— 00.37 Einmal Pressen. B und B_K stehen dabei.
— 00.36 Einmal Pressen. B stößt das Tier in die Flanke.
— 00.35 Einmal Pressen. B stößt das Tier an die Brust, es weicht aus, B und B_K folgen.
— 00.34 Abbruch der Beobachtung wegen ungenügender Sicht.

Anschrift des Verfassers: Erwin Meier, Zoolog. Institut und Museum der Universität Zürich, Birchstraße 95, CH - 8050 Zürich

The ovary of the Hartebeest *Alcelaphus buselaphus cokii*, Günther

By F. I. B. Kayanja and M. R. Stanley Price

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In view of current interest in the interaction between domestic stock and wild animals on East African rangeland, and the possible exploitation of the latter, it is clearly desirable to obtain as much information as possible about the species concerned. An investigation of reproduction is especially relevant when different species of antelope occurring in the same area may show considerable differences (Kayanja 1969, 1972; Kayanja and Gombe 1973).

The ovarian material used in this study was obtained from animals collected regularly for a study of the feeding ecology of the species. All animals were collected from the Athi Plains, an area of about 2,000 square km lying to the south of Nairobi in Southern Kenya, at a mean altitude of 1,870 m above sea level.

The hartebeest breeds throughout the year but, as observed in this study, the incidence of births was strongly related to the rainfall at the time of conception. The ecological implications of this seasonality and the effect of nutrition will be discussed elsewhere (Stanley Price 1973).

Materials and methods

The ovaries were fixed in Bouin's fluid and the paraffin wax sections stained with haematoxylin and eosin, Goldner, Azan, the Gomori method for reticular fibres and the PAS reaction. The diameter of follicles and oocytes were measured. Using the protein binding method the plasma progesterone content was estimated in two hartebeest carrying foetuses 35 cm and 44 cm crown rump length; but having no corpus luteum in either of the ovaries.

Observations

On the average the ovary of the hartebeest weighed 1.5 g and measured 1.8 cm × 1.0 cm × 1.5 cm in length, thickness and height respectively (Fig. 1). The ovaries were found in the sublumbar region of the abdomen close to the pelvic inlet in the fully grown hartebeest. The mesosalpinx formed an incomplete curtain over the lateral surface of the ovary. The bursa ovarica was therefore, poorly developed.

The ovarian surface was smooth except when large tertiary follicles or a corpus luteum were present and formed bulges along the surface. The germinal epithelium

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Fig. 1. The left ovary and uterus of the hartebeest. x 0.85

was, in most cases, composed of an attenuated simple squamous like layer of cells sitting on a basal lamina. The tunica albuginea beneath the germinal epithelium was well developed and contributed to the smooth contour of the ovarian surface (Fig. 2). The ovarian tissue was divided into an outer zona parenchymatosa and a smaller but obvious central zona vasculosa. Many muscular arteries and veins with valves were present in the ovarian medulla.

Oogenesis and follicular development: The smallest oocytes measured 20μm in diameter and were often surrounded by an attenuated epithelial envelope to form primordial follicles. The epithelial envelope became stratified when the oocyte measured about 45 μm and the follicle 90 μm in diameter. The zona pellucida was usually obvious at this stage. The antrum was developed when the oocyte measured just over 90 μm an the follicle was about 300 μm in diameter.

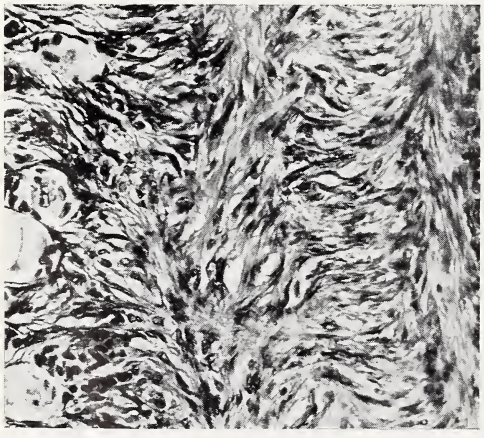

Fig. 2. Section through the ovarian cortex showing the germinal epithelium and tunica albuginea. H and E, x 125

Thecal cones projecting towards the ovarian surface, similar to those described by Harrison (1948) in the goat and by Kayanja (1969) in the impala, were also found on some follicles of the hartebeest measuring about 300 μm in diameter. The theca interna was best developed in the large tertiary follicles at about oestrus.

Even at this time, the theca interna was not as well developed as in the goat and impala.

The relative growth rate of follicle and oocyte was examined and found to be biphasic as shown in Fig. 3. The regression lines were calculated from the following formulae:

1. $y = 25.2 + 0.23x$ where y is the diameter of the oocyte in μm and x is the diameter of the follicle between 50 and 300 μm
2. $y = 90.0 + 0.011x$ where y ist the diameter of the oocyte in μm and x is the diameter of the follicle between 300 and 1,000 μm.

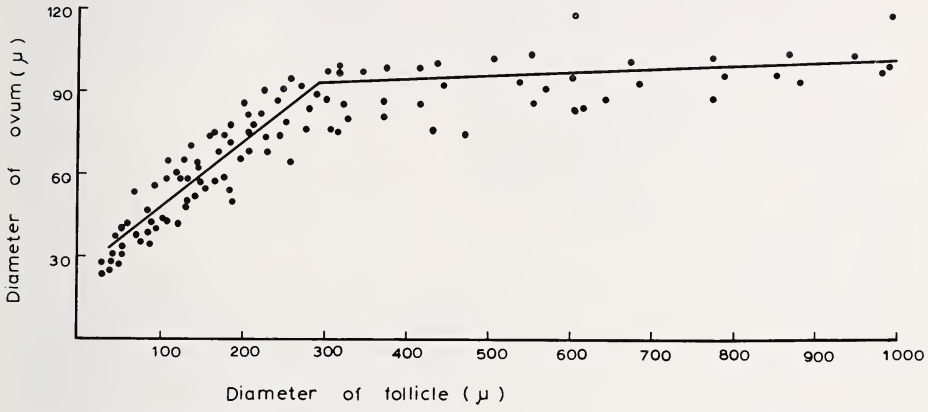

Fig. 3. The relationship between the growth of ovum and follicle in the hartebeest. (See text for the formulae of regression lines)

Follicular atresia: This process through which follicles of all types were destroyed was apparent even in the ovaries of sub-adult hartebeest (Fig. 4). In such ovaries many atretic tertiary follicles were present. There was also marked atresia of tertiary follicles at estrus and during early pregnancy. Folding of the membrana granulosa and its invasion by a richly vascularised theca interna was commonly seen (Figs. 5 and 6). In some atretic tertiary follicles the membrana granulosa showed focal thickening (Figs. 7 and 8). Loss of the granulosa cells by sloughing to produce cystic follicles was often observed in the hartebeest.

The ovarian reticular fibres: As recorded by Petry (1950) in the human ovary, the course of the reticular fibre networks within the zona vasculosa conformed with the arrangement of the connective tissue accompanying the tunica adventitia of the blood vessels in the hartebeest ovary. Within the zona parenchymatosa, the fibres interweaved to form networks in wich the follicles were lodged. Most of the reticular fibres

Fig. 4. Section through the ovary of a sub-adult hartebeest. Note the atretic follicles and especially the small tertiary follicle invaginated into a larger cystic follicle. H and E, x 4

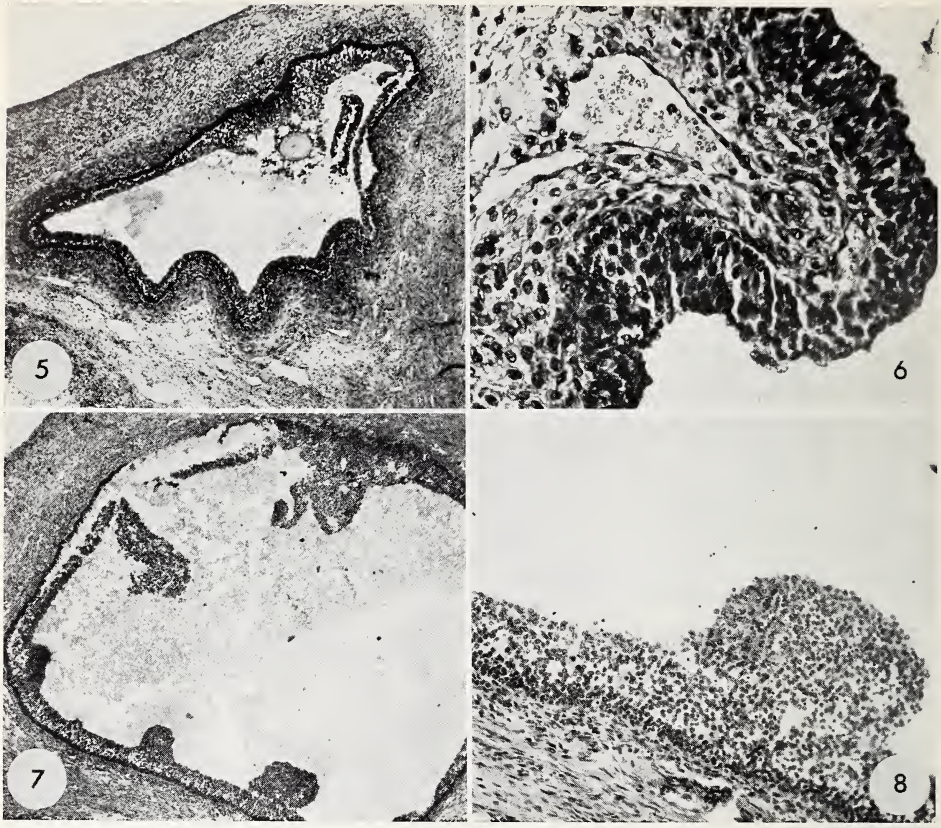

Fig. 5. Section through the ovarian cortex showing an atretic tertiary follicle. Note the folded wall. H and E, x 25 — *Fig. 6.* Section through the folded wall of an atretic tertiary follicle. Note the vascularised theca interna which invades the membrana granulosa. H and E, x 150 — *Fig. 7.* Section through a tertiary follicle showing signs of atresia. Note the focal thickening of the membrana granulosa. H and E, x 25 — *Fig. 8.* Section through the wall of an atretic tertiary follicle focal thickening. H and E, x 70

were arranged at right angle to the ovarian surface. As they approached the tunica albuginea, the fibres fanned out to run parallel to the ovarian surface. Similar observation were recorded in the impala (KAYANJA 1972).

The corpus luteum: Unlike the impala (KAYANJA 1969) the corpus luteum of the hartebeest does not persist to the end of the gestation period. In pregnant hartebeest collected when carrying a foetus over 30 cm crown-rump length, there was no corpus luteum in either overy. The plasma progesterone content was estimated at 11.90 ng/ml in the hartebeest carrying a 44 cm foetus. The animal carrying a 35 cm foetus had a plasma progesterone content of 13.20 ng/ml.

The gland was rapidly established and the luteal cells grew to about 30 μ in diameter. They contained glycogen in early pregnancy. The fully grown luteal cells contained diastase-resistant PAS – positive granules located near the nucleus. Fewer granules were seen in the hartebeest than in the impala (KAYANJA 1972). The polygonal luteal cells were surrounded by variable extracellular spaces in which many small capillaries and sinusoidal vessels were identified. The corpus albicans was associated with many muscular arteries (Fig. 9.)

Discussion

The ovary of the hartebeest structurally resembles that of the domestic ruminants and that of the impala (Kayanja 1972). There appears to be a wave of follicular atresia in the hartebeest shortly before puberty.

Petry (1950) observed that the reticular fibres of the zona vasculosa and those of the zona parenchymatosa formed different arrangements. Similar results were recorded in the impala (Kayanja 1972), in the giraffe (Kayanja and Blankenship 1973) and in the Thomson's gazelle (Masake 1972). It is likely that these arrangements also recorded in the hartebeest are widely spread in many mammalian species.

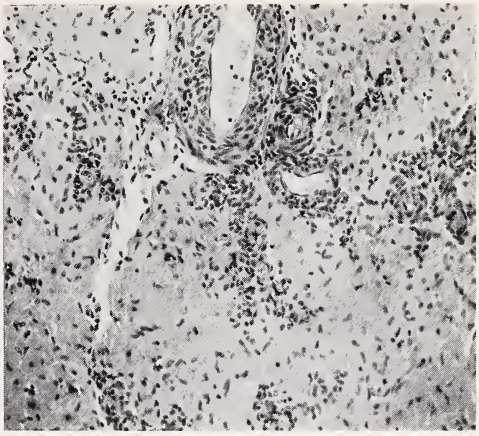

Fig. 9. Section through a corpus albicans. H and E, x 70

In this investigation all pregnant hartebeest carried one foetus found in the right uterine horn. Kayanja (1969) reported that ovulation occurred at random between the left and right ovary in the impala although implantation occurred only in the right uterine horn. Masake (1972) recorded similar findings in the Thomson's gazelle.

The corpus luteum forms rapidly in the hartebeest but disappears probably at the end of the first third of pregnancy. This species, the Thomson's gazelle (Masake 1972) an the Grants gazelle (Kayanja and Gombe 1973), form an interesting group of wild ungulates in which the corpus luteum does not persist throughout pregnancy. It seems likely that another source probably the placenta takes over the function of the corpus luteum and provides the progesterone necessary to maintain the pregnancy.

Acknowledgements

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Summary

The ovary of the hartebeest was investigated using histological techniques. The corpus luteum degenerates before the end of pregnancy. Considerable quantities of progesterone are present in the serum indicating that another source of this hormone takes over when the ovary no longer contains a corpus luteum.

Zusammenfassung

Das Ovar des Hartebeest Alcelaphus buselaphus cokkii, Günther

Das Ovar des Hartebeest wurde unter Verwendung histologischer Techniken untersucht. Das Corpus luteum degeneriert vor Beendigung der Trächtigkeit.

Beträchtlicher Progesterongehalt des Serums weist darauf hin, daß dieses Hormon anderenorts gebildet wird, wenn im Ovar kein Corpus luteum mehr vorhanden ist.

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BUCHBESPRECHUNGEN

Kay, J.: **Insel der goldenen Löwen.** Die dramatische Begründung eines stammeseigenen Wildschutzgebietes in Botswana. Hamburg und Berlin: Paul Parey Verlag 1972. 197 S., 1 Karte, 8 Bildtaf., 17 Abb. 28,— DM.

Aufgewachsen in Rhodesien, mit starken zoologischen Ambitionen und mit ebenso liebevoller und feinsinniger wie sachkundiger Beobachtungsgabe für Tiere, Landschaft und Menschen ihrer Umgebung, berichtet die Autorin mit Temperament und Humor über ihre Erlebnisse in Südostafrika, insbesondere aber über ihres Mannes Mühen gegen die vielfältigen üblichen Widerstände, in den Okawangosümpfen ein Wildschutzgebiet zu gründen, die schließlich erfolgreich enden. Ihre Tierbeobachtungen und Beschreibungen ihrer Erlebnisse mit Tieren sind auch für den Säugetierzoologen interessant und wertvoll. Ihre Darstellungskraft menschlicher Schicksale dokumentiert die schriftstellerische Begabung der Autorin. Ein spannend geschriebenes, empfehlenswertes Afrika-Tierbuch der besten Art.

L. Dittrich, Hannover

Gibbon and Siamang. Vol. 1. Evolution, Ecology, Behavior and Captive Maintenance. Ed.: D. M. Rumbangh. Basel: S. Karger AG 1972. 263 S., 83 Abb., 33 Tab., 120,— DM.

Nachdem die durch G. Bourne beim gleichen Verlag herausgegebene mehrbändige Serie über den Schimpansen jetzt abgeschlossen vorliegt, beginnt mit diesem Band eine entsprechende Reihe über die Hylobatidae zu erscheinen. Der erste Band bringt eine sehr nützliche umfassende Monographie über Systematik und stammesgeschichtliche Beziehungen der rezenten Formen zueinander (89 S.) von C. P. Groves. Außer den üblichen systematisch verwerteten Merkmalen werden Anatomie, Verhalten, Karyologie und Serologie berücksichtigt. Die Hylobatinae werden als Subfamilie in den Pongidae belassen. Drei Subgenera werden unterschieden a. *Nomascus* (Miller, 1933) mit *H. concolor,* incl. *leucogenys.* b. *Symphalangus* und c. *Hylobates* mit *H. klosii, hoolock, pileatus, lar.* Chiarelli stellt die Daten über den Karyo-