BEHAVIORAL BIOLOGY **20**, 135–140 (1977), Abstract No. 6284

BRIEF REPORT

Patterns of Agonistic Interaction and Space Utilization by Agoutis (*Dasyprocta punctata*)[1]

MERTICE M. CLARK* AND BENNETT G. GALEF, JR.†

**Department of Psychology, University of Toronto, Toronto, and*
†Department of Psychology, McMaster University,
Hamilton, Ontario, Canada

Field observation revealed that, in the months of food scarcity, normally solitary and minimally interactive agoutis (*Dasyprocta punctata*) aggregate at rich feeding sites and form dominance hierarchies. An individual agouti's position in such a hierarchy is uncorrelated with its previous frequency of utilization of the feeding site. The results are discussed as an example of plasticity in mammalian social organization in response to exogenous and endogenous variables.

The type of social organization exhibited by subpopulations of many mammalian species in their natural habitats has been found to vary as a function of environmental conditions (see for examples: Rowell, 1969; Wilson, 1975). The present studies were undertaken, first, to provide a description based on direct observation of the normal pattern of space utilization and social interaction of a wild rodent population and, second, to determine the effects of variation in resource distribution on those patterns of interaction observed. The subject species, the agouti (*Dasyprocta punctata*), is a particularly suitable rodent for such studies because of its diurnal pattern of activity (Smythe, 1970), relatively large size (2–4 kg), small home range (2–3 hectare, Smythe, 1970), surface dwelling habits, and the relative ease with which individuals become habituated to the presence of human observers within their home ranges (Galef and Clark, 1976).

Observations of agouti behavior were carried out in the Allee Creek ravine immediately adjacent to the Smithsonian Institution field station on

[1] This research was supported by National Research Council of Canada Grant AP-307 to B. G. G., Jr. We would like to thank the staff of the Smithsonian Tropical Research Institute for their hospitality, the use of their facilities, and financial aid; Dr. Robin Foster for his assistance in plant identifications; Dr. Nicholas Smythe for the loan of his equipment and helpful discussion; and Dr. Michael Leon and Dr. W. John Smith for thoughtful critiques of earlier drafts of the manuscript.

ISSN 0091-6773

Barro Colorado Island from May to October, 1974. The study area is one of second-growth lowland tropical moist-forest, steeply ridged and ravined, and contains several small creeks. Fallen fruit, the main food source of agouti, was scarce in the study area from mid-July to the end of the study period.

During May and June, a reproductively active adult female agouti (M♀) was followed through the forest for 55 hr to determine the minimum extent of her home range. During July and August, we trapped (Turtox collapsible live traps, General Biological Supply House, Inc., Chicago, baited with banana and peanut butter) and marked (black, fur dye, Nymoc Products, Toronto) other agouti intruding into the home range of the focal animal and continued monitoring her movements on an intermittent basis while observing the behavior of her young. Systematic observation of the behavior of agouti in the undisturbed study area was carried out from September 1 to 23.

A fixed transect, 285 m in extent, was established in a frequently utilized portion of the home range of the focal animal. Single observers walked the transect 3 times/hr from 8 to 12 AM and from 1 to 6 PM, 6 days/week, and, using 8-power binoculars, recorded the identity, location, and activity of each agouti sighted during each 20-min walk. Twenty-seven transects were completed at each of the 9 hr of the study day over a 23-day period.

M♀ was observed one or more times during 158 of 243 transects (65%), confirming that our transect was, in fact, within the most frequently utilized portion of her home range. Adult agouti other than M♀ were observed on 183 transects (76%), indicating that, even within the center of the focal animal's home range, other adult agouti were constantly present. As can be seen in Fig. 1, which indicates the locations in which three of the agouti observed while walking transects were seen, the agouti sympatric with M♀ similarly, exhibited extensive overlap in their home ranges.

Many of these eight marked intruding animals could be found in very restricted areas with high probability (for example, RM♀ was seen in a 96-m^2 area on 22% of transects), suggesting that individuals were making little effort to locate and expel conspecifics from their home ranges.

Simultaneous sightings of two agouti were relatively infrequent (34 of 422 observations of agouti), and 13 of these 34 simultaneous sightings involved SN♀ and her pup (RS pup). Eighteen of the twenty-one observations of two adult agouti in contact were of peaceful interactions, both individuals lying, apparently indifferent to one another's presence, at distances of from 1 to 6 m, or walking past one another without incident. In three cases, all in areas of recent fruit-fall, one agouti briefly chased another. The focal animal was not, however, engaged in any of these agonistic encounters. In summary, the population of agouti under obser-

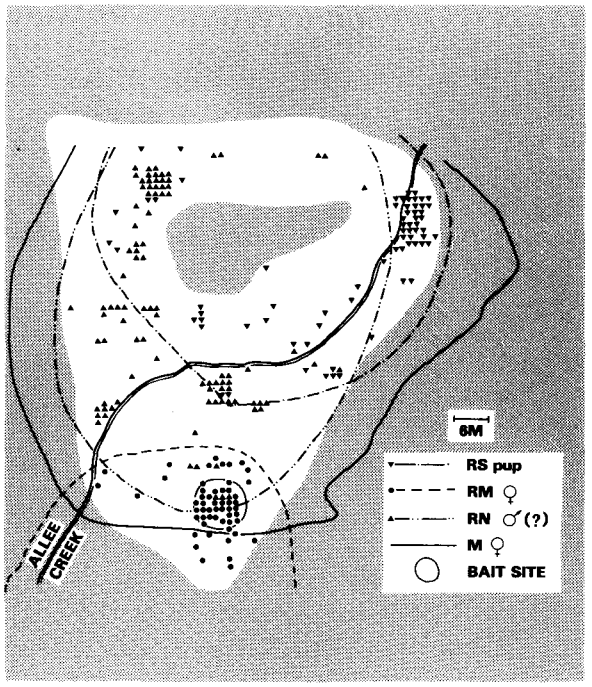

FIG. 1. Sightings of agoutis M♀, SN♀, UM♂(?), UM♂ juvenile and the extent of their minimum home ranges within the home range of M♀. The unstippled area is that clearly visible from the transect.

vation exhibited extensive overlap of home ranges, no evidence of territorial maintenance, and a relatively peaceful and solitary mode of existence. These systematic observations corroborated our impressions of agouti social interaction formed during the 55 hr spent following M♀ through the forest. During this period, we observed seven peaceful interactions and two agonistic encounters (one at a feeding site) between M♀ and other agouti.

A previous extensive investigation of the behavior of agouti on Barro Colorado Island has presented evidence indicating that agouti are highly territorial and aggressive (Smythe, 1970). Comparison of the methods employed by Smythe and by us suggested a possible source of the apparent discrepancy in our observations and conclusions. We had walked a fixed transect through the forest without otherwise disturbing the habitat, whereas Smythe had observed his agouti for 10 months from a platform from which he dropped fruit in simulation of a continuously fruiting tree. Thus, as a function of natural seasonal changes in fruit availability, his observation site was either a particularly rich food source in a generally barren area or one of many rich feeding sites available. Neither the

Smythe procedure nor our own seems to us to produce major distortion of the variety of conditions of food distribution which may arise in the natural habitat, but the ecological circumstances of the agouti in our two studies were obviously different. It seemed reasonable to hypothesize that the pattern of social interaction of agouti could vary as a function of the distribution of food in their home ranges. The second study was undertaken to investigate this possibility.

A baiting site (see Fig. 1) was selected in an area frequented by three marked adult agouti [M♀, RM♀, RN♂(?)] and at least one unmarked juvenile (UMjuv♂). The baiting site was without natural fruit-fall throughout July, August, and September.

Observation of the bait site was undertaken from 8 to 12 AM and from 1 to 6 PM for 22 consecutive days in late September. The observer, seated at a distance of 6 m, recorded the identity, time of presence, and activity of each agouti entering the clearing in which the bait site was located. During the first 8 days of observation, no food was introduced into the site, for the second 8 days, fruit of the spiny palm (frozen in early June) were made continuously available at the bait site along with pieces of banana, and, for the last 6 days, the site was returned to its normal barren state.

The main results of Study 2 are presented in Fig. 2, which shows: (a) the number of individual agouti seen in the bait site each day, (b) the

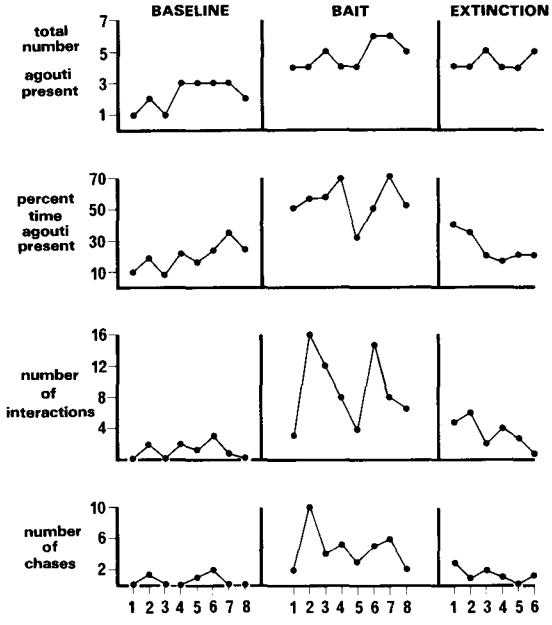

FIG. 2. Daily observations of agouti behavior at the bait site during the three phases (baseline, bait, extinction) of Study 2.

percentage of observation time one or more agouti were observed at the bait site, (c) the number of times two agouti interacted at the bait site, and (d) the number of agonistic encounters in the bait area. It is apparent from examination of the figure that introduction of a persistent food source: (i) increased the number of agouti visiting the bait site and the amount of time they spent there and (ii) increased the frequency of interactions, both agonistic and peaceful, occurring in the bait area.

We categorized our 103 observations of interaction at the bait site in three classes: (i) chase, in which one individual pursued another from the bait site; (ii) leave, in which one individual left the bait site upon approach of another without an active chase occurring; and (iii) simultaneous feeding, in which two animals fed simultaneously in the bait area. Animals remaining in the bait area at the conclusion of an interaction of the chase or leave class were considered dominant in that interaction and those leaving the bait area, subordinate. Table 1 provides a description of the frequency of observation of individuals in the bait area during the baseline condition of Study 2 and of the number of occasions on which each individual listed on the left of the table behaved in a dominant fashion during interaction with the conspecific listed at the top of the table. Study of Table 1 reveals an ordering of relative dominance at the bait site (RN♂ > M♀ > UM♂$_2$(?) > RM♀) uncorrelated with animals' previous frequency of observation there (RM♀ > M♀ > UM♂$_2$(?) > RN♂).

Individual differences in behavior during the 33 observed instances of simultaneous feeding were consistent with a dominance hierarchy interpretation of observed interactions. In 17 of 33 bouts of simultaneous

TABLE 1
Individual Activity at the Bait Site

Presence transects[a] (%)		RN♂(?)	M♀	UM♂(?)	RM♀	SN♀	UM♂juv.	RSpup
1	RN♂(?)	—	2	8	10	0	0	0
5	M♀	1(4)[b]	—	3	19	0	0	3
0	UM♂(?)	2	3	—	6	0	0	2
16	RM♀	1	1(6)	3(4)	—	0	0	2
0	SN♀	0	0	0	0	—	0	0
3	UMjuv♂	0	0	0	0(2)	0	—	0
0	RSpup	0	0(1)	0	0	0	0	—

[a] Percentage of transects on which each individual was observed in the bait site.

[b] Numbers in parentheses indicate the number of occasions on which the individual identified on the left vocalized in the presence of the individual identified above during simultaneous feeding bouts.

feeding, one of the participants produced a vocalization, similar to that exhibited by juvenile agouti interacting with their dam (Galef and Clark, 1976), which appeared to inhibit overt aggression. No chases were ever directed toward vocalizing animals, whereas chases were observed in 46 of 119 contacts in which no vocalizations occurred. As can be seen in Table 1, these vocalizations were produced in potential agonistic encounters only by the lower ranking animal, as determined by aggressive interaction outcomes.

The results of the present study indicate that, although the presence of a rich food source is sufficient to increase the frequency of aggressive interaction among sympatric agouti, it fails to elicit any apparent territoriality. In fact, the creation of an area of high food density during a period of general food scarcity increases, rather than decreases, the number of agouti visiting the food site and results in the formation of a dominance hierarchy there.

Consideration of the data collected by Smythe (1970) together with our own observations suggests that it is during the breeding season (February–April, Smythe, 1970), when agouti are paired, that they are most active in exclusion of conspecifics from portions of their home ranges. Thus, the general patterns of social interaction in subpopulations of agouti appear to vary in response both to seasonal changes in reproductive state and patterns of resource distribution during the season of food scarcity. At various times, agouti are solitary or paired, territorial, dominance hierarchy-forming, or relatively indifferent to one another.

REFERENCES

Galef, B. G., Jr., and Clark, M. M. (1976). Non-nurturent functions of mother–young interaction in the agouti (*Dasyprocta punctata*). *Behav. Biol.* **17,** 255–262.

Rowell, T. E. (1969). Variability in the social organization of primates. *In* D. Morris (Ed.), "Primate Ethology." London: Weidenfeld and Nicolson.

Smythe, N. (1970). Ecology and behavior of the agouti (*Dasyprocta punctata*) and related species on Barro Colorado Island, Panama. Unpublished doctoral dissertation. University of Maryland, College Park, Maryland.

Smythe, N. (1970a). Relationships between fruiting seasons and seed dispersal methods in a neotropical forest. *Amer. Natur.* **104,** 25–35.

Wilson, E. O. (1975). "Sociobiology: The New Synthesis." Cambridge, Mass.: Belknap Press.