# Coprophagy in the Capybara, *Hydrochoerus hydrochoeris*

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## *Introduction*

Capybaras (*Hydrochoerus hydrochoeris*) are large (50 kg), caviomorph rodents. They are found in a range of habitats in South America, but occur at higher densities in tropical, seasonally flooded grassland. They are grazers that live in groups near water, typically resting in the morning, bathing during the hot midday hours and grazing in late afternoon and evening. Nights are spent alternately grazing and resting (Schaller & Gransden Crawshaw, 1981, pers. obs.). Several studies on their biology have been published (e.g. ecology: Ojasti, 1973; behaviour: Azcarate, 1981; Macdonald, 1981; Schaller & Gransden Crawshaw, 1981; feeding: Escobar & Gonzalez-Jimenez, 1974; and digestive physiology: Gonzalez-Jimenez, 1977) but none reports the occurrence of coprophagy.

Coprophagy occurs in all lagomorphs and many rodents (McBee, 1971). It is known to increase digestive efficiency (Thacker & Brandt, 1955) and growth rate (Barnes, Fiala & Kwong, 1963) in rabbits. These animals produce two types of faeces, soft pellets which are reingested and hard ones which are not. The bacteria enclosed in a membrane surrounding the soft pellets increase the pH in the fundus of the rabbit's stomach and help the breakdown of high molecular weight hydrocarbons (Griffiths & Davies, 1963). Herbivores with hindgut fermentation either practise coprophagy or have particular adaptations to absorb the products of such fermentation (Parra, 1978). In this paper, I report evidence of coprophagy in wild Capybaras.

## *Methods*

The data were collected during a study of Capybara social behaviour and ecology. Individually marked animals belonging to three groups were observed for a total of 129·6 h between March and May 1984. The study area was located on 'El Frio' ranch in the low llanos of Venezuela (7° 46′ N, 68° 57′ W). The habitat is mainly grassland with marked wet (May–October) and dry (November–April) seasons, producing extensive flooding in July and August and severe drought in February and March. The animals could be approached to within 50 m and were observed with $10 \times 25$ binoculars and a 60 mm telescope. The 'Scan' sampling method (Altmann, 1974) was used to collect information on general activity, mainly grazing and resting. All occurrences of coprophagy events (as well as other 'instantaneous' behaviours) were recorded. The observation sessions lasted from 2–9 h and were distributed between 07.00 and 19.00 hours.

## *Results*

Coprophagy was observed in adults of both sexes as well as young with no significant differences in their rates (males $\bar{x} = 1{\cdot}06$, females $\bar{x} = 1{\cdot}00$, Mann-Whitney $U$-test $P > 0{\cdot}10$; adults $\bar{x} = 1{\cdot}03$, young $\bar{x} = 1{\cdot}06$, Mann-Whitney $U$-test, $P > 0{\cdot}10$). The sequence of movements made by a Capybara to reingest its faeces is similar to that described for rabbits (Southern, 1940). A Capybara typically sits up from its resting position, opens its back legs wide and reaches its head towards its anus, collecting the pellets as they are voided. This is sometimes performed when the animal is sitting in the water, which means it has to put its head under water to reach its anus. Then it chews the pellets for up to 10 min ($\bar{x} = 3{\cdot}44$, S.D. 2·24, $n = 13$), sometimes collecting a second mouthful immediately after swallowing. On one occasion, an animal was seen to suck hard at the pellets in its mouth only to spit them out again. On another, a string of pellets was seen to hang from a Capybara's mouth, while it sucked them back into its mouth. A sticky material

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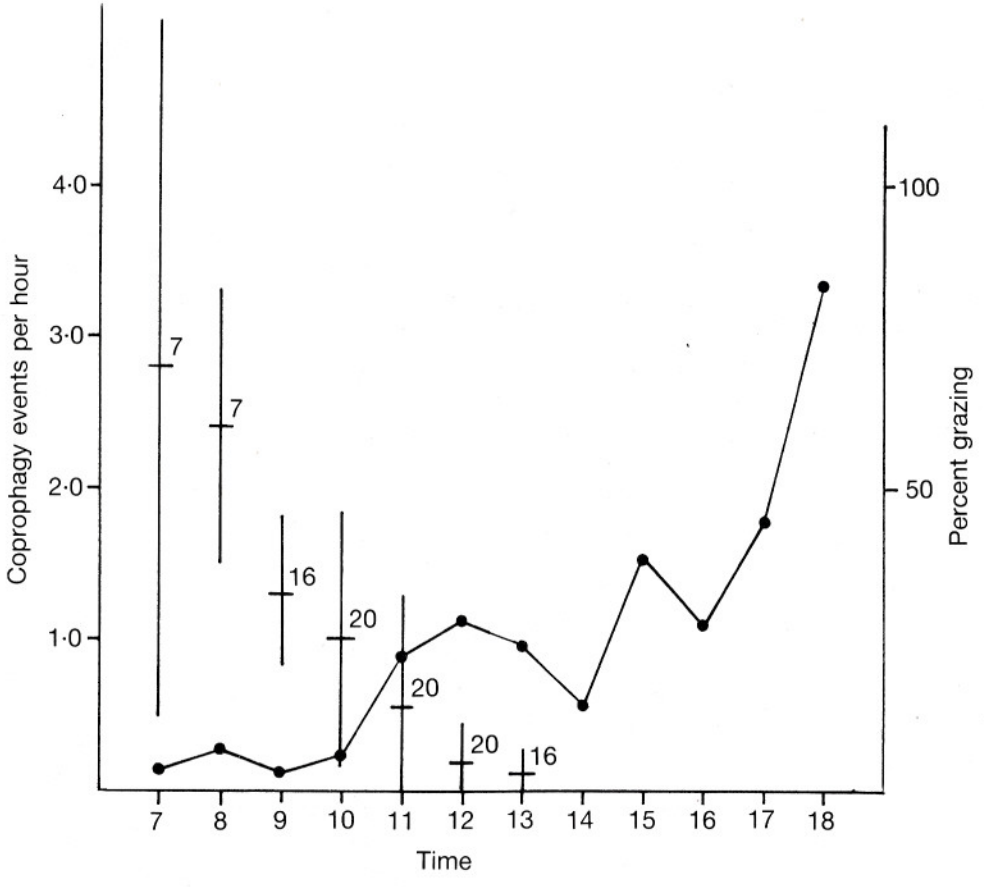


FIG. 1. Average number of coprophagy events per hour per animal and percentage of animals grazing with time of day. Pooled data from three groups of Capybaras observed between March and May 1984. The individual rates were corrected for the percentage of time each animal was present using scan sampling data. Horizontal bars are means of coprophagy events per hour for each one-hour period of the day. Values at 14.00 and 15.00 hours were less than 0·01 and nil after 16.00 hours. Vertical bars are standard deviations. The figures beside bars are sample sizes. The dots are the percentages of animals grazing, calculated from a larger number of animals, including non-marked individuals from the same three groups.

connecting the pellets may be similar to the membrane mentioned by Griffiths & Davies (1963) for rabbit soft pellets. The recycled pellets looked shiny on the occasion described above but it is not known whether they were softer than normal ones, as is the case in rabbits (Thacker & Brandt, 1955).

Ninety-seven percent of all coprophagy events ($n = 548$) were observed between 07.00 and 14.00 hours and none after 16.30. On two half nights (up to 24.00 hours) and one whole night of observation using an image intensifier, no coprophagy was seen before 05.30. However, nocturnal observations were not continuous, so the possibility that coprophagy occurred cannot be ruled out. Ojasti (1973) mentions that 81% of the faecal pellets he collected were produced during the night. Figure 1 shows the average number of times per hour (for one-hour periods throughout the

day) that Capybaras ate their faeces. This is negatively correlated to the percentage of animals grazing ($r = -0{\cdot}80$, $P < 0{\cdot}05$, $d.f. = 5$, excluding all 0 values after 14.00 hours). Thus, it seems that, while resting in the mornings, Capybaras recycle what they ate the previous evening and night. And during their evening grazing bouts, they defecate the reingested faeces. Rabbits have a similar daily routine of refection and defecation (Southern, 1940; Myers, 1955).

In Australia, rabbits have higher reingestion rates in the wet winter than in the drier summer months (Myers, 1955). In the llanos, during the dry season, when only dead and hard plant material is available, it was found that Capybaras recycled their faeces more frequently than in the wet season (dry season $\bar{x} = 1{\cdot}06$, wet season $\bar{x} = 0{\cdot}54$, one-tailed Mann-Whitney $U$-test, $P < 0{\cdot}05$). Thus, when food is scarce, faeces are more thoroughly recycled.

There is a great variability both between animals (see S.D. bars in Fig. 1) and between days for the same animal. For example, during the dry season, male WK9 had rates of about five faeces-eating instances per hour on two occasions and nil on another. On the latter, he got up at 10.00 hours, walked to the water and defecated abundantly. This flexibility probably allows them to cope with unexpected disturbances that disrupt their otherwise highly constant daily routine. Similar patterns of variation have also been observed in rabbits (Eden, 1940; Southern, 1940).

## *Discussion*

Gonzalez-Jimenez & Escobar (1975) found that Capybaras have digestive efficiencies similar to rabbits and sheep, but lose more protein than rabbits. The higher protein losses were attributed to the absence of coprophagy. However, since these experiments were carried out in small 'metabolic cages', it is possible that coprophagy was inhibited. In a later paper, Gonzalez-Jimenez (1977) presents evidence suggesting that Capybaras are not coprophagous. Again, experimental conditions might have prevented the animals from practising coprophagy. The variation found in the field indicates that such changes due to unusual situations are likely.

Since the results presented here do not show the proportion of their faeces that Capybaras actually recycle, the importance of coprophagy in this species cannot be assessed. However, these results should promote an understanding of the Capybaras' strict grazing habits in a periodically harsh environment and their high digestive efficiency.

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## Observations on the trap-response of wild House mice, *Mus domesticus* Rutty, in poultry houses

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### *Introduction*

The estimation of population parameters from mark-recapture data assumes an equal probability of capture for all members of the population (Seber, 1973; Begon, 1979). Small mammals provide abundant examples for the violation of this assumption in practice (e.g. Rowe, 1970; Stoddart, 1982).

In the House mouse (*Mus domesticus*, Rutty), numerous factors can affect the probability of being trapped. These include trap odours (Rowe, 1970), trap shyness/addiction (Young, Neess & Emlen, 1952; Crowcroft & Jeffers, 1961), and social interactions (Hurst, 1984). During an intensive study of a high-density House mouse population in a poultry house, we were able to record the extent of urine marking of Longworth traps. In a short experiment, we were also able to record the behavioural response of wild mice to the traps, and to compare the behaviour of previously trapped animals with that of mice that had never been trapped. The results are important for the interpretation of mark-recapture data for all small mammal populations studied with Longworth traps.

### *Urine marking of traps*

The dusty atmosphere of the poultry house allowed easy identification of urine marks on the exterior surfaces and inside the tunnels of the traps. Of the 425 traps set, 93% were marked with mouse urine overnight, but only 56·5% caught any mice. The traps that caught mice were marked more frequently ($\chi^2 = 39{\cdot}5$, $P < 0{\cdot}001$) and more extensively than other traps ($\chi^2 = 78{\cdot}6$, $P < 0{\cdot}001$). Even so, half of the unsprung traps were marked inside the tunnels and trap entrance, and 82% were marked on the outside. The degree of marking was scored as a percentage for each trap and the results are summarized in Table I.