An undergraduate study of the Yellow-bellied Marmot in the Idaho Primitive Area

by

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Advisor

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Little information is available on the ecological significance of the yellow-bellied marmot (Marmota flaviventris) in the Idaho Primitive Area. This proposal is directed at obtaining baseline data on this species.

Justification

To date, literature pertaining to the Taylor Ranch in the Idaho Primitive Area fails to mention the presence of the yellow-bellied marmot (Sowles pers. comm.). Since these rodents occur in the area, a study should be conducted to obtain some baseline data.

A study of this type would add another dimension to the faunal inventory of the area while also supplementing predator food habits analyses since these marmots are a locally important prey base for many predators (Bennett pers. comm.).

Since yellow-bellied marmots are an intermediate host for the mountain wood tick (Dermacentor andersoni) which carries Rocky Mountain spotted fever and Colorado tick fever a study of this type could provide an excellent opportunity to obtain blood samples of yellow-bellied marmots to determine the presence of Rocky Mountain spotted fever and Colorado tick fever at the Taylor Ranch.

Another advantage of this study is that there is no logistics problem involved since the marmots are located within easy walking distance of the Taylor Ranch.

Objectives

1. Determine the distribution of the yellow-bellied marmot populations within a radius of 10 miles of the Taylor Ranch in the Idaho Primitive Area.
2. Estimate population size and density of yellow-bellied marmots at the Taylor Ranch.
3. Establish the reproductive rates and sex ratios in the yellow-bellied marmot population at the Taylor Ranch.
4. Estimate survival and mortality rates of the above marmot population while they are above ground.
5. Determine the major predators of the marmot population.
6. Determine the subspecies of yellow-bellied marmots found at the Taylor Ranch.
7. Investigate the presence of Rocky Mountain spotted fever and Colorado tick fever in the marmot population.
8. Evaluate the capturing and marking technique presented in this study.

Description of the study area

The study area is centered around the University of Idaho-owned Taylor Ranch located in the Idaho Primitive Area. The ranch is divided by Big Creek and bordered on the east and west side by Pioneer Creek and Rush Creek respectively. Elevation at the Taylor landing field is 3835 feet and rises to approximately 9000 feet on the surrounding peaks. The main study area is an irrigated horse pasture and bordering rockslide.

The vegetation in this area is characterized by timothy(Phleum spp.) interspersed with patches of alfalfa(Medicago spp.) with many other succulent grasses and forbs (Bennett pers. comm.). In the more xeric areas the vegetation is

characterized by sagebrush(Artemesia spp.) with some bunchgrasses.

The ares containing the yellow-bellied marmots are the non-irrigated rocky areas along the northeast edge of the horse pasture and those rocky sites found inside the horse pasture that are not irrigated (Bennett pers. comm.). However the marmots do feed on the succulent grasses and forbs favored in the irrigated areas (Bennett pers. comm.).

Methodology

Distribution of the yellow-bellied marmots will be assessed by searching areas where unofficial sightings have been reported along with areas of suitable habitat determined by the researcher from aerial photos, topographic maps, and personal communication with people familiar in the area. The search for yellow-bellies will center at the Taylor Ranch and radiate approximately 10 miles upstream and 10 miles downstream along Big Creek. Actual sightings, presence of burrows, and other signs of activity will be used to determine the presence of marmots in the area. The location of these areas of activity will be drawn on a map and presented in the final report.

Trapping

The horse pasture population will be censused using the capture-recapture multiple census method (Krebs 1972). When using this method, four assumptions must be be made: 1) all marmots recaptured are caught in the same ratio of marked to unmarked as exists in the population; 2) the tags or marks on each animal are not overlooked when examining a captured animal; 3) tags or marks cause no differential mortality between marked and unmarked animals; and 4) the number of animals leaving the population at any point in time is equal to the number

of animals entering the population at that same point in time (Krebs 1972).

Several live-traps appropriate for this type of trapping are available, (National Live Trap Corp., Tomahawk, Wis. and Havahart Human Animal Traps, Assock Manufacturing Co., Ossining, New York) (Nee 1969). Trump and Hendrickson (1943) give dimensions for making live-traps specifically for marmots (Fig. 1).

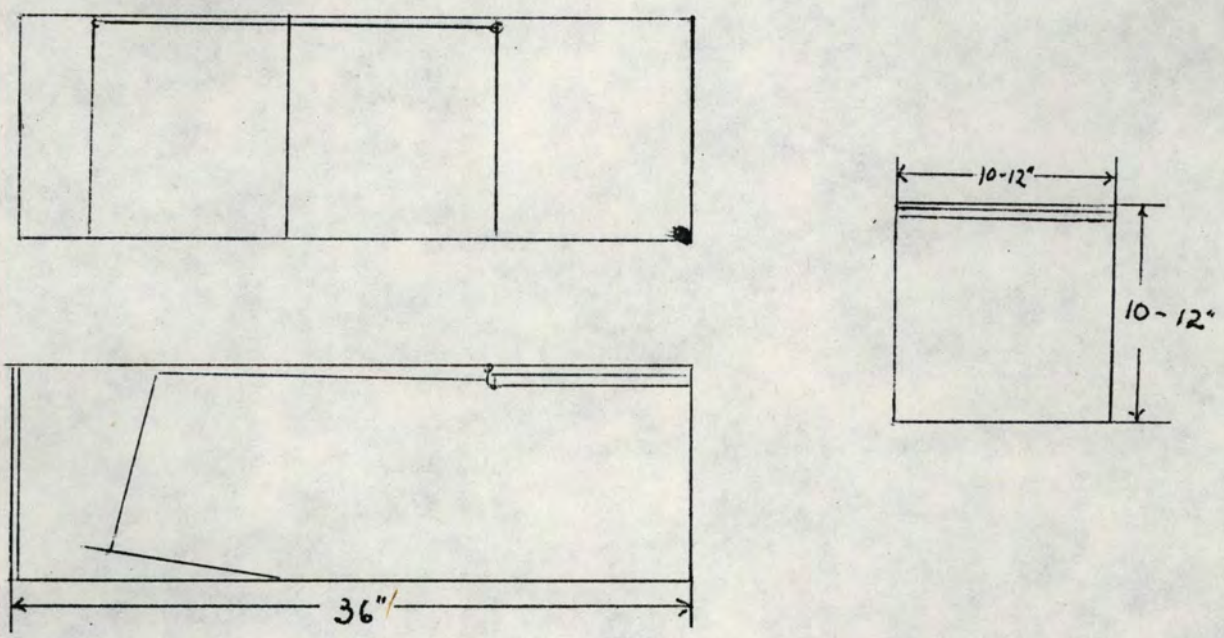


Figure 1. The dimensions for a home-made live-trap for marmots (Trump and Hendrickson 1943).

Approximately 15 traps will be needed but as yet no traps or source of funds to either purchase or make traps have been made.

Since the occurrence of marmots is associated with availibility of "rocky" areas for refuge (Davis 1939, Dalquest 1948) rather than areas for food, trapping will be conducted largely in these areas. Trump and Hendrickson (1943) report that traps placed on trails or near burrows had better success than those placed randomly.

Several baits may be used; roled oats (Kilgore pers. comm.), freshly cut grass (Trump and Hendrickson 1943), or lettuce (Whitman pers. comm.). Natural or chemical scents may be used to increase initial success but Trump and Hendrickson (1943) report that odor left by prviously captured marmots appeared to be the most important factor to successful marmot trapping.

The traps will be located in shaded areas and stabilized with rocks to protect the captured animals from the sun and prevent them from being frightened away when entering the trap (Kilgore pers. comm.). Nee (1969) suggested this shading may also facilitate easier handling.

Trapping will be done on the first and third week of each month beginning as soon as the investigator can get to the study area. The reason for this method of sampling is to periodically check the reproductive condition of the females, mark as many individuals of the population as possible, and monitor the population at short intervals through the summer. During these trapping periods, traps will be checked twice daily; once in mid-morning and once at dark. Armitage (1962) reports optimum activity patterns occurring in the crepuscular hours of the day.

Handling

Once a marmot is trapped a "zipper tube" (Fitzwater 1943) and ether anesthetic will be used to facilitate handling. A zipper tube (Fig. 2) is constructed of heavy canvas or denim in the shape of a funnel with a two-way zipper to allow easier removal of the animal.

When the marmot's head is in the small end of the tube, a plastic bag containing a cotton swab dipped in ether is placed over the small end of the zipper tube to anesthetize the marmot. When the investigator feels the animal beginning to relax the ether will be removed and the marmot may be removed from the zipper

tube to be examined.

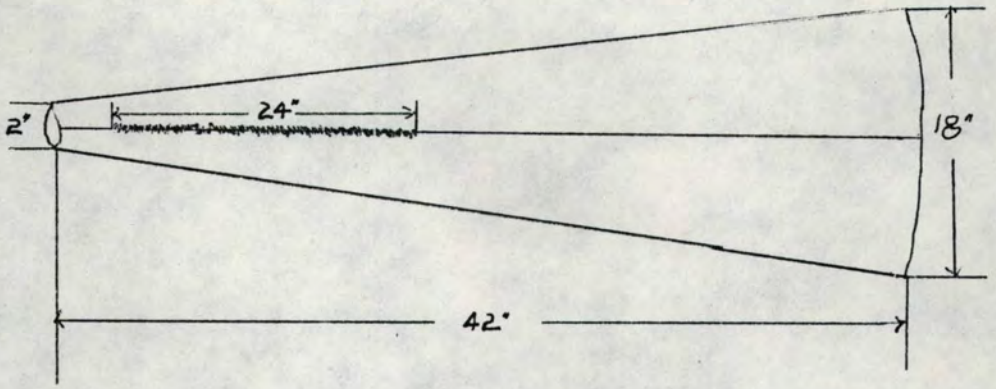


Figure 2. A zipper tube is used for handling small to medium sized mammals.

Ether lasts a short time and may have to be readministered later if the animal begins to arouse too soon (Johnson pers. comm.). Ether is an anesthetic that is convenient to use and when administered carefully should produce no illeffects on the marmots.

Specific Measurements

1. Weight

The first data obtained form these marmots is the weight. The marmots will be weighed in the zipper tube to the nearest 10 grams using a spring balance. By subtracting the weight of the empty zipper tube from the weight of the zipper tube containing the marmot, the animal's weight will be obtained.

2. Sex

Sex will be determined by the presence of male or female genetalia.

3. Reproductive status

Reproductive status refers to the breeding condition of the individual

(pregnant, lactating, testis enlarged, etc.).

4. Measurement

A measurement from the tip of the tail to the tip of the nose will be used to try to coorelate age with total length.

5. Age

Because of the lack of literaure on aging yellow-bellied marmots and the similarity between the yellow-bellied marmot and the woodchuck (Marmota monax), all aging criteria used in this study will be taken from literature pertaining to woodchucks.

Davis (1964) divides marmots into three age classes: young-of-the-year, yearlings, and adults. Age determination will be based on weight, pelage, and shape and color of incisors. Young-of-the-year have pelage that is short and fine and incisors that are long and narrow and rarely stained (Taber 1971). Yearlings are slightly larger in all proportions and have incisors similar to young-of-the-year although they may be somewhat stained. In early spring, during the breeding season, yearling males may be distinguished from adult males by the presence of white testis. Later this attribute becomes useless as the testis of yearlings become pigmented like those of the adult males (Davis 1964, Taber 1971). Adults have broadened darkly-stained incisors with testis of males colored light to dark brown (Davis 1964, Taber 1971). Couch (1930) reported mean length of adult marmots to be 550 mm from the tip of the nose to the tip of the tail.

6. Distinguishing characteristics

Individual characteristics will be recorded and may be helpful in determining the cause of any irregular behavior or help in recognition of specific individuals from the field.

7. Blood samples

Blood samples will be taken from as many marmots as possible and analyzed for the presence of Rocky Mountain spotted fever or Colorado tick fever. Blood samples will be obtained by palpating the chest of the anesthetized marmot to find the strongest heart beat. Then by inserting a small needle connected to a vacuum collection tube, between the ribs and into the heart of the marmot, a sample of blood can be obtained (Stauber pers. comm.). This method of extracting blood for samples is used frequently in the veterinary science field and when properly done results in no harm to the animal (Stauber pers. comm.). Dr. Stauber indicated he would be willing to aid the investigator in developing this technique for this study.

Samples once taken will be handled according to the specifications described by the technique of analysis for Rocky Mountain spotted fever and Colorado tick fever.

Marking

Captured marmots will be marked in two ways: one method involves dying broad bands around the body of the animal using different combinations of bands to denote individuality. The other, more permanent marking method used, will be toe-clipping. These two methods will be used for 3 reasons: 1) each marking method is a check or backup for the other method. In case the dye wears off the marmots sooner than the investigator expects, the other method will be used to denote individuality as well as make it possible to re-dye the animal. 2) Individuals dyed may be recognized in the field without actually handling the animal. This will be used to determine the number of offspring for each female when the young emerge. 3) The last reason for this method is that marmots molt through the summer so dye may not be visible the entire summer or the next year so if research is continued on these marmots, toe-clipping, which is permanent, may be used at a later date to obtain more data.

Nyanzol A fur dye (Fitzwater 1943, Armitage 1962) will be used for marking the marmots. The bands will be approximately 4 inches in width beginning with the head and neck. The second band will contain the shoulders, the third band contains the mid-section beginning just behind the shoulders and running down to the thighs. The last band will contain the hind legs and tail (Fig. 3). To allow for increased visibility of the dyed bands, the areas around each band will be douched with hydrogen peroxide.

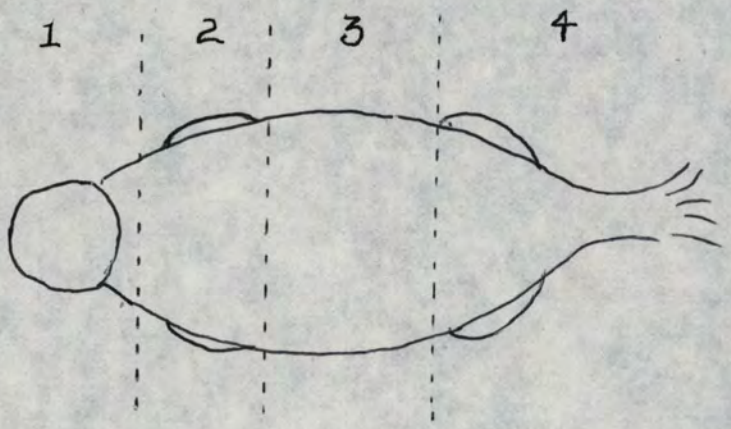


Figure 3. Marmot dying scheme based on four physical regions.

The toe-clipping will be done by removing all metacarpals of the digit to be clipped. A numbering scheme taken from Taber (1971) will be used; the toes of the front feet represent the counting numbers beginning with the digit four on the right foot and proceeding through digit four on the left foot (Fig. 4). The hind toes represent the tens place and are numbered in the same sequence as the front toes (Baumgartner 1940, Melchoir and Iwen 1965) (Fig. 4). This scheme of toe-clipping will allow 108 individuals to be permanently marked (Taber 1971).

Evaluation of data

If we assume ingress into the population is equal to the egress out, survival and mortality can be calculated between sampling periods (Krebs 1972). This is done by taking the difference between two consecutive censuses and dividing that number by the first census estimate (Krebs 1972). This may used to show small fluctuations in the population through the summer. Survival and mortality rates will also be calculated for each age class to try to coorelate vulnerability to predators with age.

Figure 4. A numbering scheme used for toe-clipping small rodents (Taber 1971).

Predation will be assessed by observing the type animal encountered and whether or not a predator-prey type interaction occurred. From this data a ratio of number of times a predatory species was seen on the study area to the number of predatory type interactions by that species can be calculated and used to rate predators in order of significance of predation. Data recorded during each confrontation between the predator and the marmot will include notes on the interacting animal, length and outcome of the interaction, and what type of interaction occurred.

According to Davis (1939), two subspecies of yellow-bellied marmots occur in Idaho: Marmota flaviventris avara and Marmota flaviventris nosophora (Schreiber

19__). M. f. avara exhibits a "buffy or yellowish brown ventral coloration" (Davis 1939), a narrower rostrum, and is typically smaller (Davis 1939). M. f. nosophora or the "chestnut-bellied marmot" is differentiated from M. f. avara on the basis that the ventral surface of M. f. nosophora is a cinnamon red color with a wider rostrum and is typically larger in overall body size (Davis 1939). Davis (1939) also reports that some marmots in south-central Idaho exhibited characteristics of both subspecies. When a mixture does occur, skull characteristics were used to subspeciate the specimens (Davis 1939).

Rocky Mountain spotted fever and Colorado tick fever are both diseases transmitted by the mountain wood tick(Dermacenter andersoni). The diseases are transmitted to humans after the tick reaches the adult life stage (Brown 1969). Previous to this the tick begins life in the larva stage or becomes a "seed tick" (Brown 1969). The larvae then under go a molt to become a nymph which is a sexually immature adult. In these early stages the tick is an intermediate parasite found mainly on rabbits and rodents (Kohls 1948, Belding 1965, Brown 1969). It is in these first two stages of life that the tick acquires the infection (Belding 1965, Brown 1969) making them potential transmitters. These nymphs undergo one more molt after which they become an adult. At this stage the adult ticks attach themselves to larger hosts such as deer, bears, and humans. Here they gorge themselves with blood, infecting the host and when full, the females drop to the ground to lay her eggs and die.

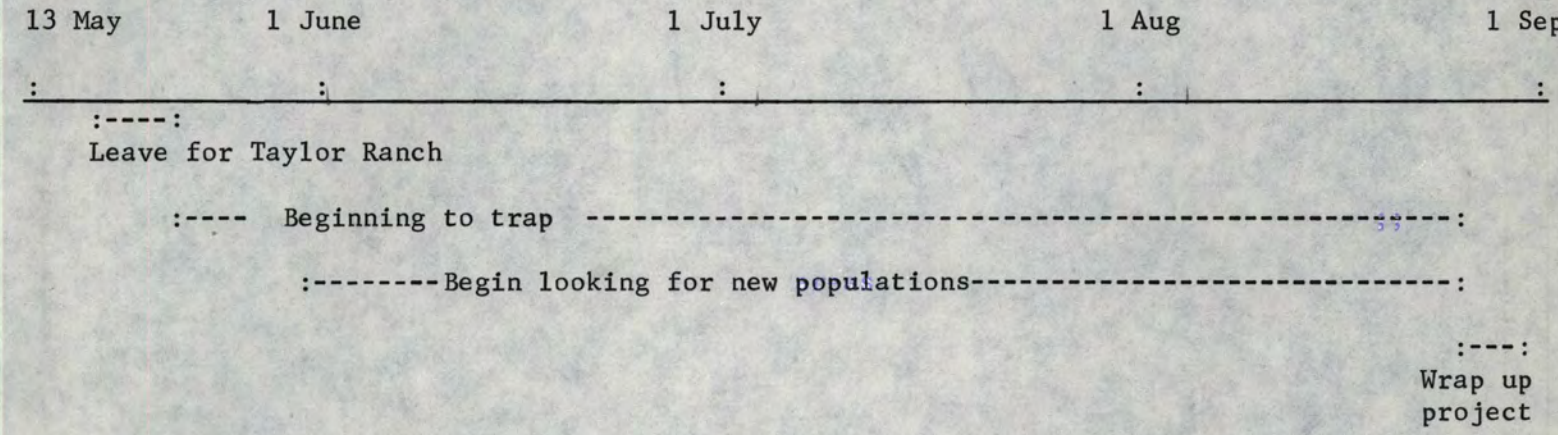
Information on how much blood is needed for the test and the technique for analysis of Rickettsia rickettsii is being obtained from the National Microbiological Institute, Rocky Mountain Laboratory in Hamilton, Montana and this will be incorporated into the final report.

The capturing and marking technique will be evaluated after the study is completed. The main points in discussing the technique used will be the ease

of handling, in identification, and in obtaining the materials used.

APPENDIX I

Tenative Time Schedule



APPENDIX II

Equipment list

#	Item	Supplier		approx. cost
		G. Hompland	U of I	
15	Live-traps (bought new)		X	330.00
	(made)		X	75.00
2	Zipper tubes			
	(canvas)	X		7.00
	(2 one foot, two-way zippers)		X	12.00
2	Nyanzol A fur dye	X		7.00
1	Rubber gloves	X		1.00
1	Cotton swabs	X		.90
2	Spring balance		Wild. Unit	----
1	Leather gloves	X		5.00
1	Binocular or spotting scope		Wild. Unit	----
1	Wire cone	X		.50
1	Hydrogen peroxide		X	2.00
25	Collection tubes for blood samples (5-10 cc.)		Vet. Sci.	----
25	Needles (20 gauge, 1 1/2 ")		Vet. Sci.	----
1	Centrifuge (manual or electric)		X	----
50	Labels for blood samples		X	.90
1	Cooler for blood samples		X	----
1	Plant press		Bot. Dept.	----
1	Disecting kit	X		----
1	Miscellaneous	X	X	----
	Bait		X	----
	Transportation		X	----
	Food		X	----