

E. Mukasa-Mugerwa<sup>1</sup> | **Parturient behaviour and placental characteristics of *Bos indicus* cows**  
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MUKASA-MUGERWA (E.), MATTONI (M.). Comportement au vêlage et caractéristiques du placenta de vaches Zébu (*Bos indicus*). *Revue Elev. Méd. vét. Pays trop.*, 1990, 43 (1) : 105-109.

Les signes d'une mise bas imminente, le comportement lors du part et les caractéristiques du placenta ont été étudiés sur des vaches Zébu éthiopiennes des Hautes Terres. L'inflammation de la vulve, le relâchement du ligament pelvien et le gonflement de la mamelle sont les manifestations qui l'accompagnent. Elles ont été observées respectivement  $6,2 \pm 4,0$ ,  $2,5 \pm 1,9$  et  $1,6 \pm 0,9$  jours avant la mise bas. L'écoulement du mucus vaginal a été constaté  $9,2 \pm 4,8$  jours avant le vêlage pour 52,6 p. 100 des vaches. Le taux de dépistage des signes d'une délivrance prochaine a donc atteint 77,6 p. 100. L'intervalle moyen entre l'agitation et le commencement du travail jusqu'au vêlage a été de  $3,72 \pm 2,01$  et de  $2,41 \pm 1,37$  heures respectivement. Les durées entre l'agitation et l'apparition de l'allantochoirion (phase I), entre l'apparition des membranes foetales et le vêlage (phase II) et entre le vêlage et l'expulsion du placenta (phase III) ont été respectivement de  $2,58 \pm 1,93$ ,  $1,32 \pm 0,9$  et  $2,50 \pm 1,14$  heures. La durée moyenne entre l'apparition de l'allantochoirion et la délivrance était plus longue pour les mâles avec  $1,55 \pm 1,05$  contre  $0,83 \pm 0,42$  pour les femelles (également en heures). Le poids moyen des veaux à la naissance était de  $20,8 \pm 2,6$  kg. Ce poids a augmenté avec la durée de la gestation ( $r = 0,52$ ,  $P < 0,5$ ) ainsi qu'avec le poids du placenta ( $r = 0,15$ ). Pour conclure, et sous réserve de connaître la date de la saillie, la date de la délivrance peut être prédite et l'assistance obstétricale donnée en temps opportun pour éviter les dystocias sur les vaches Zébu éthiopiennes. *Mots clés* : Vache Zébu - Placenta - Parturition - Comportement - Éthiopie.

## INTRODUCTION

Data from cattle indicate a tendency towards increased calving difficulty (dystocia) when the sire of the transferred embryo is of a larger breed or when the dam is a heifer (27). Further, the most frequent birth-related problems in cattle are calving difficulty (dystocia) and retained placenta (4) and about 6.4 % of potential calves die around delivery time (5), 72 % from dystocia (1). Such reproductive wastage depresses net calf crop. In addition, the post-partum reproductive performance of dams experiencing dystocia is frequently depressed (7, 9, 16). On the other hand, over 50 % of the calf losses due to dystocia could have

been prevented by timely obstetrical assistance to affected dams (24). Similarly, extensive data are lacking among *Bos indicus* cattle. Yet, these animal types are being crossed with sires from larger selected and improved (*Bos taurus*) breeds from temperate areas to increase milk and meat production in the tropics (15, 17).

Dystocia arises from foetal pelvic incompatibility, abnormal presentation, weak labour, uterine torsion, and insufficient cervical dilation (18). It is due to the calf (26) or dam (31) and can be scored (9, 24).

The purpose of this study was to (i) highlight the relationship between gestation period, cow weight, calf birth weight, sex and parturient behaviour of Ethiopian zebu cows bred to a large sized bull, (ii) describe the placental characteristics and (iii) estimate the duration of the three stages of parturition in these cow types.

## MATERIALS AND METHODS

This study was undertaken using 19 multiparous Ethiopian Highland zebu cows from a herd of 42 animals maintained at the ILCA Debre Berhan experimental station. The station is located at an altitude of about 2850 metres, 120 km north of Addis Ababa. It has an annual rainfall of 977.4 mm (1979-1986) of which 70 % falls during the heavy rain season from June to September and the rest in small showers from March to April (21). The cows were bred naturally to a 3/4 Friesian (*Bos taurus*) x 1/4 Boran (*Bos indicus*) bull. Animals grazed during the day, but were penned and fed 2 kg grass hay each in an overnight enclosure. Minimal artificial lighting was available to monitor nocturnal behaviour. Cow body condition scores were 5 to 6 at calving (20).

Cows were under constant observation for one month before calving which was predicted using a gestation length of  $283 \pm 3$  days (19). The date and time of occurrence or duration of the following signs were recorded :

— (i) imminent or impending parturition : udder fill-

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out, vulva swelling, relaxed pelvic ligaments, vulva mucus discharge, udder oedema and colostrum leakage.

— (ii) parturition: restlessness, labour onset, abdominal pains, presence of allantochorion (water bag), rupture of amnion, appearance of calf feet, calf on the ground and, placental expulsion (6).

In addition calf birth weight, cow post-partum weight, cow body condition score, calf sex, placenta weight and number of cotyledons were recorded. The following stages of parturition were identified: stage I lasted from restlessness to the occurrence of the allantochorion, stage II from occurrence of the allantochorion to calf delivery and stage III from calving to spontaneous placenta expulsion.

## RESULTS

All parturitions occurred from February to April 1988. No twin birth, dystocia or still-births were recorded. Nearly as many calvings occurred during the day (0.600 to 1.800 h) as during night (47.4 vs 52.6 %, respectively). Table I gives the average values for the time of occurrence of the symptoms of imminent parturition and duration of calving. There was a considerable between-cow variation (CV = 45.6 to 94.0 %) for most events.

Among the symptoms of impending parturition, udder enlargement occurred over a much shorter period (1

**TABLE 1** Average data for the external signs of parturition in zebu cows, as deviations in days (d) or hours (h) before or after calf delivery.

Parameter	Deviation before or after delivery			
	n	Avg.	Std. dev.	Range
Udder enlargement (d)	14	1.6	0.88	1-4
Vulva swelling (d)	18	6.2	4.0	1-15
Pelvic ligament relaxation (d)	17	2.4	1.9	1-9
Vagina mucus discharge (d)	10	9.2	4.8	0-19
Restlessness (h)	16	3.72	2.01	0.91-8.28
Labour onset (h)	16	2.42	1.38	0.68-4.55
Abdominal pains (h)	16	1.93	1.33	0.41-3.88
Sight of allantochorion (h)	15	1.32	0.94	0.33-3.41
Rapture of allantochorion (h)	16	0.85	0.61	0.13-2.40
Appearance of calf feet (h)	16	0.50	0.47	0.75-4.85
Placenta expulsion (h)*	13	2.50	1.14	0.75-4.85

\* Three placenta were expelled almost immediately after calving.

to 4 days before calving) than vulva swelling, relaxation of the pelvic ligaments and vulva mucus discharges which were spread over a 1 to 19-day period. Vulva swelling was observed in 18 cows  $6.2 \pm 4.0$  (mean  $\pm$  SEM) days before calving. This was followed by a relaxation of the pelvic ligaments and udder enlargement  $2.4 \pm 1.9$  (n = 17) and  $1.6 \pm 0.9$  (n = 14) days before calving, respectively. However, mucus discharge was exhibited by only half the cows (n = 9; 47.3 %),  $9.2 \pm 4.8$  days prior to calving. No udder oedema or colostrum leakage was recorded. Altogether 59 observations of imminent parturition symptoms were recorded from the 19 calvings, i.e. about 3.1 symptoms per delivery. This gave a detection rate of 77.6 %.

During parturition, cows became restless  $3.72 \pm 2.01$  hours before calving. Cows walked aimlessly between frequent rest periods during which they often laid down and got up. Cows appeared absent-minded, but otherwise alert. Many licked or kicked their flanks while some isolated themselves or appeared to be left behind by the rest of the herd. The mean interval from restlessness to the appearance of the allantochorion (stage I) was  $2.58 \pm 1.93$  hours.

Restlessness was followed by calmness and restricted movement. When left undisturbed, cows appeared to identify a circumscribed area for calf delivery. Labour onset occurred  $2.42 \pm 1.38$  hours before calving. Cows laid down and repeatedly shifted their position. This was followed by a period characterized by abdominal pains and straining about  $1.93 \pm 1.33$  hours before calving. There was no significant difference in the interval from labour onset to calving for male or female calves (2.6 vs 3.0 hours, respectively).

The interval from the appearance of the foetal membranes to delivery (stage II) averaged  $1.32 \pm 0.9$  hours. The foetal membranes (water bag) ruptured  $0.85 \pm 0.61$  hours before delivery. Many cows stood up and sniffed the first discharge of foetal fluids which were recorded for  $0.64 \pm 0.47$  hours followed by the appearance of calf feet  $0.50 \pm 0.47$  hours before calving. The interval from the appearance of the calf's feet until it was finally delivered, a measure of calving difficulty (18), ranged from 45 to 291 min (0.75 to 4.85 h). All calves were delivered in an anterior presentation, dorsal position and extended posture. Seventeen (89.5 %) calves were delivered while the cow was lying down. Two dropped to the ground when the dam stood up at mid-delivery.

The interval from calf delivery to spontaneous expulsion of the placenta (stage III) averaged  $2.50 \pm 1.14$  (range 0.75 to 4.85) hours. However, in three cases involving female calves, membranes were expelled almost simultaneously with the calf. Although placenta retention time was longer after delivery of a male than after that of a female calf ( $2.31 \pm 1.06$  vs  $2.84 \pm 1.31$  hours, respectively), this difference was not signifi-

cant. Mean birth weight was  $20.8 \pm 2.6$  kg with no significant difference between male ( $21.5 \pm 2.7$ , range 17.0 to 24.5 kg,  $n = 10$ ) and female calves ( $20.1 \pm 2.5$ , range 15.0 to 23.5 kg,  $n = 9$ ). Dam pre- and post-partum weight (range 195 to 315 kg) was positively but non-significantly ( $P > 0.5$ ) correlated with calf birth weight ( $r = 0.13$  to  $0.16$ ). However, calf birth weight was significantly related ( $r = 0.52$ ,  $P < 0.5$ ) to gestation length which averaged  $283.1 \pm 3.5$  days.

The mean weight of the foetal membranes (placenta) was  $2.7 \pm 0.5$  (range 2.0 to 4.5) kg. The average number of cotyledons (placentomes) per placenta was  $70.7 \pm 18.6$  (range 41 to 112). Heavier cows tended to drop heavier foetal membranes ( $r = 0.46$ ,  $P < 0.5$ ). Consequently, heavier calves were frequently associated with heavier membranes ( $r = 0.15$ ) and more placentomes ( $r = 0.36$ ). Larger calves were delivered later after labour onset ( $r = 0.10$ ).

## DISCUSSION

Signs of imminent parturition recorded in this study were fairly similar to those observed in *Bos taurus* cattle (29). The large variation between cows (CV = 53 to 79 %) was partly attributed to difficulties in precisely defining the start of these gradual processes. Moreover, Ethiopian zebu cattle have not been selected for dairy purposes. As a result, signs related to udder oedema and colostrum leakage were not observed. Furthermore, even in *Bos taurus* cattle, udder oedema was mainly observed before first calving, (BERGLUND *et al.* 6). These authors noted that udder enlargement started 1 to 2 weeks prior to calving, earlier than the 1 to 4 days recorded in the present study. In contrast, the present timing of vulva enlargement and relaxation of the pelvic ligaments was in closer agreement with these authors. The value of 3.1 signs of imminent parturition per calving reflected our ability to detect these signs and the dam's ability to express them. There are no other data on this in zebu cattle. In the event, this value gave a detection rate of 77.6 % and was regarded as favourable.

The present observation according to which as many calves were delivered during the day as during the night agrees with several previous authors (12, 14, 23, 32). This finding, however, disagrees with ARTHUR (2) who reported that two-thirds of calvings in housed cattle took place from 18.00 to 06.00 hours and EWBANK (13) who estimated that 64 % of the calvings occurred during the day. Consequently, there does not appear to be conclusive evidence that cows give birth more frequently to calves at a given time of the day than at other times (1, 23).

The wide range observed in the time from restlessness to calf delivery (0.91 to 8.28 h) indicates that the parturition process in zebu cattle can either be very short or long. The present estimates of  $2.58 \pm 1.93$  and  $1.32 \pm 0.90$  hours for stage I and II duration, respectively, are in keeping with  $144 \pm 19$  and  $66 \pm 8$  min (2.4 and 1.1 hours) obtained by BERGLUND *et al.* (6). However, our estimate of  $2.50 \pm 1.14$  hours for stage III was shorter than that observed by these and other authors (6, 10, 11). We observed that while the interval from labour onset to parturition (stage II) was the same following the delivery of male and female calves (2.6 vs 3.0 hours), as previously reported for *Bos taurus* cattle (6, 14, 22), the interval from the appearance of calf feet to delivery was actually longer for male than for female calves (0.59 vs 0.36 hours, respectively). This agrees with the  $40.2 \pm 5.1$  and  $20.8 \pm 6.2$  min reported by OWENS *et al.* (23). DOORN-BOS *et al.* (7), made a similar observation even though the difference recorded was only 8 min. These observations seem to suggest that while calves may actively participate in assuming the normal position presentation and posture, their dams assume more responsibility for final calf expulsion. Male calves take longer to be delivered and are associated with more calving difficulties. We also estimated that the interval from the appearance of the calf feet to delivery (a measure of calving difficulty) was longer for male than for female calves ( $1.56 \pm 1.05$  vs  $0.84 \pm 0.43$  hours, respectively). This may be attributed to their higher birth weights which may also be influenced by the gestation period. But other observations must confirm these results. Male calves are carried for 4-5 days more (28,29) which may result in a higher birth weight. In Ethiopia, it has been estimated that for each kg increase in birth weight cows carried their calf 0.7 day longer (3).

The present estimate of 0.75 to 4.85 h for the expulsion of the placenta is within the range of previous values of 2 to 6 hours (1) for *Bos taurus* and 5.16 hours reported for Ongole zebu cows (28). We additionally observed, as did GEORGE and BARGER (14) using Hereford cows, that the foetal membranes were expelled later following the delivery of a male calf (2.84 vs 2.31 hours, respectively).

There are limited data on the placental characteristics of zebu cows. Our results show that the placenta was about 1 % of the calf birth weight and 13 % of the post-partum dam weight. Respective values obtained in Ongole cows (31) were 0.66 % and 10 %. The disparity probably arose from breeding the small Ethiopian Highland zebu to a large sized sire.

The present estimate of 70.7 cotyledons per placenta agrees with the 69 reported by STICKLAND and PURTON (30) for zebu cattle. It is important to note that heavier calves tended to be delivered by heavier dams and with heavier membranes and more cotyle-

dons. As a consequence, since heavier membranes tended to come from the heavier dams, the importance of adequate pre-partum dam nutrition is emphasized.

## CONCLUSION

Few studies are reported on the periparturient behaviour of *Bos indicus* (zebu) cows. The present data, however, show that they exhibit basically the same signs and stages previously associated with delivery in *Bos taurus* cows. Vulva swelling, pelvic ligament

relaxation, udder enlargement and, sometimes, vaginal mucus discharge, are reliable symptoms for predicting impending delivery in zebu cows. Larger cows are likely to deliver calves with heavier foetal membranes having a larger number of cotyledons.

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Signs of imminent calving, parturient behaviour and placental characteristics were studied in Ethiopian Highland zebu cows. Vulva swelling, pelvic ligament relaxation and udder enlargement were consistent signs of impending parturition observed  $6.2 \pm 4.0$ ,  $2.5 \pm 1.9$  and  $1.6 \pm 0.9$  days before calving, respectively. Vaginal mucus discharge was observed  $9.2 \pm 4.8$  days before calving in 52.6 % of the cows. The detection rate for signs of impending delivery was therefore 77.6 %. Mean interval from restlessness and from labour onset to calving were  $3.72 \pm 2.01$  and  $2.41 \pm 1.37$  h, respectively. The length of time from restlessness to appearance of the allantochorion (stage I), from the appearance of foetal membranes to calving (stage II) and from calving to placenta expulsion (stage III) was  $2.58 \pm 1.93$ ,  $1.32 \pm 0.9$  and  $2.50 \pm 1.14$  hours, respectively. Average duration from the appearance of the allantochorion to delivery was longer for male calves ( $1.55 \pm 1.05$  vs  $0.83 \pm 0.42$  h, respectively). Mean calf birth weight was  $20.8 \pm 2.6$  kg. Calf birth weight increased with gestation length ( $r = 0.52$ ,  $P < 0.5$ ) and placenta weight ( $r = 0.15$ ). It is concluded that if the service date is known, the time of impending delivery can be predicted and necessary obstetrical assistance given to avoid dystocia in Ethiopian zebu cows. *Key words*: Zebu-Cow - Placenta - Calving - Behaviour - Ethiopia.

MUKASA-MUGERWA (E.), MATTONI (M.). Comportamiento al momento del parto y características placentarias de las vacas *Bos indicus*. *Revue Elev. Méd. vét. Pays trop.*, 1990, 43 (1): 105-109.

Se estudiaron los signos inminentes de parto, el comportamiento al momento de éste y las características placentarias de vacas cebú etíopes de Tierras Altas. La inflamación de la vulva, la relajación del ligamento pélvico y el aumento de volumen de la ubre, fueron signos consistentes de parto, observados  $6.2 \pm 4.0$ ,  $2.5 \pm 1.9$  y  $1.6 \pm 0.9$  días antes del parto respectivamente. La descarga vaginal mucosa se observó  $9.2 \pm 4.8$  días antes del parto en 52.6 p. 100 de las vacas. La tasa de detección de signos de parto inminente fue de 77.6 p. 100. El intervalo promedio desde la agitación y desde el inicio de la labor hasta el parto fue de  $3.72 \pm 2.01$  y  $2.41 \pm 1.37$  hrs respectivamente. Los intervalos promedio desde la agitación hasta la aparición del allantocorion (estadio I), desde la aparición de membranas fetales hasta el parto (estadio II) y desde el parto hasta la expulsión de la placenta (estadio III) fueron de  $2.58 \pm 1.93$ ,  $1.32 \pm 0.9$  y  $2.50 \pm 1.14$  hrs respectivamente. La duración promedio desde la aparición del allantocorion hasta el parto fue mayor en el caso de terneros machos ( $1.55 \pm 1.05$  vs  $0.83 \pm 0.42$  hrs respectivamente). El promedio de peso al nacimiento fue de  $20.8 \pm 2.6$  kg. El peso al nacimiento aumentó de acuerdo a la duración de la gestación ( $r = 0.52$ ,  $P < 0.5$ ) y al peso de la placenta ( $r = 0.15$ ). Se concluye que, si la fecha de servicio es conocida, se puede predecir el momento del parto y ofrecer la asistencia obstétrica necesaria para evitar la distocia en las vacas cebú etíopes. *Palabras claves*: Vaca Cebú - Placenta - Parto - Comportamiento - Etiopía.

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