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## Commentary

# Reproductive behavior of donkeys (*Equus asinus*)

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### Abstract

This article briefly reviews the social organization, reproductive patterns, and sexual behavior of free-ranging donkeys. Brief comments are also included on hand-breeding of donkeys and crossbreeding of horses and donkeys to produce mules. © 1998 Elsevier Science B.V. All rights reserved.

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### 1. Social organization

Feral and free-ranging domestic donkeys (*Equus minus*) have a territorial social system (Klingel, 1977; Woodward, 1979; McCort, 1980; Henry et al., 1991) as opposed to the harem system typical of horses and some zebras (Klingel, 1975). The composition and degree of stability of territorial groups varies with particular populations studied. In some populations, each breeding male holds his own territory through which solitary females with their young pass (Woodward, 1979). Jennies in estrus are bred by the breeding male holding the particular territory. Jennies travel, often over large areas, as solitary individuals with their young or in small, loosely affiliated groups of two or three jennies and their young. Subordinate nonbreeding males are more or less tolerated by the territorial breeding males as they pass through or reside in their territory. In contrast to this simple territorial system, populations have been identified in which jennies tend to stay within particular territories and have a more stable affiliation with the breeding male and other jennies in the territory, in a semi-harem type territorial breeding group (McCort, 1980). In some populations, there are groups in which subordinate males are allowed to breed some of the jennies within the territory of a dominant jack, usually

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following mating by the dominant jack (McCort, 1980). These subordinate jacks typically also assist with territorial defense and marking of excrement of the jennies (McCort, 1980). Territorial boundaries appear to be announced acoustically and in some instances marked with fecal piles. The territory is defended against intruding adult males, particularly fiercely when one or more jennies within the territory is in estrus. Nonbreeding males may form all-male bachelor groups which have their own territory or which wander through, or on the fringe of, breeding-male territories. In some instances, one or more nonbreeding males may form a relatively stable submissive alliance with a territorial breeding male, remaining within the territory, assisting with territorial defense, and sometimes gaining access to territorial females.

## 2. Reproductive patterns

Ovarian activity, pregnancy and parturition appear to be much less seasonal in domestic and feral donkeys than in wild asses (McCort, 1980; Ginther et al., 1987; Henry et al., 1987). The short-day anovulatory season in domestic jennies is approximately 165 days, with a high incidence of anovulatory estrus which is brief and frequent (Henry et al., 1987). The long-day ovulatory season then is approximately 200 days. The interovulatory interval is approximately 24-25 days (Ginther et al., 1987). The mean length of ovulatory estrus is about 6 days, with ovulation within the last 1-2 days of estrus (Ginther et al., 1987; Henry et al., 1991). Gestation length is 12 months.

## 3. Estrus

The particular elements of estrus in the jenny include: lowered head with neck extended forward, opening and closing of the mouth, ears back against the neck, hind legs splayed, one foreleg slightly back and the other slightly forward, tail raised from the perineum, and presentation of the perineum toward the jack (McCort, 1980; Clayton et al., 1981; Vandeplassche et al., 1981; Henry et al., 1991). Of these elements, the most conspicuous and unique to the jenny are mouth movements known as *jawing*, *yawing*, or *clapping*. This is the opening and closing of the mouth with the lips relaxed, the head and neck lowered and extended forward, and the ears back against the neck (Fig. 1). The mouth movements make a characteristic sound which is audible to humans at a distance of up to several meters. Certain elements of donkey estrus portray ambivalence. These include the tendency for quick movement forward a few strides away from the jack followed by an abrupt stop and solid estrus stance, abbreviated double hind-leg lifts reminiscent of kick threats, and mild tail swishing and hip swaying. All of these can occur in a single precopulatory interaction that ends in full estrus stance and copulation. The transition from the muted nonreceptive aspect to the clearly receptive counterpart typically appears to be the key behavior eliciting mounting by the jack (McDonnell, unpublished observations).

When more than one jenny is in estrus within a territory, they tend to form a sexually active group, reminiscent of sexually active female bovids (Henry et al., 1991). The

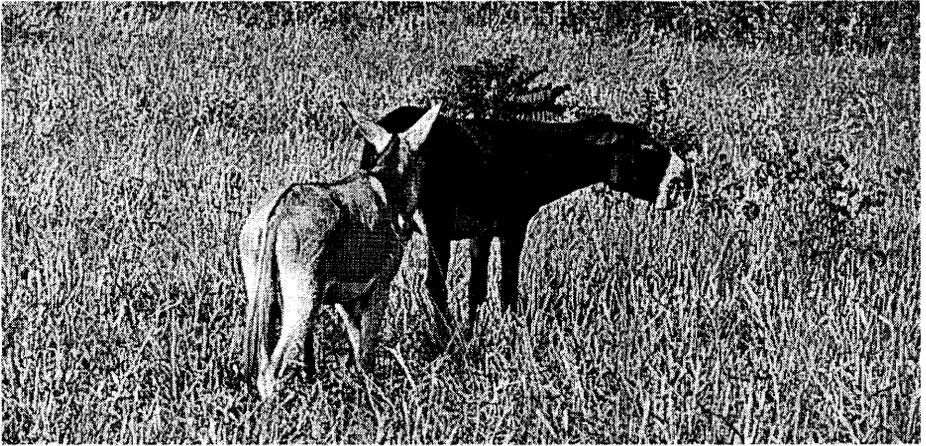


Fig. 1. Jenny in background in typical estrous posture with jawing and ears back against the neck. Jack in foreground achieving erection is at a distance from the jenny (telephoto lens underrepresents actual distance).

jennies cluster a short distance away from the jack and his preferred resting area (Fig. 2). Jennies in the sexually active group are noticeably more active than the other jennies within the territory. They periodically vocalize toward the jack and exhibit heterotypical and homotypical sexual behavior within the group. Heterotypical behaviors include mounting, herding, chasing, sniffing and nibbling, olfactory investigation and covering of each other's urine and feces with urine and/or feces, and flehmen. Homotypical behaviors include all those elements of estrus in response to a jack as described earlier. The activities of the jennies in the sexually active group appear to attract and hold the attention of the jack. When the jack is teasing or breeding one jenny, the others in the sexually active group cluster near the mating pair, often with a burst of sexual interaction among the jennies.

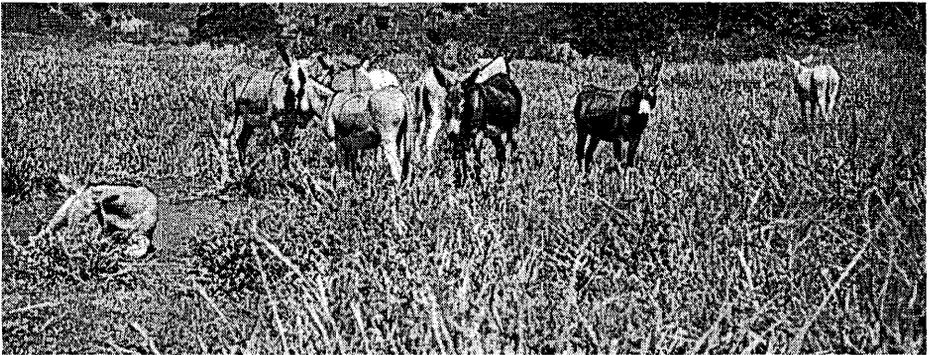


Fig. 2. Sexually active group of jennies lingering near the jack who is recumbent in his preferred resting area.

#### 4. Diestrus

Diestrus includes: running away from the jack, turning away and moving off rather than stopping abruptly, swaying of the hips side-to-side and away from the jack, clamping of the head of the tail against the perineum while swishing the distal portion of the tail, kicking out with full extension of both hind legs, a grunting vocalization, and biting the jack.

#### 5. Male sexual behavior

Jack sexual behavior includes territorial boundary defense, investigation and covering of jennies' excrement with urine, and tending the sexually active group or individual estrous jennies. Little ongoing attention is paid by the jack to jennies not in estrus, other than investigation and covering of excrement. In tending the sexually active group, the jack typically spends most of his time in one small resting and grooming area (Fig. 2). Periodic vocalizations by the jack appear to keep the sexually active group near the resting area of the jack and to stir sexual activity among the jennies. At the same time, the jack appears to keep the jennies at a tolerable distance from his resting area by rebuffing them with threatening postures if they get too close. Pre-copulatory behavior includes: naso-naso contact; nibbling and/or sniffing of the head, neck, back of the knee, body, flank, perineum and tail; olfactory investigation of voided urine or feces; and flehmen. The jack typically interacts with jennies in a series of brief episodes, interrupted by a retreat to his resting area.

In a study of pasture-breeding donkeys (Henry et al., 1991), we observed what appeared to be an intercopulatory cycle of behavior by the jack. This cycle consisted of



Fig. 3. Mounting without erection of one jenny immediately preceding copulation of another jenny shown in Fig. 4.



Fig. 4. Copulation at the moment of ejaculation.

vocalization from the resting area, approach to the sexually active group and intense teasing of one or more jennies, retreat to resting area and ambivalent 'eyeing' of the sexually active group, one or more sudden approaches to the sexually active group, with brief teasing or mounting without erection (Fig. 3) retreat back to the resting area, sudden erection while still in the resting area, with immediate approach to a jenny and quick copulation with minimal or no precopulatory interaction at that time (Fig. 4), retreat to the resting area, rest, roll and groom, spontaneous erection and masturbation, grazing, and rest. The cycle spanned roughly 90 min. Each jack appeared to have a preferred area of his territory within which these activities occurred and a preferred resting area into which no other donkeys were permitted.

Spontaneous erection and masturbation occur at the same rate as in other equids, at about one episode every 90 min. For other equids, this behavior is independent of environment, housing, sociosexual conditions, exposure to breeding, or age (McDonnell et al., 1991).

## 6. Hand-breeding donkeys

Donkeys have long held the reputation of being slow and difficult to hand breed. As a result, most are bred at pasture or in paddocks where they are allowed free interaction with one or more jennies. By comparison to horse stallions, jacks typically take a long time to achieve erection and mount when handled for breeding. They also tend to proceed with erection only after mounting without erection, as is the normal sequence for free-ranging jacks. The jack also appears to need enough space and liberty to approach and retreat from the jennies as is done under free-ranging conditions. For some jacks, erection is most often achieved when they are at a distance from the jennies. Hand-breeding is also usually more efficient when the jenny is given enough space and liberty to 'dart and stop'. Breeding or semen collection can also be more efficient if two or more jennies are allowed to interact as a sexually active group (Henry, unpublished

observations). Jacks also appear to be easily distracted by other males, and will typically breed more efficiently if isolated from other jacks during the breeding process.

## 7. Interspecies breeding

Mules are the result of crossing a donkey jack with a horse mare. Lodi et al. (1995) compared field breeding behavior of jacks pastured with jennies to that of jacks pastured with mares. She found that the jacks with mares continued to behave in a territorial fashion, not actively herding or teasing the mares as a horse stallion would. The characteristic jack-type approaches and retreats resulted in threats and rebuffs from the mares. Jacks continued periodic vocalizations, which evoked little response from the mares. Mares rarely approached the jacks as they would a stallion, and did not form a sexually active group. Actual copulation pattern and duration for jacks breeding mares are similar to those for jacks breeding jennies. Poor fertility results were attributable to these behavioral differences.

Traditional wisdom has been that young jacks raised with horses are more successful at breeding horse mares. This has apparently not been systematically demonstrated, and remains an intriguing area of study.

## 8. Summary

In summary, donkeys have a territorial social system. Group composition and size, dominance relationships, and access to breeding vary considerably among populations studied. Several aspects of male and female sexual behavior are unique to donkeys and are particularly different from that of horses.

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