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Behavioral Aspects of Conservation and Management of Umblachery Cattle

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Abstract: Cattle production makes a valued and essential contribution to human life. Many of the cattle breeds with whom we share our countries are going extinct because we overexploit them or destroy their habitat. Cattle breeds extinction and habitat destruction have an immediate impact upon many economic and social activities. Tamilnadu is one of the richest biodiversity of livestock in the world and also known for home of many recognized draught cattle. Among those, Umblachery cattle endowed with unique quality like tolerance to heat and humidity, diseases resistance and ability to survive under several stress conditions. The reproductive performance of Umblachery breed cattle has declined. Reproductive performance is essential to effective management and production of cattle. Based on the above information, the present review aimed to observe the behavioral patterns of Umblachery cow estrous cycle in field condition. During behavioural study various behaviours were observed in the female cow and bull towards female cow were also recorded. Among the various behaviors exhibited by cow, viz. restlessness, increase locomotion, weight loss, reduced feed intake, reduced milk secretion, frequent urination, vaginal mucus discharge, vaginal swelling, hyper salivation, tear discharge, bellowing, standing heat, self-grooming and allogrooming were intense during estrus. At times, the female cow was involved in the homosexual behavior like flehmen and mounting. The behaviors exhibited by female cows were categorized based on the intensity of expression. The behaviors like body rubbing, licking, sniffing, flehmen, mounting, penis erection and copulation were observed in bull, which encountered with cow in estrus. Animal behavioral assay for male and female is used for determine the animal reproductive status to improve conservation and management of livestock production.

Key words: Reproduction · Behaviours · Conservation · livestock production · Umblachery cow

INTRODUCTION

Umblachery cattle breed is known for wetland ploughing and the animals can be managed with low input system. This cattle breed is present in Nagapattinam, Thanjavur and Thiruvarur districts in Tamil Nadu state. These cattle breeds are maintained in farms or group of herders. The Umblachery is a medium sized draught type of cattle. The head is straight and moderate in width with pronounced white markings in the forehead, foot and tail. The cow yields up to 3 litres of milk per time with lactation period of 6-10 months. One pair of bullocks can carry about 2 tonnes of agricultural produce through bullock cart. The animal requires least maintenance and it thrives well with paddy straw.

Umblachery Cow and Bull

The original breed present in Umblachery, Thalaignayiru, Korkai, Wattakudi, Aymur, Vadugur. At present famers are allowing their cows to be inseminated with Jersey cross breed due to lack of availability of semen of native breed or in order to increase milk yield. Based on family heritage, the breed has different varieties such as Attukari Madu, Ganapathiyan madu, Sooriyankattu madu, Venna madu, Mariapillai madu.

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In order to create awareness on conservation of local breeds including Umblachery breed has been undertaken by SEVA. This project has been implemented with financial support from NABARD–FTTF scheme to enhance conducted awareness rising through village level training cum workshops, animal health camps, breeders group meeting, micro credit for members. We promoted Umblachery cattle herders group in Korkai village for strengthening breeding services. But know days the cattle breeds are declined. Feed shortage and reduced fertility are the main reasons of this decline. Even though information on the reproductive behaviour of Zebu cattle is limited [1] it is known that their oestrus is short and behavioural signs associated with this event appear to be less apparent than in *B. taurus* [2]. Estrus-specific bovine urinary chemical cues (pheromones) are identified successfully in our laboratory by gas chromatography linked with mass spectrometry [3]. These pheromonal signals are stimulate the animal reproductive behaviour for successful reproduction.

Reproductive behaviour and mating systems are the main factors in the conservation and management of lives stock because they can have a profound impact on population structure [4]. The population growth and viability is determined many aspects of behaviour are important for conservation, I will concentrate on reproductive behaviour rather than development of mechanism because it is here that the potential benefits for cattle production. Once breed becomes extinct they cannot be recreated. Hence, there is a need to preserve the different livestock breeds adapted to different climatic conditions for sustainable utilization and future exploitation. Based on the above information, the present study focus on the conservation of Umblachery breed with the help of behaviours to detect reproductive status and enhance the natural and artificial reproductive success in this breed. A suggestion for future plan of action has been highlighted.

Behavioural Aspects of Conservation: Cattle are social animals, with complex communication channels and allelomimicry exhibited in much behaviour. Wilson [5] defined an aggregation as a group of individuals of the same species gathered in the same place but not internally organized or engaged in cooperative behaviour. He made a distinction between an aggregation and a true social organization, which he defined as a group of individuals organized in a cooperative manner with reciprocal communication and interactions extending beyond mere sexual activity. The conservation of biodiversity is increasing among the general public as well as among behavioural ecologists who study wild animals and their environment. It is important to define the role that animal behaviour can play in conservation and management. Problems in conservation and management are a subset of the global environmental problems that are of interest to conservation biology. Major ecological problems include the wholesale loss of species through habitat destruction. The introduction of exotic species (Including domestic animals) and the alteration of global biogeochemical cycles. Knowledge of animal behaviour is not the sole key to solving global conservation problems. Indeed, biologists do not make the important decisions that affect species extinction and people's continued ability to benefit from functional ecosystems. Such decisions are the purview of politicians and business leaders, who are primarily interested in political and economic goals and are therefore much more influenced by political and economic processes than by science [6].

Zoologists, including animal behaviourists, clearly play a major role in the conservation of biodiversity by informing decision makers and the general public about the ecological consequences of human activities. Solving the global conservation problems that threaten our quality of life and in some cases our very lives, will require scientific knowledge, but first and foremost it will require a better system of economic valuation of goods and services. Economic externalities such as pollution, habitat destruction and the loss of ecological functions (Including those that provide clean air, safe drinking water and a stable climate) must be incorporated in the evaluation of different activities [7].

Behavioural ecologists typically study the long-term evolutionary consequences of different animal behaviours. As a result, when examining the consequences of human actions, they usually consider a longer timescale than the few years to the next election, or this year's balance sheet, or the time it takes to win one particular court case. It is essential that they transmit such long-term thinking to other sectors of society.

Estrous Determination: The Umblachery cattle oestrous cycle were determined with the help of the conventional oestrus behaviours in female and bull such as, frequent urination, vaginal swelling, restlessness, grooming, female-female mounting, flehmen, male sniffing with female vulva Female Umblachery cattle's are expressed some behaviour changes occur in the reproductive cycle. These behavioural changes are observed from herd person for determination of estrous.

Fig. 1: Frequent urination

Frequent Urination: Urine is one of the source animal communications (Fig. 1). The urine contain the mixture of biochemical like protein, carbohydrate and lipid were present in estrus urine. Particularly the level of protein found to high in estrus urine compared to all other phases. Prabu and Rameshkumar [8] and Gnanamuthu and Rameshkumar [9] were reported that the level of protein found to be higher during estrus period followed by prepubertal, lactation and pregnant. The level of carbohydrates was found to be high lactation period when to all other phases. Similarly the level of lipids was also significantly high during lactation period followed by pregnant, estrus and prepubertal. Further, the level of carbohydrates was higher in all four stages followed by lipids and proteins. Urination in the female involves raising the tail, ceasing any activities, arching the back and sometimes splaying the legs to avoid their becoming wet. In the male urination can be accomplished while walking. A secondary function of urination is to transmit pheromonal information, especially during periods of stress [10] and oestrus [11]. Cattle urinate less frequently than they defecate, on average about ten times a day [12]. At pasture urine presents less of a problem than faeces, although herbage may be scorched at high stocking rates and during dry weather. Cattle prefer to graze pasture that has recently received a urination, perhaps because of the herbage's increased sodium content and will graze it lower than uncontaminated herbage [13]. Most urination takes place while cattle are grazing, not while they are resting. Urination is more frequent when cattle have high liquid intakes.

Vaginal Swelling: Vaginal swelling is one of the indicating factors of oestrous detection in farm animals (Fig. 2). Ldpez-Gatius *et al.* [14] demonstrated that the physical properties of the vaginal fluid and flow behaviour varied during the course of natural oestrus [15]. Fluidity increased at the middle of exhibition of estrus and decreased markedly at the end. The objective of this study was to determine whether rheological properties of the vaginal fluid could be used as an indicator of the optimal time of insemination. Physical properties of cervical mucus such viscosity, flow elasticity and spinnbarkeit have been related estrus and to the time of ovulation in cattle [16-19].

Grooming: Grooming is primarily a body care activity but it has nutritional, communicative and psychological functions. Self-grooming is widely believed to function as a displacement activity [20, 21] and is characterised by licking activities but rubbing of the head and neck (Fig. 3-5) is also common.

Allogrooming (Grooming others) acts as an affinitive behaviour [22,23] and is mainly characterised by one animal licking the head and neck regions of other animals (Fig.3) that are in a similar or slightly subordinate position in the dominance order. All animals in a herd are groomed but only about three-quarters of the animals in a herd do the grooming [24]. As preferred partners are often kin, allogrooming may thus function not only to maintain dominance position but also to reinforce family bonds and those between adult cattle. Fraser and Broom [25] also attribute dopaminergic functions to allogrooming, suggesting that since the hormone prolactin is known to be associated with grooming and also dopaminergic activity, grooming may, via prolactin, cause opiate induction and self-narcotisation. The fact that allogrooming is increased in more intensive environments, where stereotypies are often performed for self-narcotisation, supports this hypothesis. According to Reinhardt and Reinhardt [23] Zebu cows with high social position are more likely to receive more attention such as grooming by other members of the herd, particularly the submissive females.

Female-Female Mounting: The reproductive strategy of cattle are typical for mammals, they differ by being essentially bisexual, with both sexes frequently exhibiting hetero- and homosexual behaviour (Fig. 6-8). Homosexual cow behaviour was used in feral herds as a visual signal that the herd contained receptive cows. There has also probably been human selection for this trait for as long as the sexes were kept apart, to indicate when a cow was ready for mating or insemination. The mounting cow is usually close to oestrus herself and by drawing attention to the receptive cow; she is also drawing attention to herself and the sexually active group as a whole. Thus the mounting cow is signalling to the bull. This change is attention to a new cow in oestrus. This should not present difficulties for the male.

Fig. 2: Vaginal swelling

Fig. 3-5: Grooming behaviour of cow

Fig. 6-8: Female-female mounting activity

The stimulus for one cow to mount another is provided by the rump of the oestrous cow. Female–female mounting also involves pelvic thrusts in approximately 50% of cases. It is not clear what the immediate physical reward for the mounter is. Does she feel any satiation of libido during this potentially dangerous behaviour? The benefits for the mounted cow are more easily explained. Cows mounted by a bull experience a lowering of the electrical resistance of the skin immediately after the bull's ejaculation, suggesting an orgasm-like response [26]. Probably a similar though weaker sensation is achieved by the rump pressure of a mounting cow, particularly during pelvic thrusting. This may be caused by pressure on the clitoris and vagina and is likely to be confined to the receptive period. Indeed genital stimulation helps to induce and synchronise oestrus via the hypothalamus. During oestrus the electrical resistance of the vaginal epithelium [27] and mucus [28] decreases markedly, allowing small pressure changes to trigger large electrical responses. The importance attached to homosexual mounting is demonstrated by the fact that cows even perform it in the presence of a bull. Both environmental and animal factors influence the frequency of homosexual mounting behaviour and therefore are of importance for detection of oestrus by the herdsperson.

Head to Head Interaction: The head to head interaction is very interactive to both sexes. It is effective motivation of animal sexual mating. The symptoms of aggression during oestrus may occur during circling behaviour when the cows engage in sniffing and licking each other's vaginal area, but more often takes the form of head-to-head tussles and butting the flanks. If we assume that the increased aggression arises from internal motivational forces rather than difficulties encountered in forming novel associations, it may enable an oestrus cow to fight for the attention of her intended partner, male or female. It may also serve to dissipate the increased motivation for activity that oestrous cows possess. Activity increases occur for virtually all oestrous cows (Fig. 9, 10, 11).

In this situation the bull cannot present in the herd group the female involved in the same behavioural pattern (Homosexual) for decrease the stress, tension and other purposes (Fig. 12, 13).

The Immature Reproductive Behaviour: Mounting behaviour commences in calves as early development mainly between the fourth and tenth month, especially between male calves (Fig.14,15). Males are more often mounted than females during the prepubertal period, which may reflect their tolerance of this behaviour rather

Fig. 9-11: Head to head interaction in Male-Female

Fig. 12,13: Head to head interaction in Female-female

Fig. 14,15. Immature bull behaviour

than any sexual preference. Female calves often reject mounting attempts [29, 30] perhaps to prevent any unwanted pregnancy before they are mature. Males gradually learn to target their advances to receptive females, but in feral herds they are inhibited from most mounting with females by the dominant male at ten months of age. By 16 to 18 months they have learnt to distinguish the finer points of oestrous exhibition.

Visual Communication: Visual observation is a commonly used method of heat detection. It involves a trained observer's recognizing and recording signs of heat. Observable signs of heat include mounting or attempting to mount other cattle, standing to be mounted by other cattle, smelling other females, trailing other females, bellowing, depressed appetite, nervous and excitable behaviour, mud on hindquarters and sides of cattle, roughed up tail hair, vulva swelling and reddening, clear vaginal mucous discharge and mucous smeared on rump.

Visual signals are one of the most important means of communication in cattle. Grazing mammals have wide-set eyes and panoramic vision, an adaptation for survival as prey animals. Their angle of vision is approximately 320°. Cattle have only 1/22 to 1/12 the visual acuity of humans [31]. The female oestrous behaviour symptoms like self grooming, female-female mounting, tail raising and other behaviours are first visually determine by male (Bull) (Fig.16) and confirmed in olfactory communication.

Olfactory Communication: Bovine species mainly communicate with olfaction than other species. Olfactory signals have an important role in facilitating reproduction. Bull use olfactory cues to detect oestrous cow. The bull will sniff the vulval region of the cow and any urine that is voided (Fig. 17). Often the bull will then exhibit a flehmen response. Volatile compounds, such as oestrogens in the urine of the ewe, are thought to be detected by the bull's vomeronasal organ. Olfactory signals from bull also act as a reproductive signal for cow. The movement of fully mature bull into the cow groups at the start of the breeding season helps to stimulate and synchronize the onset of oestrus.

Odours are received through both the nose and the vomeronasal organ in cattle. The vomeronasal organ is particularly involved in receiving pheromones that control

Fig. 16: Bull visually determine cow in estrus

Fig. 17: Bull conform the estrus animal in olfactory senses

aggressive behaviour and the oestrous cycle of cows. Bulls can detect a change in the pheromonal secretions of cows up to four days before the day of oestrus [32]. On the day of oestrus the main olfactory system of nasal detection is operative and the flehman expression is not always used. The ability of bulls to predict oestrus in cows relates to their tendency in wild herds to 'Guard' cows as oestrus approaches. In domestic herds where there is no competition between bulls this does not occur. To test for cows' odours bulls sample the urine of potential oestrous cows and mark the ground with pheromones by rubbing their head and neck on the ground. Homosexual cow relationships appear to be stimulated by sniffing and licking, particularly in the perineal regions (Fig. 17).

The bull exhibits the Flehmen behaviour repeatedly after inhaling the olfactory cues from cows in oestrus [33-35]. Flehmen behaviour helps in the detection of estrus and provides necessary initiation for successful matting [36]. Flehmen behaviour is higher towards oestrus specific samples in goat, elephant, cow and buffalo [37]. Oestrus urine was capable of inducing the Flehmen behaviour in bull [38].

Pheromones are a specialised group of chemical attractants produced by animals to stimulate other animals. They are present in all body fluids including sweat and there are many different types in cattle, including alcohols, diols, alkanes, ethers, diethers, ketones, primary amines and aromatic alkanes. The oestrous pheromones are mainly released from the body surface, particularly the hindquarters and genital region, rather than in urine, faeces or vaginal mucus [39]. Cows in oestrus spend much time sniffing and licking the anovaginal areas of other cows. Bulls respond to odours produced by teaser bulls even more than to pheromones identified in the blood of oestrous cows [40].

Estrous Detection: Each female exhibits signs of oestrus for a certain amount of time during their oestrous cycle. Duration of oestrus and length of the reproductive cycle varies among species. Many species exhibit similar signs of oestrus. However, there are many signs of oestrus that are species specific. There are primary signs and secondary signs that signal the onset of oestrus. Primary signs are the most reliable and secondary signs are less reliable because they vary in length and intensity and may be confused with the symptoms that are the indication of a minor health problem, such increased urination, isolation and decreased intake, often observed with sick or diseased animals. It is easier to observe signs of estrus if there is a sexually active group of animal's together, ones that are approaching heat. Other sexually active females in the group will allow you to observe if the individual is in standing heat when other sexually active females are present to mount her. Without this group, you can rely only on physical and behavioural signs demonstrated by that individual.

Most of the dairy cows are kept in single sex groups and the herdsperson needs to know when individual cows are in oestrus to arrange for them to be inseminated, either naturally or artificially. Beef cows are more often run with a bull, because of the difficulty of detecting the oestrus, which is less intensive and the irregular contact with humans. Many dairy cows are kept unrestrained in a building yard or at pasture and the behavioural changes associated with homosexual oestrous interactions can be detected by the herdsperson. Observation is, however, often restricted to milking times and collection for milking [41] which give a detection rate

of only 50 to 60% of oestrus. Cows display sniffing and chin resting followed by mounting behaviour and then standing heat. Sniffing and chin resting are, however, not useful as predictors of oestrus because they are not displayed by all animals at every oestrus and they are also exhibited at other stages of the estrus cycle with no apparent consistency [42].

The development of more efficient and cost effective oestrous detection techniques for cattle depends on a thorough understanding of the changes in behavior and physiology of the female during its oestrous cycle. Variability in the expression of oestrous behaviours both between individuals and over successive oestrous cycles complicates this process [43] Apart from behavioural changes, the herdsperson can look at changes in milk yield to assist in decisions about whether a cow is in oestrous [44]. At the first milking after the onset of oestrus about 80% of dairy cows withhold some of their milk and yield and fat content are reduced. In these cows there is a compensatory increase in yield at the second milking after the onset of oestrus [26]. Management practices, housing environment, nutrition, genetic factors, age and physiology status can also affect the manifestation of overt signs of estrus [43]. Roelofs *et al.* [45] concluded that for an oestrous detection method to be useful in practice, the measurements should be easy to carry out, repeatable and preferably automated. In their study, the interval between onset and end of oestrus varied almost threefold among individuals. Because of this variability these two events are not useful forecasters for time of ovulation.

During the receptive period (Oestrus) the female produces conspecific chemical signals through excretion. These signals (Pheromones) serve as sexual attractants including sexual arousal and mating behaviour [15]. It is reported that the timing of the physiological events of ovulation and co-ordination of sexual behaviour ensure the successful fertilization [46]. It is well documented that the female produces a specific odour during oestrus through urine [3, 47, 48] faeces [49] vaginal fluid [50, 51] and specialized scent glands [52] which constitute a major source for chemical communication in mammals [53] and may be considered an accurate indicator of female receptivity [54, 55].

The accurate detection of oestrus in cattle is probably the single most important issue limiting the use of artificial insemination and embryo transfer in the developing world. Until now, standing oestrous behaviour has been the principal sign used to determine the right time for insemination. However, standing oestrous behaviour is observed in less than 50% of the cows in oestrus [56, 57].

CONCLUSION

Oestrous detection in farm animals is dependent upon the observer paying close attention to the behaviour and physical changes of the female experiencing estrus. Aids are available to assist the herds-person checking for signs of heat, but these aids should never be the sole indicator of estrus, because they can be unreliable. The best method of estrus detection is by observing primary signs exhibited by the female in response to the male. Estrus detection is a valuable tool for use in artificial insemination techniques, hand mating and for use of predicting parturition dates. The effectiveness of detecting oestrous in cattle varies, depending on method used. Consider the cost, labour and management system associated with each method in deciding on the best approach to oestrous detection. The purpose of heat detection also determines the level of heat detection accuracy needed. For more information on cattle conservation and management

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