

Studies in Native Animal Husbandry (1).

(6) A Note on Ovambo Cattle.

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INTRODUCTION.

It having been emphasized recently by Quinlan, Bisschop and Curson (1932) that the indigenous cattle of South Africa had not received the attention they deserved, we venture to record a few observations made on several head of Ovambo cows introduced from South-West Africa Protectorate in 1929. It should be noted that Ovamboland, being situated without the Police Zone, is probably the least accessible territory south of the Zambesi River. One would expect, therefore, that Ovambo cattle have been less disturbed by the march of civilisation than elsewhere in the sub-continent.

Until the arrival of the cattle referred to above, the only material available consisted of two skulls (see Figs. 1 and 2), from a bull and cow respectively, received from Lieut. C. H. Hahn, Ondonga, Ovamboland, in 1922.

VIEWS REGARDING CATTLE IN SOUTH-WEST AFRICA.

But few references to Ovambo cattle are available. Molhuysen (1911), however, has collected quite a number, the most useful being those of Schinz (1891) and Hermann (1902). Schinz states that prior to European occupation there were in South-West Africa two types of cattle, the Ovambo in the north and the Herero or Damara in the south. The latter he compares with the Hottentot cattle to be found

(1) The following studies have appeared:—(i) Notes on the Wankonde. *Jl. S. Afr. Vet. Med. Assn.* I (4). (ii) Proposed plan of investigation, *Id.* II (2). (iii) Native milking-pails. In the press: (iv) Bantu and cattle in the Northern Transvaal, *Jl. S. Afr. Vet. Med. Assn.*, II (2). (v) Indigenous cattle in the Transkeian Territories, *Id.* III (4). (vi) This paper. (vii) Makalanga cattle—a representative described. *This Journal.* (viii) The domesticated animals of Pre-European S. Africa, *Jl. S.A.V.M.A.*, IV (2).

apparently still farther south. According to Hermann, as a result of the northerly migration of the Rhehoboth Bastards from the Cape Colony a change in type occurred, resulting in the production of what is to-day the Nama, a cross between the indigenous and introduced, i.e. European, types. The only reference Ostertag (1912) makes to the Ovambo beast is that it is one of the four⁽²⁾ indigenous types of South West African cattle. He gives, however, an excellent picture of Ovambo oxen (Fig. 10, p. 32). In 1914 Schlettwein's description of farming conditions in South West Africa Protectorate appeared as a second edition, and reference will be made to this in discussing the observations of the next worker.

In 1928 Dr. G. Schmid, Government Veterinary Officer, Omaruru, submitted an interesting report (S.V.O., Windhoek, Minute A/2 of 16/8/28). The portion dealing with the Ovambo is reproduced *in extenso* as follows:—

“ The Ovambo cattle: This third type was chiefly restricted to the north of the territory and was mostly in possession of the Ovambo tribes. This type is very similar to the type found in the inner parts of equatorial Africa, and is also an indigenous African breed.

“ The animals are small but well proportioned, with fine bones of great density, small head and long and lyre-shaped horns. The predominant colour is a light or dark grey-brown (game colour). The Ovambo cattle have acquired great resistance against diseases, and I found that many of them did not react on lung-sickness vaccination, because they apparently possessed a natural immunity against the disease. The milk production is low but the beef is of a fine texture. These cattle were much appreciated by the early European farmers of the north as a good foundation stock, on which to build, which gave very satisfactory results when crossed with imported breeds, especially for beef production. An estimable attribute in this type is its great adaptability to different climatic conditions; for even in times of drought the Ovambo cattle keep their condition and fertility.

“ There is no doubt that from this type, under better conditions and with some knowledge of breeding, a very good and hardy breed could be built up. The Ovambo tribes, however, are more an agricultural people and have not the interest in their cattle in comparison with the Hereros. I saw some very good specimens of this type on the Okavango River.”

Schmid adds:—

“ The devastations of Rinderpest, 1899-1900, and later of the native war, 1904-06, sadly depleted the herds of native cattle in South-West Africa. Rohrbach states: “ After the war, 1906, the whole native stock was exterminated with the exception of about 3,000 cattle, which were distributed to the farmers. Also nearly all the cattle in possession of the old farmers were lost. Only the

(²) The other are Damara, Bechuana and Nama. With regard to the last, Dr. Schmid writes that they are a cross chiefly of Afrikaner and Friesland and belong to the coloureds of the south.

Rhehoboth Bastards saved about 600 female cattle. Consequently the herds of the farmers and newcomers had to be built up eventually almost entirely from imported cattle from the Cape and Europe. During 1906 to 1912 alone, about 15,000 cattle were imported from the Cape and Bechuanaland . . .

“ . . . The material for this report has been partially collected from the following sources:—

1. Rohrbach, Deutsche Kolonialwirtschaft, I. Band, S.W. Afrika.
2. Schlettwein, Der Farmer in Deutsch Südwest Afrika.
3. Ostertag, Veterinärwesen und Fragen Der Tierzucht in D.S.W.A.
(Denkschrift über die Rinderzucht des D.S.W.A. Schutzgebiets, 1912) ”.

The above remarks relating to the position after the German-Native campaign of 1904-06 probably do not refer to the Ovambo cattle, since being so far north they apparently escaped the ravages of war.

THE ONDERSTEPOORT HERD.

Six cows, later numbered from 3584-89, arrived at Onderstepoort on 20th June, 1929, having been entrained at Tsumeb. At Windhoek they were inoculated for anthrax (according to the export regulations) and then forwarded to Onderstepoort under quarantine conditions. Actually seven head were purchased by the Chief Agricultural Officer (Dr. P. v. d. H. Schreuder), but one beast died *en route*. The price paid was £4 per head.

On arrival at Onderstepoort the animals were naturally poor in condition, their weights ranging from 550-600 lb. They thus “ felt ” the colder winter of the Transvaal Middleveld more than otherwise. Their ages were approximately 10 years, but old cows had expressly been purchased in order to be surer of obtaining cattle of the pure Ovambo type. At first the cows refused food from a manger and water from a trough, but it was not long before they became accustomed to these receptacles of civilisation. Their behaviour, however, was never as quiet as that of European cattle, there always being a certain nervousness. The only ecto-parasites observed on their arrival were ticks, *R. evertsi* var. *albigeniculatus* being common beneath the root of the tail.

Although clearly of native stock, it was obvious the cattle represented a definite type. Regarding origin, too little is known of this aspect of African types, and to discuss the matter at this juncture would be most unprofitable. It is, however, remarkable that State officials (especially museum authorities) have manifested little or no interest in this important subject.

Since it was believed that the cows would be susceptible to tick-borne diseases, such as redwater, gallsickness and heartwater, appropriate precautions were taken. On 25/6/29 they were injected with

5 c.cm. of redwater and gallsickness vaccine, but in all cases the reactions were inconclusive. This is most surprising in view of the

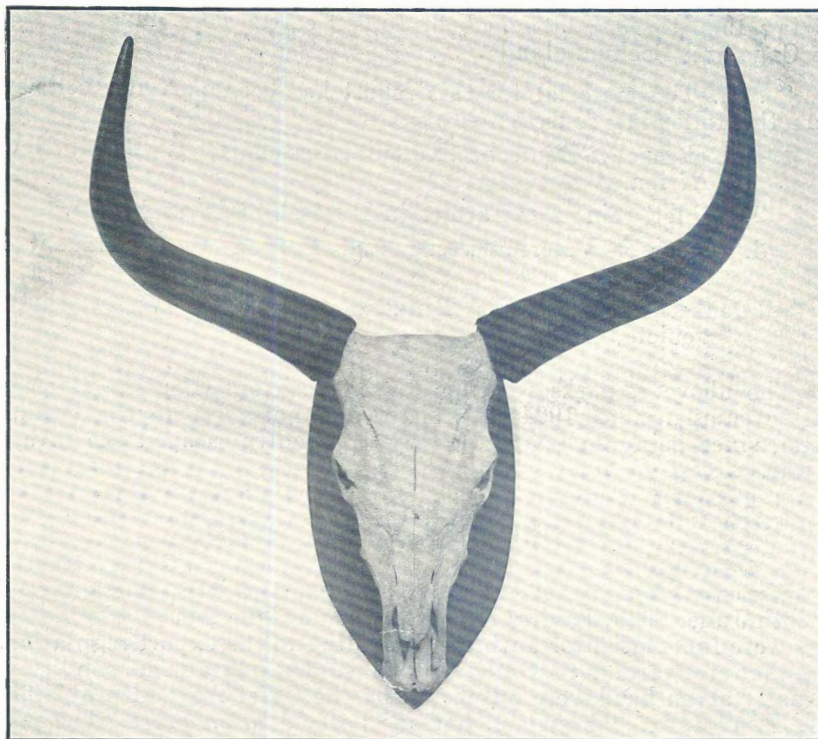
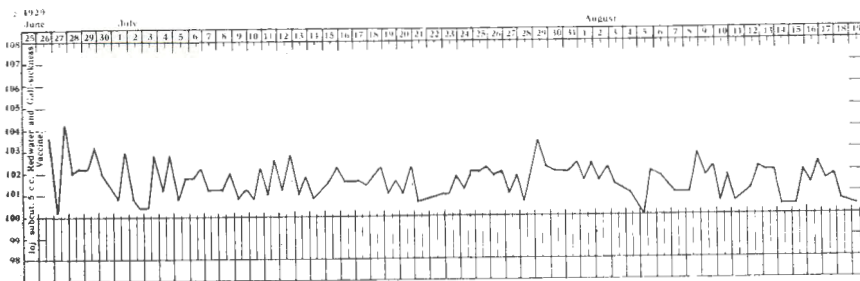


Fig. 1. Ovambo skull, bull.

fact that western (Kalahari) cattle are believed to be susceptible to redwater and gallsickness. The attached chart is representative of the temperatures recorded over a period of two months:—

Temperature Chart.—Ovambo Cow D.O.B. 3586.



While the horns, hump, dewlap, navel and sloping quarters are features of indigenous cattle as a whole, there is no doubt that the Ovambo is a product of its environment. Although Schlettwein states that the cows give generally more milk than the neighbouring Damara cattle, yet on account of its short sturdy build, it is for beef purposes that the type seems best suited. For grading with bulls of European

breeds, the Ovambo would prove excellent foundation stock. For transport purposes the small size of the oxen would be a disadvantage when compared with the larger Damara.



Fig. 2. Ovambo skull, cow.

Below is tabulated the information bearing on the cows referred to above:—

Cow.	Fate.	Progeny.	Born.	Fate.
3584	Killed 14.6.32 for Onderstepoort Museum. See milk record.	{ 3661 male... 4471 male ...	1.11.29 19.3.31	Died, icterus 6.4.31. Cast, type poor 17.8.31.
3585	Killed 13.2.30 for Transvaal Museum	—	—	—
3586	Used for milk records. Discharged 24/8/32	{ 4301 female... 5010 male....	12.1.31 3.2.32	Cast, type poor 17.8.31. To reach maturity and then to be killed for Transvaal Museum.
3587	Used for milk records. Discharged 24.8.32	4654 female..	1.10.31	Cast 24.8.32.
3588	Killed 14.6.32 for Transvaal Museum	3666 male....	11.11.29	Contracted tuberculosis naturally. Castrated 13.6.32 and cast.
3589	Died 18.9.29. Skeleton in Onderstepoort Museum	—	—	—

Unfortunately, it was not possible to obtain an Ovambo bull from South-West Africa. Under the circumstances, a local native bull was used for service, except in the case of Bull 5010. Here the sire was Bull 3666, born of Cow 3588 five months after her arrival at Onderstepoort.

GENERAL CHARACTERISTICS OF THE OVAMBO COW.

HEAD.

Forehead: Broad and flat, i.e. not much dished.

Horns: Curved forward, sideward and upward.

Face: Fairly long with veins showing slightly.



Fig. 3. Ovambo cow No. 3588.

Muzzle: Broad, strong and black.

Jaws: Strong and lips firm.

Eyes: Languid, with heavy fold of skin above.

Ears: Oval, pointed, stylish and alert.

NECK.

Short and broad, but neatly put on.

Devlap: Prominent.

FOREQUARTERS.

Shoulders: Blend smoothly although slightly heavy.

Hump: Small and set well forward on withers.

Chest: Proportionately good depth but small, medium width between forelegs.

Brisket: Light.

Legs: Straight, light and fine boned.

Feet: Sharp and of medium size.

Joints: Firm and smooth.



Fig. 4. Ovambo cow No. 3584.

BODY.

Back: Short and drooping.

Chine: Short and curved downward.

Loin: Medium, broad and sloping downward.

Ribs: Medium spring and not deep.

Abdomen: Round and shallow.

Navel: Characteristic loose skin fold.

Flank: Smooth, thin and of medium depth.

HINDQUARTERS.

Rump: Sloping from hook to pin bones as well as towards tail head, narrow, medium distance from pins to hooks.

Hooks: Not projecting much.

Pins: Pinched and low.

Thighs: Very small.

Tail: Long, but tail-setting prominent.

Legs: Straight, fine and clean cut.

Feet: Sharp and of medium size.

Shanks: Fine and smooth.

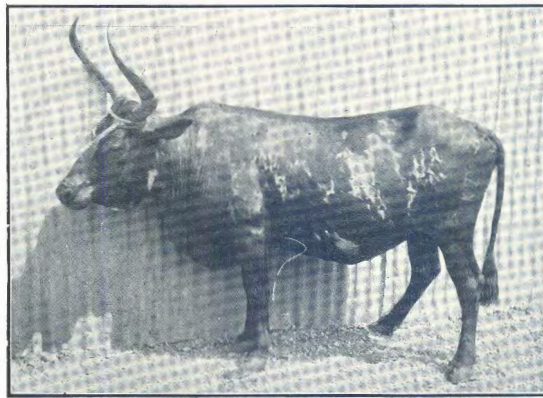


Fig. 5. Ovambo cow No. 3585.

UDDER.

Small, tight meaty bag, but well proportioned with ample loose folds stretching up behind.

Teats: Small and closely spaced.

Milk Veins: Prominent, tortuous and easily visible.

Escutcheon: Distinctly defined.

COLOUR.

Dun or black predominating.

COVERING.

Skin: Fine and elastic.

Hair: Soft and fine.

GENERAL CHARACTERISTICS OF THE OVAMBO BULL.

(Fig. 9.)

The bull differs from the cow mainly in exhibiting coarser horns, which follow an outward and upward curvature. The dewlap and brisket are heavier than in the cow, the hump is also larger and its well forward position gives the neck a thick-set throaty appearance.

The forequarters, body and hindquarters are, however, disappointingly small and light, being much like the cow in all respects and giving an effeminate impression.



Fig. 6. Ovambo cows Nos. 3587 and 3586.

These animals are extraordinarily nervous, are small and undersized, and show more beef than dairy qualities. Calves at birth weigh about 52 lb. and mature cows may be expected to average approximately 750 lb.

MILK OBSERVATIONS FROM SOME OVAMBO COWS.

The milk of the Onderstepoort herd was recorded and tested for fat and solids-not-fat at various stages during the different lactation periods. It was found impossible to draw more than a cupful of milk from a cow if the latter were milked without suckling the calf (see Fig. 10). The calves, too, seemed never to learn how to take milk from a pail. For these reasons the most satisfactory results could only be obtained by allowing the calves to suckle their dams and stay with them during the period of milking, a fact which may account for many irregularities in the tests, which are given in the following table:—

STUDIES IN NATIVE ANIMAL HUSBANDRY (6).

TABLE.

<i>D.O.B.</i> 3584. Calved 19.3.31.				<i>D.O.B.</i> 3586. Calved 12.1.31.			
Date.	Milk.	Fat.	S-N-F.	Date.	Milk.	Fat.	S-N-F.
	c.c.	%	%		c.c.	%	%
2.4.31..	590	2.1	8.1	2.4.31..	600	1.9	9.3
8.4.31..	550	1.4	8.7	8.4.31..	620	1.9	9.5
15.4.31..	210	2.7	8.5	15.4.31..	360	2.2	9.4
22.4.31..	500	2.5	8.7	22.4.31..	410	2.3	9.0
29.4.31..	420	1.5	8.6	29.4.31..	200	1.5	9.3
7.5.31..	300	1.7	8.8	7.5.31..	410	1.4	8.5
13.5.31..	100	3.5	8.9	13.5.31..	190	1.5	8.7
Average.	381	2.2	8.7	Average.	399	1.8	8.9

<i>D.O.B.</i> 3587. Calved 1.10.31.				<i>D.O.B.</i> 3586. Calved 3.2.32.			
Date.	Milk.	Fat.	S-N-F.	Date.	Milk.	Fat.	S-N-F.
	c.c.	%	%		c.c.	%	%
8.10.31..	—	4.8	9.0	8.2.32..	192	3.3	9.4
9.10.31..	—	5.2	8.5	9.2.32..	180	1.6	9.4
10.10.31..	—	4.6	8.7	10.2.32..	165	1.1	9.3
13.10.31..	—	6.8	8.3	11.2.32..	158	1.5	9.4
14.10.31..	—	6.7	8.2	12.2.32..	142	1.1	9.8
15.10.31..	—	7.2	7.4	13.2.32..	193	1.7	9.4
16.10.31..	—	7.5	7.6	16.2.32..	168	2.2	9.1
17.10.31..	—	5.2	8.4	17.2.32..	189	2.2	9.8
20.10.31..	—	6.7	8.8	18.2.32..	167	2.3	9.2
22.10.31..	—	5.1	8.6	19.2.32..	140	1.9	9.3
23.10.31..	—	8.0	7.8	20.2.32..	185	1.1	9.0
26.10.31..	—	5.0	9.8	23.2.32..	180	2.0	8.5
10.3.32..	—	5.2	10.0	24.2.32..	158	1.6	9.1
11.3.32..	—	3.9	10.0	25.2.32..	176	2.3	8.9
8.5.32..	—	5.0	9.9	29.2.32..	159	1.7	8.5
8.6.32..	—	4.6	10.0	1.3.32..	164	3.3	9.6
				2.3.32..	192	1.6	9.2
				3.3.32..	156	2.8	8.7
				4.3.32..	177	3.6	8.7
				5.3.32..	156	2.4	9.5
				6.3.32..	190	1.7	10.4
				7.3.32..	159	2.3	9.1
				8.3.32..	163	1.7	9.5
				9.3.32..	118	2.7	9.6
				10.3.32..	146	2.7	10.0
				8.6.32..	185	3.0	9.7
Average.	—	5.7	8.7	Average.	112	2.3	9.3

The colostrum milk period did not vary in duration from that of European breeds, the milk being fit for consumption after seven days. A fact very clearly illustrated in the table is the low butterfat percentage in numbers 3584 and 3586 (the latter was tested in two different lactation periods), as compared with the comparatively high butterfat test in the case of No. 3587. This phenomenon corroborates the findings of Blackham (1922), who states that the cow's milk in the tropics shows a fat percentage ranging from 3.4 to 7.71 per cent., a fact easily comprehended when we consider that no selection has ever been made with regard to the improvement of milk qualities.



Fig. 7. Ovambo cow No. 3587.

The quantity of milk is likewise very small, but the average duration of lactation does not fall far short of European breeds. The solids-not-fat percentage is very good, comparing very favourably with the highest milk qualities.

Selection is a measure which should obviously be encouraged even among native cattle owners.

THE MEAT FROM TWO OVAMBO COWS.

Two cows, Nos. 3584 and 3588, were slaughtered. One, No. 3588, was emaciated (due to chronic metritis) and in poor compound condition, whereas No. 3584 was of medium to good condition. The carcasses were very small, but quite compact, showing good width in proportion to length. The loins were rather thin and hollow, and the forequarters well fleshed, but lacking depth. There was an almost entire absence of external fat, the most noticeable layer being beneath the hump. The hump consisted chiefly of muscular tissue, and the measurements were approximately 30 cm. (length) by 20 cm. (width) and 10 cm. (depth), and the weight was about 3 Kgm.

The entire absence of marbling may be attributed to the age of the animals. The meat was of fine texture and the bones were also fine.

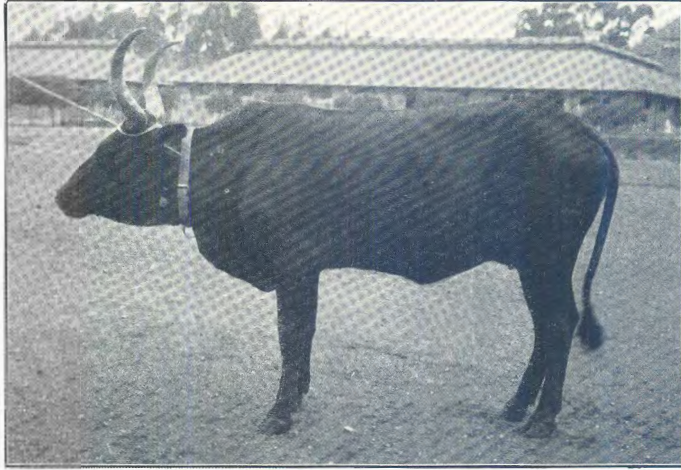


Fig. 8. Ovambo cow No. 3589.

POSSIBILITIES.

Although many breeds of *Bos taurus* are noted for their beef or milk qualities, comparatively little is known of the characteristics of the many types of *Bos indicus*, under which is grouped the Ovambo beast. In very few tropical or sub-tropical territories have the colonists or State officials endeavoured to make use of the advantages of indigenous cattle. Instead, cattle have been introduced from Europe, with the result that not only has mortality been considerable, but also a definite tendency to "degeneration" has been noted. A little thought should convince those interested that obviously the best material for development would be the "survival of the fittest", in other words, the stock which has survived "the vicissitudes associated with climatic, physiographic, edaphic and biotic factors."

The conditions with which the Ovambo has had to cope has given the type a fast gait so as to enable it to cover long distances during a day's grazing. In spite of this the conformation is neat and well proportioned and the type uniform. The Ovambo is thus able to thrive on poor pastures which are green only 4-5 months of the year. In addition, it possesses the advantages noted by Kelley (1932) for the Zebu, when he refers to "The indirect effect of their short sleek coat, their better provision for radiation of body heat, their smaller stomachs, different grazing methods and their ability to remain rela-

tively long without water." It was quite evident that the Onderstepoort Ovambo cattle did not pick up ticks as readily as the long-coated grades.

The success obtained by ranchers in Texas and New Mexico by the introduction of Zebu blood is of paramount importance to us in South Africa. Apart from other advantages, e.g. disease resistance, the Smithfield market reports show that cattle of the Zebu type are worthy of attention.

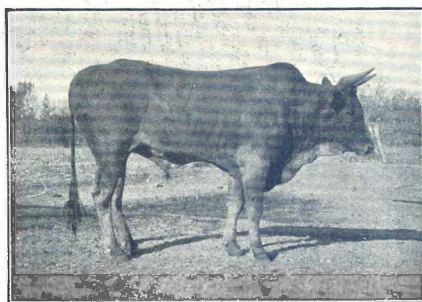


Fig. 9. Ovambo bull No. 3666.

It is clear that many decades will pass before native cattle under present management can attain the standard of excellence so desired by Europeans. The native idea of selection, e.g. pugnacity in a bull or mere coloration in a cow, etc., being so unscientific, it behoves the administrative authorities in the various tropical and sub-tropical territories to give scientific advice wherever possible. In fact, to collect data by the establishment of a herd as indicated by Quinlan, Bisschop and Curson (1932) would be the ideal.

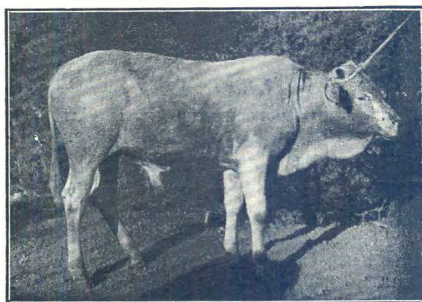


Fig. 10. Ovambo bull calf No. 5010. (Born 3.2.32 and photographed Sept., 1932.)

ACKNOWLEDGMENT.

We desire to record our indebtedness to Prof. A. M. Bosman for his observations (Appendix 1) and to Mr. J. H. R. Bisschop for his measurements (Appendix 2). Indeed; it is evident that the data provided by these workers represent the very foundation of this study,



Fig. 11. Ovambo cow skeleton No. 3589. Height at withers 120 cm.

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MISCELLANEOUS.

- (1932.) Our Native Breeds. *The Farmers' Weekly*, 4/5/32, p. 451.

APPENDIX 1.

INDIVIDUAL DESCRIPTION (See Figs. 3-8.)

D.O.B. 3588 (taken as standard).

Head: Moderately short and fairly wide in forehead. Black strong muzzle and lips. Eye between European and Afrikander types—no large lumps as seen in Afrikander. Ears pointed. Head is straight from poll to muzzle except for a Roman nose. Poll indented.

Horn: Extends in an upward and sideward direction, bending forwards and upwards. Points slightly back. The horn is moderately oval-round at base, becoming round towards the points. Colour cream with black tips.

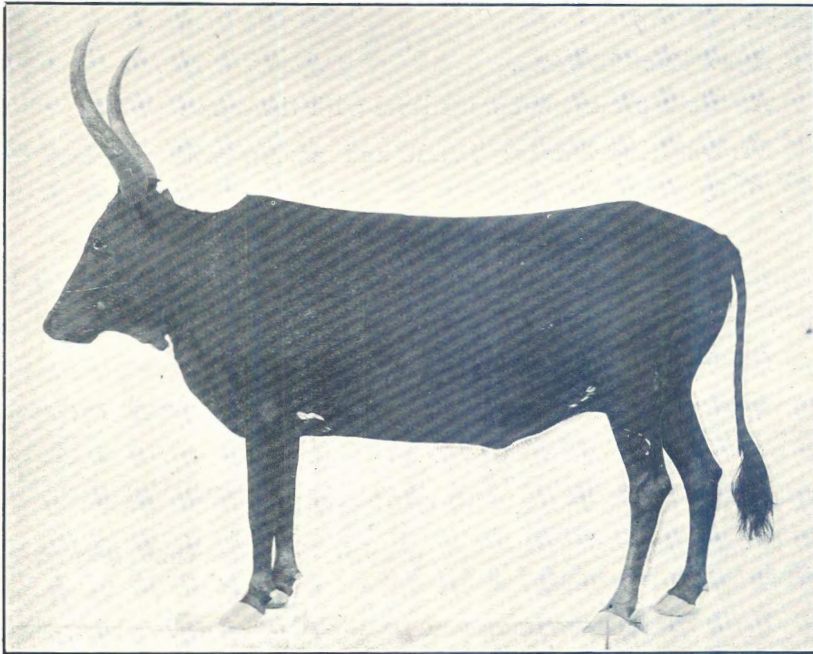


Fig. 12. Ovambo cow No. 3584, prepared for Transvaal Museum.

Neck: Fairly well developed dew-lap.

Hump: Set forward on withers and small.

Withers: Rather high and shoulder blades small and extending well up.

Chest: Moderately deep but narrow. Ribs moderately arched and depth is in proportion to the chest. Back drooping.

Navel: Smaller than in Afrikander.

Hindquarters: Very typical of the indigenous types. There is a pronounced slope towards the pin bones (*Tuber ischii*), the latter being fairly close together (pinched in). Very rooﬂy over top of rump (roomy). Pelvic arch very pronounced.

Tail: Set high up into body. Tail itself is clean, slender, with a small switch.

Thighs and Second Thighs: Under developed.

Udder: Small but well proportioned and set fairly forward.

Legs: Clean and rather small boned. Hoofs well developed.

Colour: Dark dun with an elongated white patch on forehead and "skimmel" (white interspersed with dun hairs) mark on shoulder blade, forearm and hind flank of right side and similar marks on left side on forearm, barrel and hind flanks. Also similar marks over hook bones (*Tuber coxae*). Eyes ringed with "skimmel" marks.

Age: 11 or 12 years.

All teeth present but worn level with the gums.

General Appearance: Small and narrow with deficient hind-quarters.

D.O.B. 3584 (compared with 3588).

Head: This is longer with moderately strong muzzle and lips. Horns more upstanding and longer.

Dewlap: Same.

Hump: Is slightly more developed and is nearer to the withers than in 3588.

Chest: Deep and moderately wide. Back moderately straight. Barrel well let down and ribs well sprung.

Hindquarters: Drooping, pinched in somewhat towards pin bones, fairly pronounced pelvic arch.

Tail: Moderately large and set high up. Rather short, slender with large switch.

Thighs and Second Thighs: Deficient.

Udder and Teats: Close together and rather small, rather forward.

Bone: Rather over fine, slightly cow-hocked.

Colour: Black, with "ringhals" and slight white marks on brisket and udder.

Size: Largest of the lot, and with the exception of the thighs, animal is fairly well fleshed, with long legs.

D.O.B. 3585 (compared with 3588).

Head: Same—muzzle rather small. Horns more curved inwards, with the points coming closer together.

Devlap: Same, except that it is rather pinched round the neck (“throaty”).

Hump: Well pronounced.

Chest: Deep, but not well filled in behind the elbow. Slightly hollow back, with a well-developed and deep barrel.

Hindquarters: Short and drooping towards pin bones, which are moderately pinched in. Left hook bone more outstanding than right.

Moderately deep thigh but deficient in second thigh.

Tail: Thicker and of moderate length.

Udder: Hind teats poorly developed.

Legs: Cow hocked.

Colour: Black roan (dark grey).

Animal is rather small and is higher over hook bones than over the withers.

D.O.B. 3586 (compared with 3588).

Head: Horns similar to 3588 but thicker, larger and rounder. Very wide between horns with characteristic indented poll. Moderately short and wide head. Black skin round muzzle and eyes.

Devlap: Fair amount.

Hump: The same.

Withers: Well rounded with fleshy shoulders.

Chest: Moderately deep and wide. Back well fleshed, slightly hollow. Ribs well sprung with a deep barrel.

Hindquarters: Moderate droop and pinched in slightly between pin bones.

Tail Head: Pronounced and set high up.

Tail: Moderately long, slender, with a good switch.

Thighs: Well developed, but lower thigh rather deficient.

Udder: Rather far forward and hind teats rather under-developed.

Legs: Fair bone, slightly cow hocked.

Colour: Dark dun right through, with hindquarters slightly darker than forequarters.

Size: Small, very compact, with short legs well fleshed, the animal being in good condition.

D.O.B. 3587 (compared with 3588).

Head: Differs in being weaker of muzzle and lips, shorter of horns and more hair on ear.

Dewlap: Same.

Horns: Slightly oval at base and rounder towards hips.

Neck: Shorter.

Hump: Forward on withers.

Withers: Wider and more fleshy over shoulder.

Chest: Good depth and of fair width, although a little slack in the "crops". Barrel well let down and the ribs well sprung. Back, moderately straight.

Hindquarters: Also drooping, but moderately wide between the pin bones.

Tail: Set farther back and is long and slender with a large brush.

Thighs: Lower thighs very deficient.

Udder: Placed farther back.

Legs: Shorter but otherwise similar.

Colour: Black with white markings on brisket, navel, udder, tail above switch, and in front of both thighs. In addition there is a slight "skimmel" colour round both eyes. Horns, muzzle and lips as for 3588.

APPENDIX 2.

MEASUREMENTS.
 Locality : ONDERSTEEPOORT.
 (Cows from Ovamboland).

Type : OVAMBO.

D.O.B. No. and Sex.	Approximate Age. (Years).	Date of measuring (3).	Length of body (point of shoulder to <i>Tuber ischii</i>).	Height at withers.	Height at hook-bones (<i>Tuber coxae</i>).	Depth of Chest.	Width of chest (across back—behind shoulder).	Width between hook- bones.	Width between thirds (<i>Trochanter I, Femur</i>).	Width between pin- bones (<i>Tuber ischii</i>).	Heart girth.	Length of head.	Width between eyes.	Length of croup.	Greatest height. (<i>Tuber sacrale</i>).	Remarks.
Cow 3586	—	4/4/30	131.5	114.8	116.3	62	31.6	42.7	30.8	15	167.8	46	17	45.3	118.5	Condition excellent.
Cow 3587	10	"	131	108.1	112.1	60.3	39.6	44.5	32.1	13	168.3	45.5	17	43.8	115.3	Condition excellent.
Cow 3588	11-12	"	—	118.1	120.8	58.3	29	42.8	30.8	10	155	45.3	17	45.8	123.6	Condition poor.
Cow 3584	10	10/6/30	133	119	124	63	37.5	44.5	36.5	10.5	172	45.5	18	44	123	Condition good.

(3) Three measurements taken where possible and average of these is accepted. Measurements given in cm.
 For description of measurements see du Toit and Bisschop (1929).

APPENDIX 3.

Useful References in Studying African Cattle.

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