'separation' call have both evolved from the 'lost' call of the day-old chick" (Stokes, 1967). A similar case is made for the "cuca cow" call of the California quail *Lophortyx* (H. W. Williams, personal communication).

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**LITERATURE CITED**


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**INTRASPECIFIC AGGRESSION AND SOCIAL ORGANIZATION IN GROUND SQUIRRELS**

Recently, Steiner (1972) has reported on wounding and mortality of juveniles resulting from attacks by adult males in *Spermophilus columbianus* and *S. undulatus*. Steiner suggested that aggressive behavior of adult male Columbian and Arctic ground squirrels plays some role in juvenile dispersal and in population regulation. During a 3-year behavioral study (1969 to 1971) of a subpopulation of Richardson's ground squirrel (*Spermophilus richardsonii*) in southern Saskatchewan no evidence of intraspecific mortality was found. It is here suggested that differences in the social structures of various ground squirrel species accounts for such differences in responses of adult males to juveniles.

The study area, a one and a half hectare portion of short-grass prairie on the Key West Community Pasture (lat. 49° 40' N, long. 105° 10' W), supported five to seven adult females
and one or two males. Most intense observations were performed in 1969 when six adult females, two adult males, and 37 juveniles were present. During 40 hours of observation between 16 June (when juveniles were about 6 weeks old) and 3 July (after which adult males ceased above-ground activity), 26 interactions between juveniles and adult males were observed; these involved 10 approaches by a male to a juvenile, five approaches by a juvenile to a male, and 11 occasions on which a male and juvenile were close together (< 10 meters, average ± SE = 4 ± 1 meters) but did not approach.

Of the 10 approaches by a male, six involved a display in which the male postured in front of and perpendicular to the juvenile, with his body arched and curved toward the juvenile and the tail fluffed. Holding this posture the male slowly moved sideways toward the juvenile. Only once did this result in physical contact; the juvenile did not move, and the adult ceased posturing and moved away. On the other five occasions the juvenile moved away before physical contact was made. No fights between adult males and juveniles were observed and only two chases by males were observed. On four occasions juveniles behaved aggressively toward the male—either biting, jumping on the male, or mounting the male. This lack of aggressiveness by the males occurred even though the juveniles were, on the average, 4 meters from the males' home burrows.

Steiner (1972) reported finding wounded and crippled young but of 917 juvenile Richardson's ground squirrels trapped from 1969 to 1971 on the surrounding area (D. Michener, 1972a) none was injured or maimed.

Pairing of laboratory raised adult males and juveniles in an observation box confirmed the low level of aggressive behavior by adult males. Four yearling adult males were tested once each with four juvenile males (from different litters) and once each with four juvenile females (from different litters). Each test lasted until 10 contacts had occurred between the squirrels (less than 5 minutes). Contacts were classified as neutral, cohesive, or agonistic according to the method of G. Michener and Sheppard (1972).

No difference between tests involving male and female juveniles was noted. Of the 320 contacts 152 were neutral, 19 were cohesive, and 149 were agonistic. Of the agonistic contacts 116 were submissive responses by the juveniles, six were aggressive acts by the adult males, and 14 involved arching by the adult male. Thus submissiveness by the juveniles was not generally caused by overt aggression by the male.

The observed social interactions between adult male and juvenile Richardson's ground squirrels indicate that the males are rarely aggressive. The behavior of adult male Richardson's ground squirrels towards juveniles differs from that of adult male Arctic and Columbian ground squirrels. The difference can be explained in terms of the different social organizations in these species. Columbian ground squirrels live in groups containing a single adult male, which is dominant to the adult females and juveniles. The dominant male defends the group area, chases out intruding males, and is the most aggressive individual in the group (Steiner, 1970a, 1970b). Mayer (1953) did not observe territoriality in Arctic ground squirrels but Steiner (1972) discussed dominant adult males and apparently considers the social organization to be similar to that of Columbian ground squirrels. According to Carl (1971), Arctic ground squirrels, in spring and summer, maintain breeding territories in which an adult male actively defends an area containing several females. Steiner (1970a, 1970b, 1972) observed that both dominant male Columbian and Arctic ground squirrels regularly intrude on neighboring territories and often attack juveniles unless interrupted by the resident male.

In contrast, Richardson's ground squirrels do not live in social groups; the adult females have overlapping home ranges containing within them defended territories, and the adult males, although occasionally moving over a large area, only defend small territories between the female home ranges (personal observation; D. Michener, 1972b). After breeding, adult females exclude males from their areas (Yeaton, 1972). The males are subordinate to the females except within their defended area and even there they may be attacked by
neighboring females (personal observation). That adult male Richardson’s ground squirrels are not aggressive toward juveniles may be an extrapolation of the adult male’s subordinate position with respect to the juveniles’ mothers.

It is suggested that in those ground squirrel species in which there is active territorial defense of a group area by the resident male and in which adult males are dominant to adult females, the interactions between adult males and juveniles, especially from different groups, will be aggressive. On the other hand, in those species in which each adult squirrel occupies a home range containing a smaller defended area and in which adult males are not dominant to adult females there will be few aggressive interactions between adult males and juveniles.

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**THERMOGRAPHIC MEASUREMENTS OF THE SURFACE TEMPERATURES OF ANIMALS**

Thermography is a well-documented technique in human medicine and veterinary applications have been described by Kaemmerer and Buntenkötter (1971) and Stephan and Görlich (1971). Clark and Cena (1972) discussed the influence of environmental factors on the distribution of surface temperature over animals with insulating coats. The temperature recorded by a thermographic camera will be that of the skin surface of hairless animals, but of some layer within the coat of hairy animals (Cena and Clark, 1973). The skin surface is usually below body core temperature because of dissipation of metabolic heat through the subcutaneous insulating layers of the body. A coat introduces an additional thermal resistance between the skin surface and a layer of hair whose radiative temperature