May 6, 1976

Mr. John D. Gimbel
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Dear John:

The Technical Board of the Wilderness Research Center has decided that we will not be able to fund your proposal, "Behavioral Patterns in A Colony of Yellow-Bellied Marmot (Marmota flaviventris) in the Idaho Primitive Area". There were several good proposals and unfortunately not sufficient funds to finance all projects.

We appreciate your effort in writing the proposal and would invite you to submit again next year.

Sincerely,

John H. Ehrenreich
Dean

JHE:ms

Received April 1, 1976

BEHAVIORAL PATTERNS IN A COLONY OF YELLOW-BELLIED Marmot (*Marmota flaviventris*) IN THE IDAHO PRIMATIVE AREA.

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Wynne-Edwards(1964) was the first to postulate that animal populations regulate themselves through social interactions and their affects upon the food supply. The social interactions leading to the territorial system of marmots has also been postulated to be important in the regulation of their numbers(Downhower and Armitage 1971). The purpose of this study is to observe when certain behavior occurs, its duration time and its importance in the social interactions that occur.

OBJECTIVES

1) To determine when the major activity periods occur.
2) To determine the time devoted to each activity.
3) To determine if a correlation exists between temperature and the initiation and termination of daily activity.
4) To determine if a correlation exists between body weight and activity times(e.g. A possible correlation between a certain body weight and diminishing foraging activities).

MATERIALS AND METHODS

Marmots are diurnal and occupy a variety of environments ranging from low-elevation meadows to alpine situations(Svendsen 1973). Seventy-five percent of all marmots live in colonies(Svendsen 1973).

One colony of marmots from among the marmot population located in the horse pasture of the Taylor Ranch ~~Research~~ Field Station will be sampled and observed. All individuals will be live trapped using homemade woodchuck traps as designed by Trump and Hendrickson(1943), but with slight modifications. A piece of heavy metal screening with quarter inch holes 36 by 50 inches(91.44 X 127 cm) will be bent to form the main body of the trap 12 inches high, 12 inches wide and 36 inches long(30.5 cm X 30.5 cm X 91.5 cm); the end, the door, and the frame on which the door is hinged will be made of wood. The door frame is made of 4 pieces of wood, 1 by 4 inches(2.5 cm X 10 cm), and fastened flush with the trap outside the screen. The door is suspended inside

the trap and is connected to a strong piece of string. The string is connected to a thin loop of thread which is attached to an elevated metal treadle 6 by 8 inches(15.3 cm X 20.3 cm) that is hinged to the floor with two loops of wire. When the treadle is depressed, the thread breaks and the door falls shut, wedging against the bottom of the trap. Trapped woodchucks have been observed pushing the door, but never pulling on it, and there has been no evidense of animals escaping from this type of trap. This design has the advantage of working well in rough terrain and in heavy vegetation(Trump and Hendrickson 1943).

Armitage(1962) found that oats and clover worked well for bait. The two most important factors found in trapping woodchucks were the proper placing of the traps and the presence of woodchuck odor on the trap. Human odor seems to have had no noticeable effects in previous studies(Trump and Hendrickson 1943).

Traps are best placed in the runways, especially where the trail is narrow. This makes it possible to camouflage the entrance, and makes it more difficult for the animal to detour around the trap. The trap will be loosely covered with cloth or vegetation to prevent direct exposure of the confined animal to the sun. This was found to be a major source of mortality in other studies(Trump and Hendrickson 1943, Nee 1969).

To remove a captured marmot the mouth of a burlap bag, which is enclosed in a nylon fishing net, is placed around the trap entrance. The marmot enters the burlap bag, and the end facing the trap is tied shut. The animal is allowed to enter the nylon net and this is then tied shut, leaving little room for movement(Nee 1969).

Nee(1969) found that placing a hand on the nape of the marmot's neck or lightly gripping some nape skin causes the animal to become docile. This condition remained for about 15 seconds as long as no quick movements were made and could be reintroduced by the same process(Nee 1969).

Each trapped animal will be sexed, aged and marked for clear and easy identification. Ear tags and colored streamers will be used for identification purposes. Sex will be determined by visual

observation. Age composition will be determined by weight and the time period when each animal is first trapped.

Downhower and Armitage(1971) observed that young marmots arrive in the colony in midsummer and are the smallest animals present, weighing about 1 lb(.45 kg). Yearlings may also be distinguished by their small size when compared to adults. In June, a yearling weighs 3 to 4 lbs(1.4-1.8 kg), whereas an adult weighs 6 to 13 lbs(2.7-5.9 kg, Downhower and Armitage 1971). Each animal will be weighed to the nearest quarter of a pound(.11 kg), using a spring balance, while it is still secured in the net.

A number one hog ring with attached streamer serves to make each animal more identifiable. Vinyl plastic flagging one and three sixteenths inches(2.6 cm) wide and 13 inches(33 cm) long will be used as the streamer material. The strip is folded and attached to the hog ring with a falconer's jess knot cemented with epoxy. The ring is attached to the loose skin at the back of the animals neck. Previous work has found the rings to remain intact indefinetly and no skin reactions have been noted(Svendsen 1973). The use of different colored flagging, with painted numbers will facilitate recognition of individuals at a distance. The ear tags serve as a second source of identification should a streamer be lost.

The burrows will be classified as either home-burrows, where an animal normally spends the night and where the young are born; or auxiliary burrows, which serve as a place of refuge when the animal is unable to return to the home burrow during an alarm call(Armitage 1962). Armitage(1962) found that the best way to distinguish the two types of burrow systems was by activity. The observation of which marmot occupies what burrow is best accomplished during the last hour of light, as each animal usually sits by the entrance to its burrow for some time prior to entering(Armitage 1962). Armitage (1962) found that home burrows have atleast 3 openings while auxiliary burrows commonly have 2 and sometimes only one.

The activities of marmots are bimodal, with the greatest activity occuring between 8 o'clock and 10 o'clock in the morning and 3 o'clock to 5 o'clock in the afternoon. The time of these activities

tends to shift in August with the first peak occuring later and the second peak occuring earlier, suggesting the influence of temperature (Armitage 1965). Temperature readings will be taken when the first marmot appears in the morning and again at night when the last marmot enters a burrow to see if any correlation exists.

Observations will be made from several locations around the colony using 10 by 50 binoculars and a spotting scope. Two different methods will be used to determine the different behavior patterns and their duration. The first approach is to record the activity of all marmots at one instant in time. The second approach is to follow the activity of one marmot during the entire day.

Behavior will be recorded as: feeding and gathering, sunning, digging, resting(underground), mating, amicable, agonistic and play fighting. These behavior patterns were classified in detail by Armitage(1973) and his descriptions will be used as the basis for behavioral determinations.

Live trapping and weighing of a few select individuals will continue throughout the summer to determine if any correlation exists between body weight, activity and the duration of these activities.

Armitage(1962) found an increase in wandering late in the summer, wherein some adults traversed great areas of the colony and in some cases left the colony. Anthony(1923) postulated that seeking hibernation sites might be the cause of such wanderings(Armitage 1962). Surrounding areas will be observed to see if any animals move from, or to the study area.

DISCUSSION

Adult male marmots typically establish a territory, with one or more adult females plus subordinates occupying burrows within this area. Resident males exclude all other adult and yearling males from this area(Svendsen 1973). Territoriality in marmots is postulated to have 3 major functions. Juvinal survival rate is increased, outbreeding is encouraged, and the fitness of the colonial male is enhanced(Armitage 1974). Increased surface activity of marmots may result in increased animal conflicts. An animal can reduce its conflicts by reducing its level of activity or changing its place or

time of activity(Armitage 1965).

The dispersal of yearlings from marmot colonies is related to levels of agonistic behavior. Agonistic behavior between pregnant females and yearlings enhances dispersal. Male yearlings have been observed leaving a locality immediately after being chased by one of these females. However, agonistic behavior alone is not sufficient to cause dispersal. The continued presence of the adult male is apparently necessary to cause yearling male dispersal. This conclusion is supported by the failure of all yearlings to become residents when introduced into a locality with an established resident male. But when introduced into a colony lacking a resident male the yearlings remained as members of the colony(Armitage 1974).

Downhower(1968) found behavioral differences an important consideration in the dispersal of yearlings. The more aggresive female yearlings either remained at their birth sites in the colony or dispersed, whereas subordinates tended to move to the periphery of the colony if sites were available(Svendsen 1973). The colonial adult females subdivide the territory and the use of the area by any female depends upon the behavior profile of the individual(Svendsen 1973).

MATERIALS

Materials to construct the traps.
20 ear tags
20 # 1 hog rings
4 meters of flagging(4 different colors)
1 large nylon net
1 spring balance marked in .2 kg units

A prototype of the trap will be built prior to the study to insure that it performs adequately. In this way, the traps can be built at the research station, which will alleviate some of the transportation problems.

VITAE

John D. Gimbel was born August 14, 1954 in New York City. He attended public school in Fair Lawn, N.J. and graduated from Fair Lawn High School in 1972. He entered Paul Smith's College in N.Y., where he received an A.A.S. degree in forestry in 1974. He is presently a first semester senior at the University of Idaho majoring

in fish and wildlife management.

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