

Behavioral responses of Yellow-Bellied Marmots to birds and mammals

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Abstract. The habitat of Yellow-bellied Marmots (*Marmota flaviventris*) is visited or occupied by a variety of birds and mammals. Species that interact with marmots were divided into three groups: (1) other species of ground-dwelling sciurids, (2) non-predatory transients, and (3) predators. The rare social interactions between Yellow-bellied Marmots and other ground-dwelling sciurids were chased by marmots. Large birds elicited alarm calls by rapid flight or swooping over marmots. Domestic horses or cattle usually were watched by the marmots and alarm calls usually occurred when the ungulates approached the marmots closely. Marmots responded to foraging mule deer by running to their burrows, by alarm-calling, by immersing, or by watching the deer. Alarm-calling and watching were significantly more likely to occur than immergence. Adult females watched significantly more frequently than young or yearlings and reproductive females watched significantly more often than non-reproductive females. Deer walked toward or followed marmots or moved away when a marmot whistled, stared, or moved toward the deer. Marmots alarm-called when golden eagles soared overhead, but whistled about one-third of the time when red-tailed hawks soared overhead or swooped at marmots. Long-tailed weasels were vigorously chased, but alarm calls were not emitted. Coyote and domestic dog intrusion was greeted with alarm calls or running to burrows without calling. Marmots alarm-called to dogs less frequently. All age-classes of marmots alarm-called. Marmots typically sat or stood and watched the intruders. Experiments with a dog revealed that marmots watch the predator and change locations to keep the predator in view and flee or immerse only when the predator approaches closely. Watching characterizes marmot responses to the presence of large mammals or birds.

Key words: watching, predators, transients, alarm-calling, intruders, running to burrows, vigilance

Introduction

Many species of animals are associated with marmots. Burrowing activity affects the kind and abundance of various species of invertebrates and burrows may provide shelter for a diverse array of birds and

mammals (Bibikow 1996). Most of these species apparently use the habitat produced by marmot activity or share the habitat because of similar ecological requirements. For example, pika (*Ochotona princeps*) and spermophiles often coexist with marmots in the same talus slope-meadow environments (Barash 1973a). Other species may travel through marmot habitat while foraging (e.g., various ungulates) or seeking prey (e.g., badgers, Armitage 2004).

There is little information on the behavioral responses of marmots to animal species that live in the same habitat or that pass through marmot habitat as part of their daily activities. In this paper I focus on the behavioral interactions of Yellow-bellied Marmots (*Marmota flaviventris*) and species of birds and mammals that frequently visit marmot habitat. For the description and analysis of marmot behavior, I placed the bird or mammal species into one of three categories: (1) ground-dwelling sciurids, (2) non-predatory transients, and (3) predators.

Methods

Each year from 1962 to 1998, all marmots in four colonies were trapped, sexed, weighed, and marked according to procedures in Armitage (1982a). Upon first capture, each marmot was provided with uniquely numbered ear tags for permanent identification. Reproductive status of adult females was determined by the degree of nipple development (Armitage and Wynne-Edwards 2002) or by the emergence of weaned young. During approximately 5770 hours of observation, all behavioral responses by Yellow-bellied Marmots to other species of birds and mammals were recorded. In addition, the presence of species with whom marmots were not observed to interact were recorded.

Results and Discussion

1. Non-interactive species

The White-crowned Sparrow (*Zonotrichia leucophrys*) and Green-tailed Towhee (*Pipilo chlorurus*) commonly nest in marmot habitats and occasionally are caught in marmot traps where they fed on the bait. Broad-tailed (*Selasphorus platycercus*) and Rufus (*Selasphorus rufus*) Hummingbirds regularly forage on flowers growing in the meadows where marmots forage. The deer mouse, *Peromyscus maniculatus*, has been observed at dusk foraging in or around marmot traps. None of these species were observed to

interact with marmots and their overlap with marmots is readily attributed to overlap in ecological requirements.

At one colony that is characterized by an extensive talus slope, pika occur. Although pika frequently were observed running across the rocks or carrying vegetation to their hay piles, interactions with marmots were never observed. Although pika and marmots may share a talus slope, they apparently use the talus differently. Pika are much more closely associated with talus whereas marmots may forage well beyond the talus into the adjoining meadow (Barash 1973b).

2. Ground-dwelling sciurids

The least Chipmunk (*Tamias minimus*) and the mantled Ground Squirrel (*Spermophilus lateralis*) occur in all of the marmot colonies. It is common for a spermophile to co-occur with marmots (Barash 1973a). Both species were attracted to the bait in traps. The considerable difference in size among the three species indicates that considerable niche differentiation occurs. *T. minimus* utilizes seeds and arthropods (Forbes 1966) whereas *S. lateralis* and *M. flaviventris* feed on leaves and flowers (Bartels and Thompson 1993, Frase and Armitage 1989). The mantled ground squirrel is omnivorous and also feeds extensively on seeds, fungi, and insects (Bartels and Thompson 1993). Thus, there seems to be little competition for resources.

Although *S. lateralis* frequently is active near marmots, I observed only 10 chases of the ground squirrel by a marmot: four times by a reproductive female, once each by an adult male and adult non-reproductive female, twice each by yearling males and females. Likewise, chipmunks are regularly active near marmots but I observed only three chases by marmots: once each by a yearling female, an adult non-reproductive female, and a reproductive female. Twice I observed a reproductive female respond to chipmunk alarm-calling; each time the female marmot became vigilant and called. The cause of the alarm was unknown.

3. Non-predatory transients

Marmots respond to sudden movements by birds. When a Steller's Jay (*Cyanocitta stelleri*) swooped over and landed on a log, two young jumped from the log. When a Kestrel (*Falco sparverius*) flew swiftly and swooped over a colony, the young disappeared without alarm-calling. When a kestrel swooped down to land on a fence post, the adult male gave a single whistle and fled only to return and climb on a log near the kestrel who flew off. A Sharp-shinned Hawk (*Accipiter striatus*) sat on a fence post and raised its wings and looked at a reproductive female as she approached. The female gave weak whistles; the hawk moved away and the female stood and watched. A Cooper's Hawk (*Accipiter cooperii*) sitting on a fence post was watched by a young female and a non-reproductive adult female; when the hawk flew, the marmots whistled. Four reactions to a Raven (*Corvus corax*) were recorded. When the raven swooped at a yearling female, she whistled as did a reproductive female. Rapid flight by a raven elicited whistles from a female and a male young. When a raven flew over the colony, in one instance the young ran to the burrow area and

in the other instance, a young and yearling responded to whistles by standing and looking.

Domestic horses sometimes were pastured in a meadow adjacent to a marmot colony. If the horses ran, the marmots were likely to whistle. When the horses moved slowly through the meadow, adult females were likely to sit and watch them. A Porcupine (*Erethizon dorsatum*) elicited whistles from a non-reproductive, vigilant adult female as the porcupine walked at the edge of the burrow area. Late in the summer, domestic cattle may forage in the meadow adjoining a marmot burrow area. Marmot activity decreased when cattle were present. When cattle forage near burrows, marmots may respond. For example, in one instance, a whistle was heard and young immersed. A reproductive female sat and watched the cattle. As the cattle moved toward the rocky outcrop where the burrows were located, the female marmot moved toward them and faced them. The cattle then detoured around the rocky area.

Mule Deer (*Odocoileus hemionus*) frequently foraged in meadows adjacent to marmot burrow areas. Marmots of all age-sex groups responded by running to their burrows (11 events, 6 without alarm calls) or by alarm-calling, immersing, or watching, the deer (Table 1). Alarm-calling and watching were significantly more likely to occur than immergence, but alarm-calling and watching did not differ significantly (Table 2). Adult females watched more frequently than young or yearlings, but there was no significant difference in watching among the remaining groups (Table 3). Reproductive females watched more frequently than non-reproductive females (Table 4).

The deer interacted with the marmots in 11 of the 16 events in which marmots alarm-called. Deer sometimes walked toward a marmot or followed a marmot running to its burrow or bent down to look at a marmot while ready to flee. Trills by a young marmot caused a deer to run several meters; a whistle by an adult startled a deer who jumped, moved several meters quickly, then departed. When staring at a marmot, deer appeared uneasy or nervous and moved off when the marmot stared at it or when a tail-flagging adult female moved toward it. A typical deer:marmot interaction is illustrated by the following field note:

13 June. North Picnic Colony. 09:20. Reproductive female 324 ran up the hill to her burrow area where a deer was feeding. Female 324 cautiously moves toward the deer. Deer startled and looks at female 324 who moves toward the deer who is uneasy and moves away outside burrow area. Female 324 follows across the burrow area and deer stops and is joined by another deer and both look at female 324 who stops just beyond main burrow entrance, then apparently entered and the deer move off upslope.

It is not clear why yellow-bellied marmots react the way they do to mule deer. Mule deer are not predators but they do have the general body shape of a mammalian predator. The marmot willingness to approach a deer closely differs from the way marmots respond to predators (described below). Deer are not abundant and do not represent a serious competitor for food. Perhaps marmot anti-predator behavior is in part generalized to include any elongated, moving object of whatever size.

Age-sex group	Alarm-calling (16)	Immergence (7)	Watching (21)
All marmots	-	2	-
Adults	2	-	-
Adult male	-	-	3
Adult female	-	2	-
Reproductive	-	-	12
Non-reproduc.	-	-	4
Yearling			
Male	1	-	1
Female	3	3	2
Young	3	1	2
Unknown	7	-	1

Table 1. Number of responses by Yellow-bellied Marmot age-sex groups to Mule Deer (*Odocoileus hemionus*) foraging in colony meadows. N = 31 events. Numbers in parentheses are the number of events in which the behavior occurred.

	Immergence	Alarm-calling	Watching
Occurred	7	16	21
No occurrence	24	15	10
Immergence vs alarm-calling:	G = 5.7, 0.025 > p > 0.01		
Immergence vs watching:	G = 13.3, p < 0.001		
Alarm-calling vs watching:	G = 1.7, 0.5 > p > 0.1		

Table 2. The frequency of alarm-calling, watching, and immergence by Yellow-bellied Marmots when mule deer were present. Mule deer were present 31 times. More than one of the behaviors could occur during deer presence.

	Adult Female	Adult Male	Young	Yearlings
Watching	16	3	2	3
No watching	37	19	23	28
Adult females vs young:	G=5.4, 0.025 > p > 0.01			
Adult females vs yearlings:	G=5.2, 0.025>p > 0.01			

Table 3. Analysis of the frequency of watching by Yellow-bellied Marmots when mule deer were present. Total number for each age/sex group includes all the members in that group that were resident in the colony when the response occurred.

	Reproductive	Non-reproductive
Watching	12	4
No watching	18	19
	G = 5.3, 0.025 > p > 0.01	

Table 4. Analysis of the frequency of watching by reproductive and non-reproductive adult female Yellow-bellied Marmots when Mule Deer were present.

4. Predators

Although golden eagles (*Aquila chrysaetos*) prey on marmots in my research area (Armitage and Downhower 1974, Van Vuren 2001), this predation has not been observed and golden eagles are rarely seen. Twice when eagles flew overhead, alarm calls were heard. Red-tailed Hawks (*Buteo jamaicensis*), which nest near two of the study sites, probably prey on marmot young, although such predation has not been observed. Nine instances of marmot reactions to red-tailed hawks were recorded. All occurred when a hawk circled or soared overhead or swooped down over the colony. Only three times were whistles emitted. Similarly, *M. marmota* gave an alarm call in two of four interactions with Griffon Vultures (*Gypus fulvus*), but did not hide in any of the four events (Heredia and Herrero 1992). Typically one or more marmots were alert and watched the hawk (7 times). An adult male crouched each time a hawk swooped down, then straightened up as the hawk flew up. The following observation illustrates hawk:marmot interaction:

19 June. Picnic Colony. 09:27. Large hawk dives at adult female 1194 who doesn't move. Hawk returns and female 1194 gets down off log and watches as hawk zooms away. Hawk then chased after yearling female 920 who is in the aspen, but hawk moves awkwardly in the aspen. Female 920 moves out and hawk dives at her and she runs under a large shrub. Hawk swoops over again, then departs and female 920 comes out from the shrub and begins feeding after sitting up and looking around.

Marten (*Martes americana*) were observed active twice in a marmot colony. Each time marmots were alert and in one instance a non-reproductive adult female was vigilant and whistled. Marmots have been observed to chase marten (Waring 1965, Travis and Armitage 1972). A running red fox (*Vulpes vulpes*) was greeted with alarm calls.

Long-tailed Weasels (*Mustela frenata*) were observed 14 times in marmot colonies. Marmots became alert or vigilant and frequently chased the weasel, but never whistled (Table 5). Weasels quickly disappeared and vigilant marmots appeared to be looking for the weasel. My impression is that weasels are always chased when seen by marmots. Weasels represent a threat to marmots; one was observed carrying a pre-weaned young and a dead yearling female was found with tooth marks at the base of the skull indicating weasel predation.

Badgers (*Taxidea taxus*) are the second most important predator of Yellow-bellied Marmots (Van Vuren 2001). Badger predation and marmot responses were detailed elsewhere (Armitage 2004).

The Coyote (*Canis latrans*) is the most important predator of Yellow-bellied Marmots (Van Vuren 2001). In addition to the two times that coyote predation of yearling marmots was observed (Armitage 1982b), 11 intrusions by coyotes into marmot colonies were observed. Four times the coyotes were stalking marmots from high vegetation near a marmot lookout or burrow area. Once a coyote was observed carrying a young female marmot. The other six times the coyote was walking through a meadow or across talus. Typically the presence of a coyote was associated with alarm calls either by yearlings or adults, but marmots sometimes

Age-sex group	Followed or Chased Weasel	Alert or Vigilant	No reaction
Adult females			
Reproductive	5	4	-
Non-reproductive	2	2	-
Yearlings	1	3	-
Young	1	1	1

Table 5. Number of responses by Yellow-bellied Marmot age-sex groups to 14 incursions by Long-tailed Weasels, *Mustela frenata*.

ran to a burrow without calling (Table 6). On one occasion a reproductive female alarm-called for 13 minutes. During her calling, the young climbed up on rocks adjacent to their burrows. Frequently several animals emitted whistles. Characteristically, yearling or adult marmots were vigilant or sitting alert and watched the coyote (Table 6).

The responses of Yellow-bellied Marmots to domestic dogs were quite similar to their responses to coyotes. Usually dogs were accompanied by humans hiking on a road or trail passing near a marmot colony. Alarm-calling was less frequent when dogs were present than when coyotes were present (62.5% vs 81.8%). This difference may be a consequence of dogs being more distant from marmots; 21 times dogs were on the road and only 10 times was a dog in the meadow adjoining marmot burrows. By contrast, all coyote sightings were in marmot colonies. All age-classes of marmots alarm-called (Table 7). One reproductive female called for 27 minutes while she watched dogs pass along a road. Only once did a dog chase a marmot.

Four times when dogs were close to marmots, the marmots trilled. In nearly all dog:marmot interactions, one or more marmots stood or sat watching the dog (Table 7). Sometimes marmots immersed than re-emerged and watched the dog. As with other mammalian intruders, marmots frequently did not call, but ran to a burrow or immersed or sat looking at the dog (Table 7). Marmots watched in more events than they called (25 vs 19 events, $G = 2.9$, $0.1 > p > 0.05$), and far more individuals participated in watching (43 vs 23, Chi-square = 6.0, $0.025 > p > 0.01$).

5. *Experiments with a dog*

The many times that yearling or adult marmots of both sexes stood or sat and watched intruders such as deer, coyotes, dogs and badgers (Armitage 2004) and even followed an intruder or moved to a different location, apparently to be able to view the intruder more easily, suggested that an important response to intruders by Yellow-bellied Marmots is to keep track of the intruders. I tested this interpretation by approaching with my dog a cabin under which marmots lived.

The dog and I walked along a dirt road that passed near the cabin. I ran four trials. In the first, a yearling female stood and chirped while looking at us. The behavioral pattern was recorded as follows:

22 June. 09:00. Walked toward the cabin with my dog Mollie. Yearling female stood on all four legs on the woodpile at the northwest corner of the cabin and whistled at us. Whistles were well spaced, she seemed to focus on Mollie. We walked down the road to a point where she could not see us; she came around the corner of the cabin, faced us, and continued to whistle.

Age-sex Group	Alarm-calling (9)	No Calls—Run to Burrow (2)	Watches Coyotes (7)	Appear in Rocks
Adult male	3	1	3	1
Adult females				
Reproductive	4	-	2	1
Non-reproductive	3	1	1	-
Yearling female	2	-	1	-
Young	-	-	-	1
Unidentified	1	-	1	-

Table 6. Number of responses by Yellow-bellied Marmot age-sex groups to 11 intrusions by coyotes, *Canis latrans*. Numbers in parentheses are the number of intrusions in which that behavior was observed.

Age-sex Group	Alarm-calling	Call and Immergence	Re-emerge	Immerge	Run to Burrow /Perch	Watch
Adult male	1	1	1	-	1	1
Adult females						
Reproductive	6	-	-	1	2	14
Non-reproductive	3	-	-	1	1	7
Yearlings	7	-	-	3	5	18
Young	1	1	-	-	-	3
Multiple marmots	1	1	1	-	-	-
None	12	-	-	-	-	-

Table 7. Number of responses by Yellow-bellied Marmot age-sex groups to the presence of domestic dogs. N = 31 events.

In the second trial, two female yearlings whistled at us as we walked along the road parallel to the cabin. The yearling that was positioned to watch us all the way did not move, but the yearling that could not see us as we passed by the cabin moved to the side of the cabin where she could see us. Whistling continued until we crossed over a small hill and were out-of-sight of the marmots. In the third trial, the marmot whistled, was vigilant, and moved to a location where she could see us. In the fourth trial, we approached the cabin from a different direction. A marmot stood, whistled, and watched us. The marmot moved toward us, apparently to keep us in view as we passed along a high bank between us and the cabin. When we could no longer be seen from the side of the cabin, the marmot moved around the corner of the cabin and continued to stand, face us, and whistle. We then walked toward the marmot. When the dog ran toward the marmot, it gave rapid whistles, ran around the cabin and entered a burrow. This solitary, non-reproductive adult female could have entered the burrow without whistling or after the first whistle. Instead, it changed position to keep us in view and immersed only when the dog directly approached.

Twice the dog and I entered a colony to set traps or to photograph burrow activity. Each time one or more marmots stood, faced us, and whistled even though we were no more than 30m distant. Marmots continued to stand and whistle until we were about 150m distant. Marmots immersed only when we walked directly toward them.

I conducted two additional sets of observations. Four times I had the dog Mollie approach a marmot; three times the marmot whistled. All marmots immersed. In a second set of observations, I walked with Mollie along a road that passed four sites where marmots were active and recorded marmot responses. In every instance marmots stood and watched us (26 marmots), but only two marmots whistled.

These experiments/observations with a dog revealed that a primary response of marmots to the presence of a predator was to stand and watch and to alarm-call, especially when we were close to the marmot. Furthermore, when necessary, marmots changed location to keep the dog and me in view.

Summary and Conclusions

Yellow-bellied marmots essentially ignore small birds and mammals, but are alert to larger birds (hawks, ravens) especially if they fly rapidly or swoop over the marmots. Small predators are chased without alarm-calling. Large non-predatory transients and predators are usually greeted with alarm calls, but frequently marmots do not call. A characteristic response is that marmots watch the intruder with or without alarm calls. When alarm-calling occurs while a marmot is watching an intruder, the calls seem to be more directed to the intruder than to warning other marmots; e.g., solitary marmots express this behavior (Blumstein and Armitage 1998). Apparently a critical feature of interspecific interactions is for marmots to keep track of the intruder. Only when the intruder approaches a marmot closely does a marmot cease watching and immerse.

Why should a marmot keep track of an intruder? First, while an intruder is present, marmots cannot engage in normal activities such as foraging. Thus, a marmot needs to know when it is safe to resume normal activities and that knowledge is most readily obtained by watching the intruder until it leaves. It may be that repeated alarm-calling at an intruder serves to inform the intruder that its presence is known and that its chance for successful predation is near zero. Thus, it is to the advantage of both the predator and the marmot for the predator to depart and allow both species to resume normal activity. Second, if a marmot immerses it does not know if the predator is still present and hence how risky emergence will be, the marmot will either lose foraging time by waiting for some period of time before emergence or risk predation by emerging too soon. In that regard, when marmots emerge, they are very cautious, emerge slowly a short distance at a time and then spend considerable time scanning the environment before initiating foraging or other activities (Armitage and Chiesura Corona 1994). Overall yellow-bellied marmots are wary and also engage in more obvious alert and vigilant behaviors (Armitage et al. 1996). Monitoring the location and movements of an intruder is part of general wariness (Armitage and Chiesura Corona 1994, Travis and Armitage 1972).

The importance of watching for and tracking intruders is supported by marmot activity patterns. Yellow-bellied Marmots spend more time sitting/lying above ground than in any other activity, even at mid day (Armitage et al. 1996) when marmots may be heat stressed (Melcher et al. 1990). Presumably marmots could avoid heat and/or predator activity by immersing, but they apparently spend as much time above ground as thermal conditions permit. This behavior is explicable in terms of marmots needing to know whether intruders (including conspecifics) are present.

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References

- Armitage, K.B. 1982a: Yellow-bellied Marmot. In *CRC Handbook of Census Methods for Terrestrial Vertebrates* (Davis D.E., ed.), pp. 148-149.
- Armitage, K.B. 1982b: Marmots and coyotes: behavior of prey and predator. *J. Mamm.* **63**: 503-505.
- Armitage, K.B. 2004: Badger predation on Yellow-bellied Marmots. *Am. Midl. Nat.*, **151**: 378-387.
- Armitage, K.B. and Chiesura Corona, M. 1994: Time and wariness in Yellow-bellied Marmots. *IBEX J.M.E.* **2**: 1-8.
- Armitage, K.B. and Downhower, J.F. 1974: Demography of Yellow-bellied Marmot populations. *Ecology*, **55**: 1233-1245.
- Armitage, K.B., Salsbury, C.M., Barthelmess, E.L., Gray, R.C. and Kovach, A. 1996: Population time budget for

- the Yellow-bellied Marmot. *Ethol. Ecol. Evol.*, **8**: 67-95.
- Armitage, K.B. and Wynne-Edwards, K.E. 2002: Progesterone concentrations in wild-caught Yellow-bellied Marmots. In: *Holarctic Marmots as a Factor of Biodiversity* (eds. K.B. Armitage and V.Yu.Rumiantsev), pp. 41-47.
- Barash, D.P. 1973a: Latitudinal replacement in habitat utilization of mountain mammals. *J. Mamm.*, **54**: 535-536.
- Barash, D.P. 1973b: Habitat utilization in three species of subalpine mammals. *J. Mamm.*, **54**: 247-250.
- Bartels, M.A. and Thompson, D.P. 1993: *Spermophilus lateralis*. *Mamm. Species*, **440**: 1-8.
- Bibikow, D.I. 1996: Die Murmeltiere der Welt. Westarp Wissenschaften, Magdeburg.
- Blumstein, D.T. and Armitage, K.B. 1998: Why do Yellow-bellied Marmots call? *Anim. Behav.*, **56**: 1053-1055.
- Forbes, R.B. 1966: Studies of the biology of Minnesotan Chipmunks. *Am. Midl. Nat.*, **76**: 290-308.
- Frase, B.A. and Armitage, K.B. 1989: Yellow-bellied Marmots are generalist herbivores. *Ethol. Ecol. Evol.*, **1**: 353-366.
- Heredia, R. and Herrero, J. 1992: Bearded Vulture (*Gypaetus barbatus*) and Alpine Marmot (*Marmota marmota*) interactions in southern Pyrenees. In: *First Int. Symp. on Alpine Marmot (Marmota marmota) and on genus Marmota* (eds. B. Bassano, P. Durio, U. Gallo Orsi and E. Macchi E.), pp. 227-229.
- Melcher, J.C., Armitage, K.B. and Porter, W.P. 1990: Thermal influences on the activity and energetics of Yellow-bellied Marmots (*Marmota flaviventris*). *Physiol. Zool.*, **63**: 803-820.
- Travis, S.E. and Armitage, K.B. 1972: Some quantitative aspects of the behavior of marmots. *Trans. Kan. Acad. Sci.*, **75**: 308-321.
- Van Vuren, D.H. 2001: Predation on Yellow-bellied Marmots (*Marmota flaviventris*). *Am. Midl. Nat.*, **145**: 94-100.
- Waring, G.H. 1965: Behavior of a marmot toward a marten. *J. Mamm.*, **46**: 681.