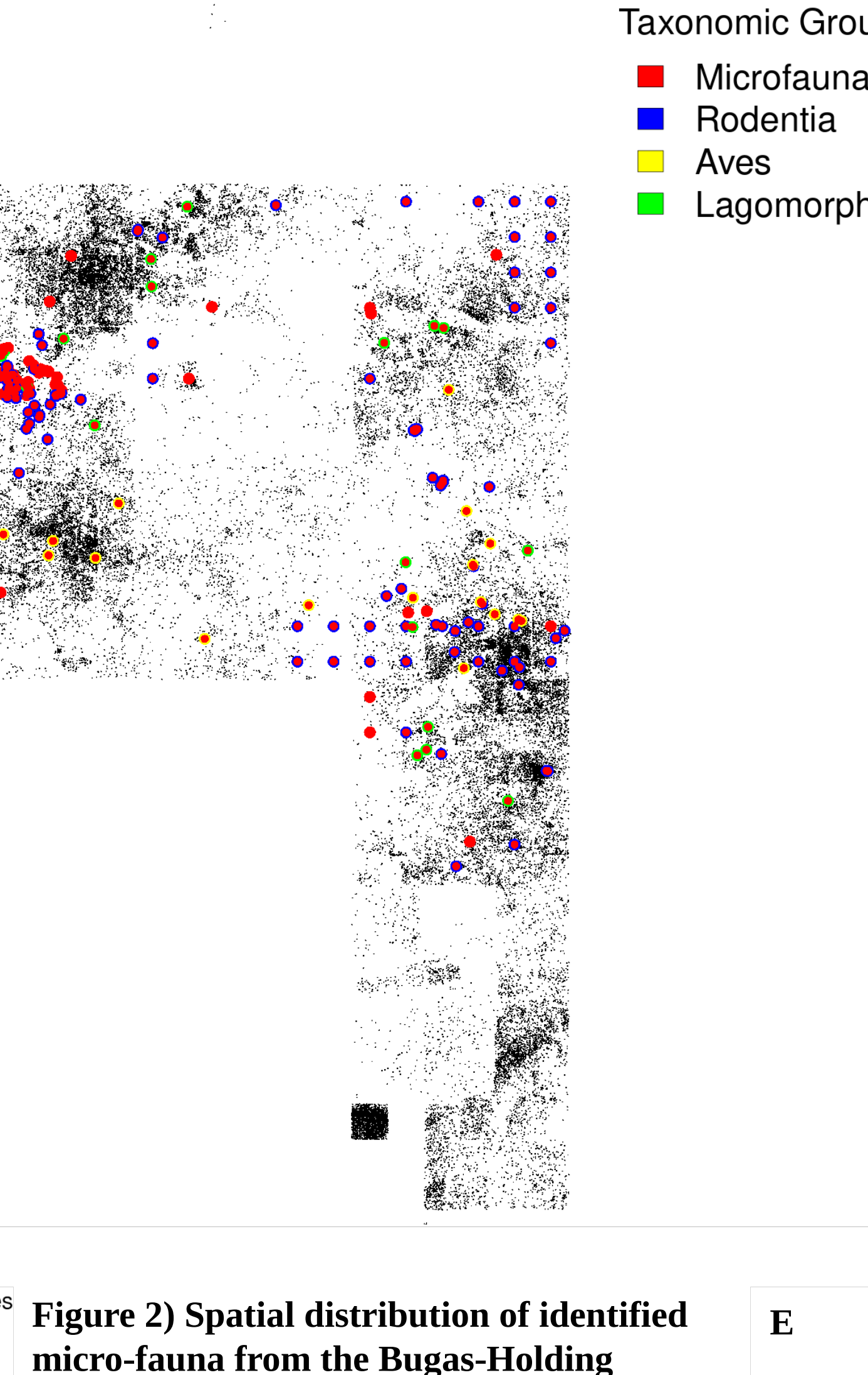
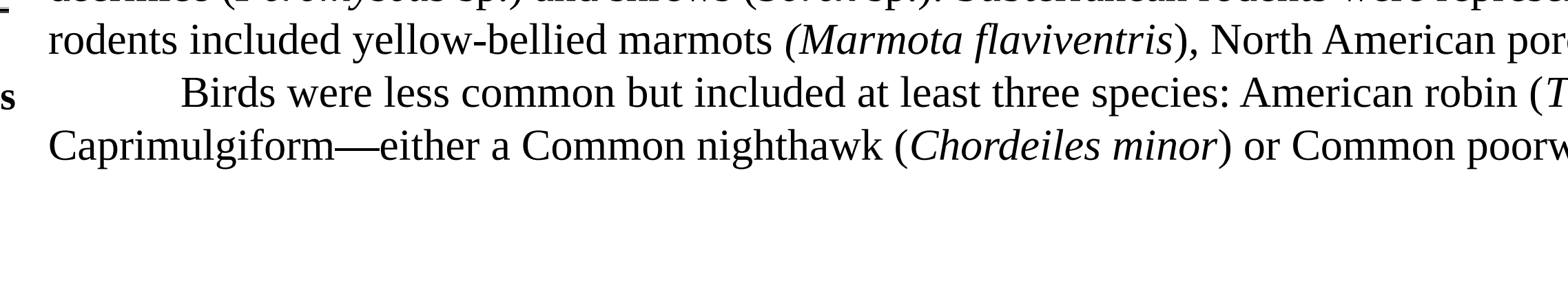
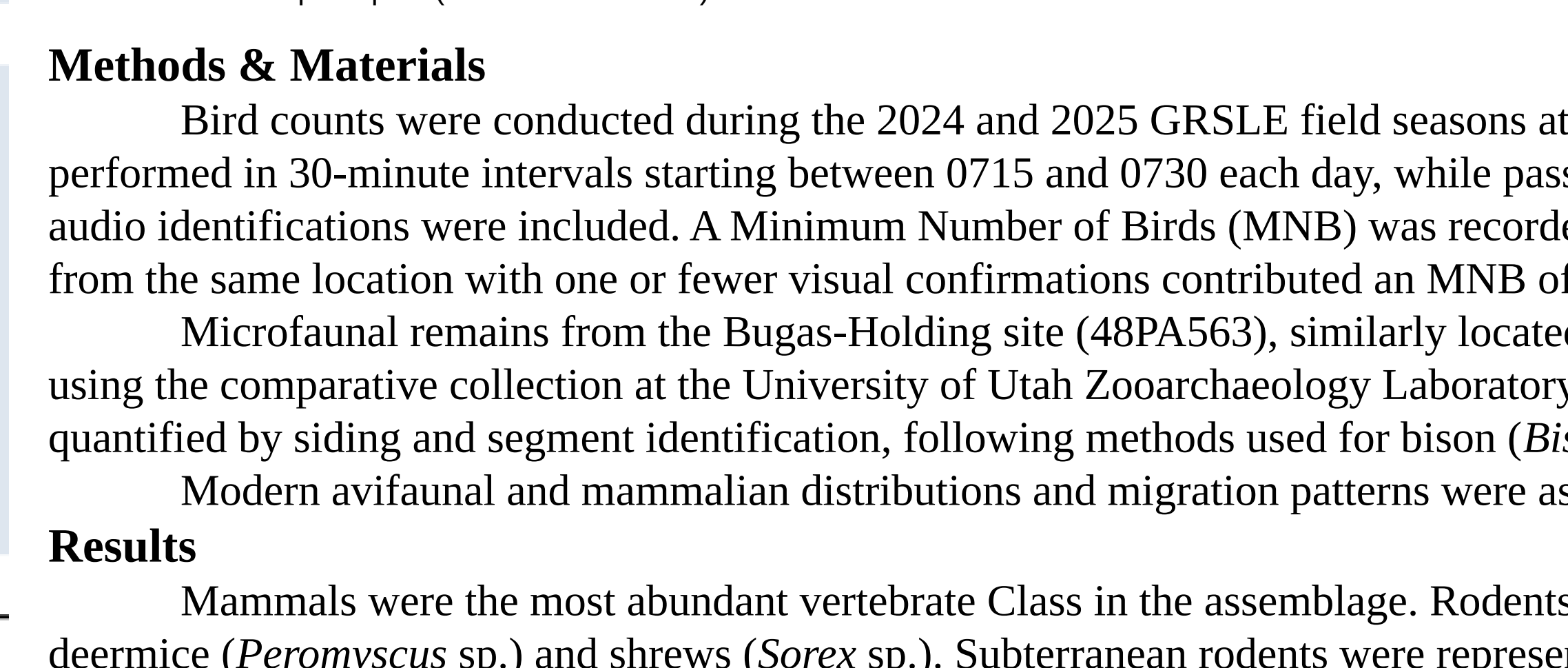
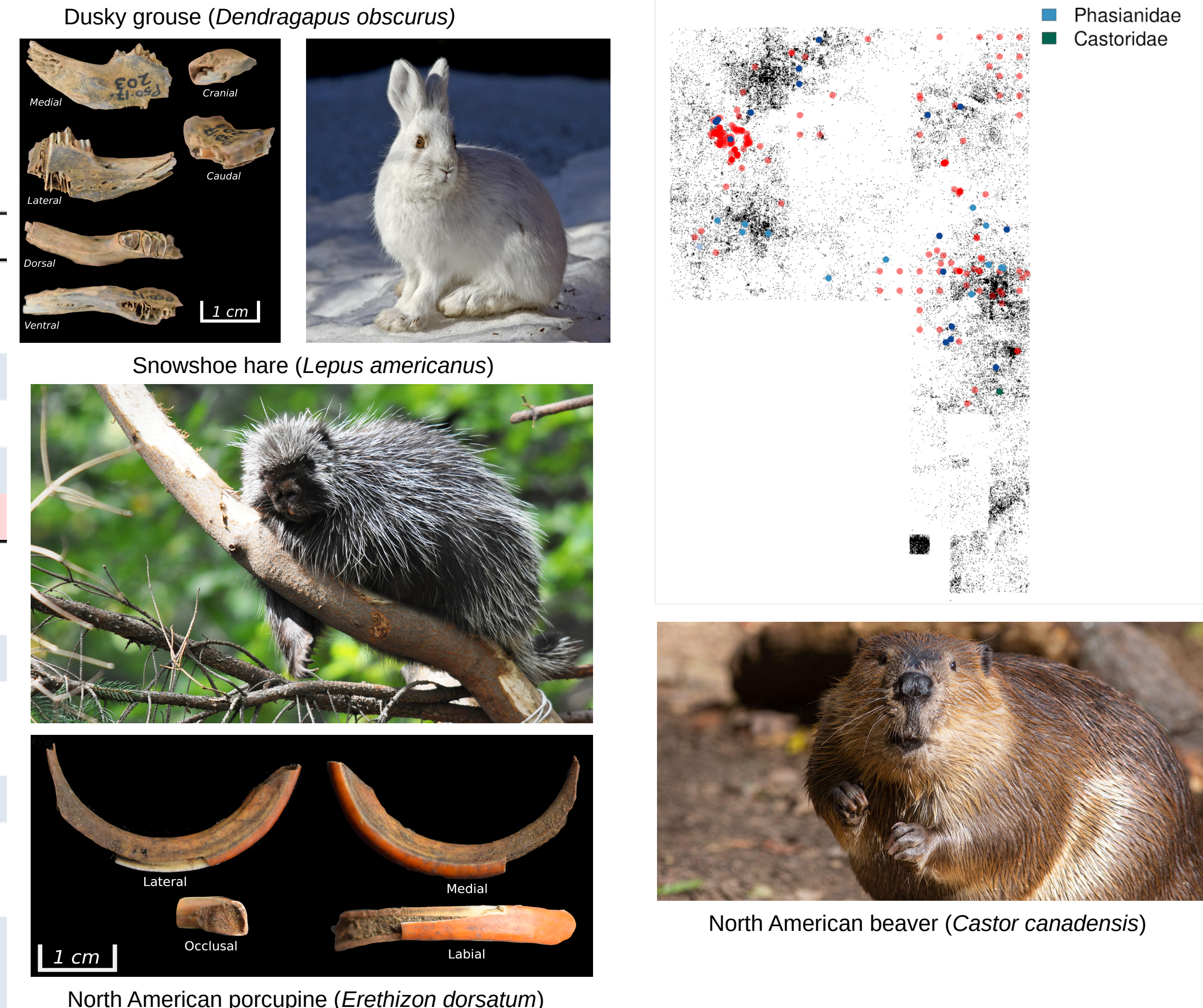
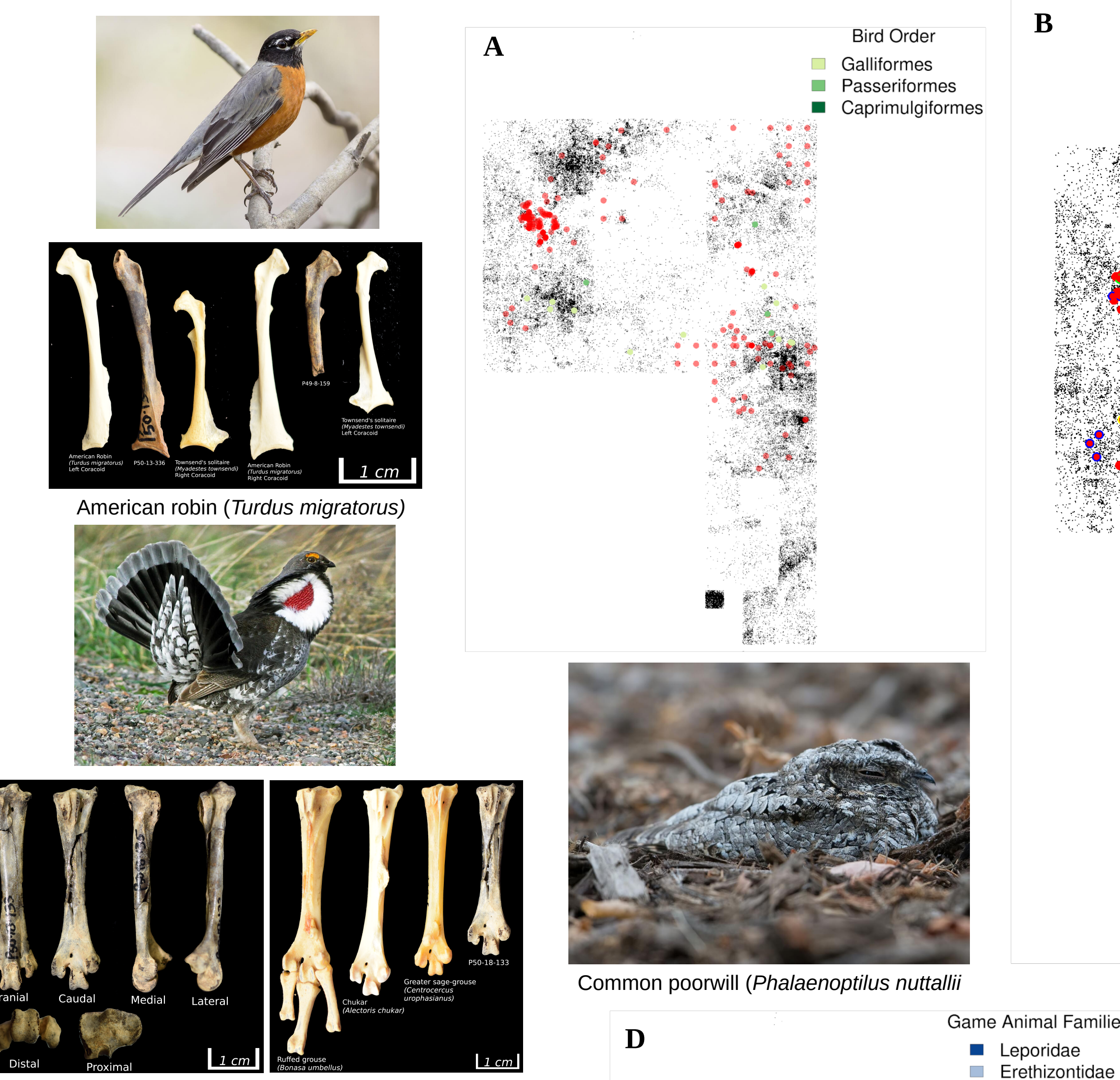


Figure 2) Spatial distribution of identified micro-fauna from the Bugas-Holding assemblage. For each map A, B, C, D, and E artifact locations are represented by black points and micro-fauna by red points. Map A provides the distribution of bird elements colored by Order, map B provides all locations of identified micro-fauna and colored for Class Aves and Orders Rodentia and Lagomorpha, map C highlights the distribution of rodents grouped by taxonomic Family, map D identifies key game taxa including: Leporids (rabbits and hares), Erethizontid(s) (porcupine), Phasianid(s) (grouse), and Castorid(s) (beaver), and map E provides localities of all Genus or Species level identifications at Bugas-Holding.

Methods & Materials

Bird counts were conducted during the 2024 and 2025 GRSLE field seasons at Castle Creek and Pickett Creek in the Absaroka mountains, Wyoming. Active counts were performed in 30-minute intervals starting between 0715 and 0730 each day, while passive counts occurred throughout the day. To minimize double counting, only visual or single audio identifications were included. A Minimum Number of Birds (MNB) was recorded for both count types. For example, two MacGillivray's Warbler (*Geothlypis tolmiei*) calls from the same location with one or fewer visual confirmations contributed an MNB of 1, while calls from separate locations each contributed 1.

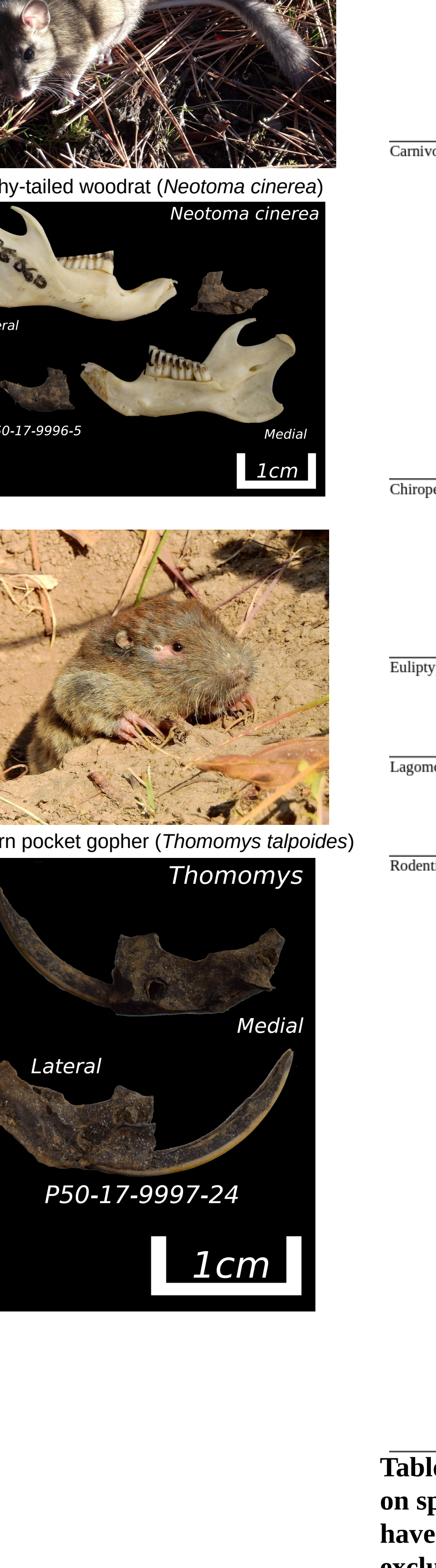
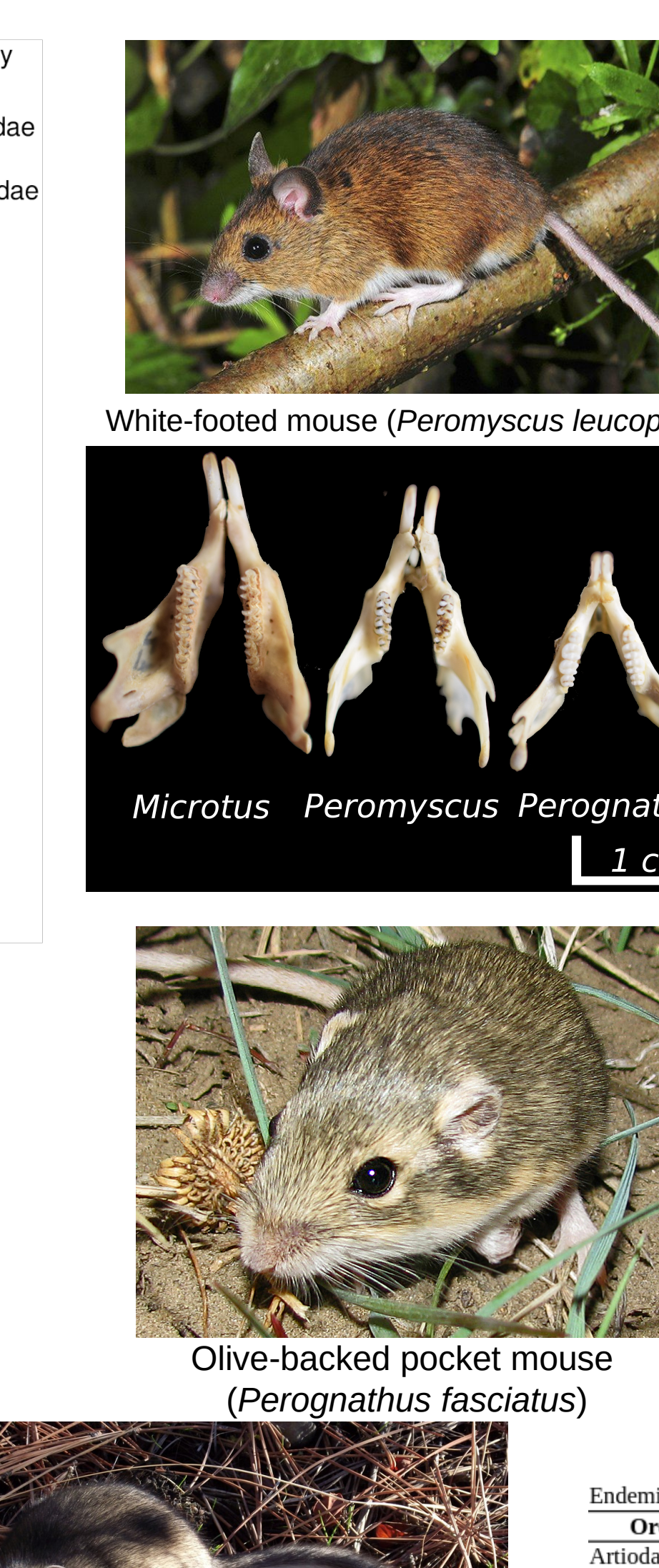
Microfaunal remains from the Bugas-Holding site (48PA563), similarly located in the Absaroka mountains, were recovered during the 1983–84 excavations and identified using the comparative collection at the University of Utah Zooarchaeology Laboratory. Elements were identified to the lowest possible taxonomic level—often using teeth—and quantified by siding and segment identification, following methods used for bison (*Bison bison*) and bighorn sheep (*Ovis canadensis*) (Todd & Rapson 1988).

Modern avifaunal and mammalian distributions and migration patterns were assessed using data from the Cornell Lab of Ornithology and Keys & Wilson (2009).

Results

Mammals were the most abundant vertebrate Class in the assemblage. Rodents dominated the sample, with meadow voles (*Microtus* sp.) most common, followed by deer mice (*Peromyscus* sp.) and shrews (*Sorex* sp.). Subterranean rodents were represented only by gophers (*Thomomys* sp.), while ground squirrels were notably absent. Larger rodents included yellow-bellied marmots (*Marmota flaviventris*), North American porcupines (*Erethizon dorsatum*), and North American beavers (*Castor canadensis*).

Birds were less common but included at least three species: American robin (*Turdus migratorius*), Dusky grouse (*Dendragapus obscurus*), and an unidentified Caprimulgiform—either a Common nighthawk (*Chordeiles minor*) or Common poorwill (*Phalaenoptilus nuttallii*) based on range.



Discussion

Small mammal and bird remains from the Bugas-Holding assemblage are consistent with a winter camp occupation. The abundance of summer residents is well documented in the active and passive bird counts conducted in the Absaroka Mountains. For example, Common poorwill were recorded only once in mid-August across two years of observation and are known to migrate south by November.

The presence of Cricetids and Heteromyids suggests rodent activity associated with human encampments. These taxa likely exploited food resources generated by human activities such as the processing of bison and bighorn sheep at the site. Establishing a winter camp may have created a localized and temporary increase in rodent populations and diversity in and around the occupation area.

Larger game mammals and birds are also represented in the assemblage. Dusky grouse, one of the largest resident Galliformes in the Absaroka Mountains, is present, as are snowshoe hare, porcupine, and beaver—all well-established game species. Their presence indicates that foragers targeted not only large artiodactyls but also incorporated smaller, locally available game into their diet.

| Order | Family | Genus | Species | Common Name |
|--------------|------------------|------------------------------------|------------------------------------|--------------------------------|
| Artiodactyla | Antilocapridae | <i>Bison</i> | <i>Bison bison</i> | Pronhorn |
| | | <i>Oreamnos</i> | <i>Oreamnos americanus</i> | American Bison |
| Cervidae | Cervidae | <i>Ovis</i> | <i>Ovis canadensis</i> | Mountain Goat |
| | | <i>Alces</i> | <i>Alces americanus</i> | Bighorn Sheep |
| | | <i>Cervus</i> | <i>Cervus canadensis</i> | Moose |
| | | <i>Odocoileus</i> | <i>Odocoileus hemionus</i> | Elk |
| Carnivora | Canidae | <i>Canis</i> | <i>Canis latrans</i> | Mule Deer |
| | | <i>Canis</i> | <i>Canis lupus</i> | White-tailed Deer |
| | | <i>Vulpes</i> | <i>Vulpes vulpes</i> | Coyote |
| | | <i>Lynx</i> | <i>Lynx rufus</i> | Bobcat |
| | | <i>Puma</i> | <i>Puma concolor</i> | Red Fox |
| | | <i>Mephitis</i> | <i>Mephitis mephitis</i> | Cougar |
| | | <i>Spilogale</i> | <i>Spilogale gracilis</i> | Striped Skunk |
| | | <i>Gulo</i> | <i>Gulo gulo</i> | Western Spotted Skunk |
| | | <i>Lontra</i> | <i>Lontra canadensis</i> | Wolverine |
| | | <i>Martes</i> | <i>Martes americana</i> | North American River Otter |
| Mustelidae | Mustelidae | <i>Mastela erminea</i> | <i>Mastela erminea</i> | American Marten |
| | | <i>Mastela frenata</i> | <i>Mastela erminea</i> | Ermine |
| | | <i>Mastela nigripes</i> | <i>Mastela nigripes</i> | Long-tailed Weasel |
| | | <i>Neovison vison</i> | <i>Neovison vison</i> | Black-footed Ferret |
| | | <i>Taxidea taxus</i> | <i>Taxidea taxus</i> | American Badger |
| | | <i>Ursus arctos</i> | <i>Ursus arctos</i> | Black Bear |
| | | <i>Ursus americanus</i> | <i>Ursus americanus</i> | Brown Bear |
| | | <i>Corynorhinus townsendii</i> | <i>Corynorhinus townsendii</i> | Townsend's Big-eared Bat |
| | | <i>Eptesicus fuscus</i> | <i>Eptesicus fuscus</i> | Big Brown Bat |
| | | <i>Lasiurus borealis</i> | <i>Lasiurus borealis</i> | Silver-haired Bat |
| Chiroptera | Vespertilionidae | <i>Lasiurus cinereus</i> | <i>Lasiurus cinereus</i> | Eastern Red Bat |
| | | <i>Myotis lucifugus</i> | <i>Myotis lucifugus</i> | Hoary Bat |
| | | <i>Myotisotis</i> | <i>Myotisotis</i> | Myotis |
| | | <i>Myotisotis</i> | <i>Myotisotis</i> | Myotis |
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| | | <i>Myotisotis</i> | <i>Myotisotis</i> | Myotis |
| Eulipotyphla | Soricidae | <i>Sorex cinereus</i> | <i>Sorex cinereus</i> | Cinereus Shrew |
| | | <i>Sorex merriami</i> | <i>Sorex merriami</i> | Merriam's Shrew |
| | | <i>Sorex monticolus</i> | <i>Sorex monticolus</i> | Dusky Shrew |
| | | <i>Sorex nanus</i> | <i>Sorex nanus</i> | Dwarf Shrew |
| | | <i>Sorex preblei</i> | <i>Sorex preblei</i> | Preble's Shrew |
| | | <i>Sorex ochrogaster</i> | <i>Sorex ochrogaster</i> | Prairie Vole |
| | | <i>Sorex pennsylvanicus</i> | <i>Sorex pennsylvanicus</i> | Meadow Vole |
| | | <i>Sorex richardsoni</i> | <i>Sorex richardsoni</i> | North American Water Vole |
| | | <i>Myodes gapperi</i> | <i>Myodes gapperi</i> | Southern Red-backed Vole |
| | | <i>Myodes gapperi</i> | <i>Myodes gapperi</i> | Southern Red-backed Vole |
| Lagomorpha | Leporidae | <i>Lepus americanus</i> | <i>Lepus americanus</i> | Snowshoe Hare |
| | | <i>Lepus townsendii</i> | <i>Lepus townsendii</i> | White-tailed Jackrabbit |
| | | <i>Sylvilagus auduboni</i> | <i>Sylvilagus auduboni</i> | Desert Cottontail |
| | | <i>Sylvilagus nuttallii</i> | <i>Sylvilagus nuttallii</i> | Mountain Cottontail |
| | | <i>Ochotona</i> | <i>Ochotona princeps</i> | American Pika |
| | | <i>Castor</i> | <i>Castor canadensis</i> | American Beaver |
| | | <i>Lemmus</i> | <i>Lemmus curtatus</i> | Sagebrush Vole |
| | | <i>Microtus</i> | <i>Microtus longicaudus</i> | Long-tailed Vole |
| | | <i>Microtus</i> | <i>Microtus montanus</i> | Montane Vole |
| | | <i>Microtus</i> | <i>Microtus ochrogaster</i> | Prairie Vole |
| Rodentia | Cricetidae | <i>Microtus</i> | <i>Microtus pennsylvanicus</i> | Meadow Vole |
| | | <i>Microtus</i> | <i>Microtus richardsoni</i> | North American Water Vole |
| | | <i>Myodes</i> | <i>Myodes gapperi</i> | Southern Red-backed Vole |
| | | <i>Neotoma</i> | <i>Neotoma cinerea</i> | Bushy-tailed Woodrat |
| | | <i>Ondatra</i> | <i>Ondatra zibethicus</i> | Common Muskrat |
| | | <i>Onychomys</i> | <i>Onychomys leucogaster</i> | Northern Grasshopper Mouse |
| | | <i>Peromyscus</i> | <i>Peromyscus boylii</i> | Bush Deermouse |
| | | <i>Peromyscus</i> | <i>Peromyscus leucopus</i> | White-footed Deermouse |
| | | <i>Reithrodontomys</i> | <i>Reithrodontomys megalotis</i> | Western Harvest Mouse |
| | | <i>Erethizon</i> | <i>Erethizon dorsatum</i> | North American Porcupine |
| Heteromyidae | Dipodops | <i>Thomomys talpoides</i> | <i>Thomomys talpoides</i> | Wyoming Pocket Gopher |
| | | <i>Thomomys talpoides</i> | <i>Thomomys talpoides</i> | Northern Pocket Gopher |
| | | <i>Thomomys talpoides</i> | <i>Thomomys talpoides</i> | Wyoming Pocket Gopher |
| | | <i>Thomomys talpoides</i> | <i>Thomomys talpoides</i> | Northern Pocket Gopher |
| | | <i>Dipodops ordii</i> | <i>Dipodops ordii</i> | Ord's Kangaroo Rat |
| | | <i>Perognathus</i> | <i>Perognathus fasciatus</i> | Olive-sided Pocket Mouse |
| | | <i>Callospermophilus lateralis</i> | <i>Callospermophilus lateralis</i> | Golden-mantled Ground Squirrel |
| | | <i>Cynomys</i> | <i>Cynomys leucurus</i> | White-tailed Prairie Dog |
| | | <i>Glaucomys</i> | <i>Glaucomys sabrinus</i> | Northern Flying Squirrel |
| | | <i>Sciurus</i> | <i>Sciurus hudsonicus</i> | Thirteen-lined Ground Squirrel |
| Sciuridae | Sciuridae | <i>Marmota flaviventris</i> | <i>Marmota flaviventris</i> | Yellow-Bellied Marmot |
| | | <i>Tamias minimus</i> | <i>Tamias minimus</i> | Least Chipmunk |
| | | <i>Tamias umbrinus</i> | <i>Tamias umbrinus</i> | Umber Chipmunk |
| | | <i>Sciurus vulgaris</i> | <i>Sciurus vulgaris</i> | Red Squirrel |
| | | <i>Urosciurus</i> | <i>Urosciurus elegans</i> | Western Ground Squirrel |
| | | <i>Urosciurus</i> | <i>Urosciurus elegans</i> | Western Ground Squirrel |
| | | <i>Zapus</i> | <i>Zapus princeps</i> | Western Jumping Mouse |
| | | <i>Zapus</i> | <i>Zapus princeps</i> | Western Jumping Mouse |
| | | <i>Zapus</i> | <i>Zapus princeps</i> | Western Jumping Mouse |
| | | <i>Zapus</i> | <i>Zapus princeps</i> | Western Jumping Mouse |

Table 2) A list of the endemic taxa to northwestern Wyoming based on species range maps from Keys and Wilson (2009). Species names have been updated and species introduced after 1880 have been excluded from the list.