Jarvis OSTRICH Manual

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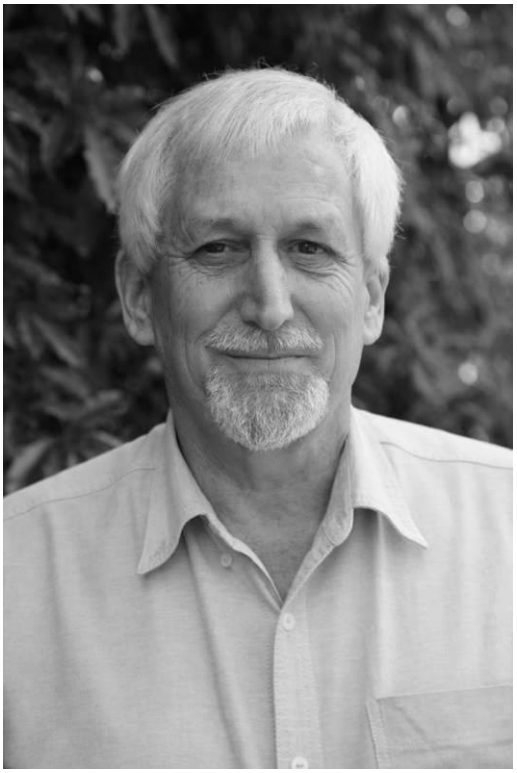
Jarvis OSTRICH Manual

Dr Michael Jarvis



ISBN: 978-0-9802770-7-4

First published: 2015

Published by:
Fact and Faith Publications
PO Box 292, Wellington, 7654, South Africa
Email: Mike@factandfaith.co.za
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Brief author CV

Born in Dar-es-Salaam, Tanzania in 1942
Schooling in Nairobi, Kenya
PhD: 1971, Cape Town University.

1966-68: Research Assistant to Prof. G.J. Broekhuysen. Cape Town University.
1969-71: Bird Ringing Officer: Percy Fitzpatrick Institute of African Ornithology.
1971-75: Professional Research Officer, Cape Dept. Nature Conservation.
1975-83: Senior Ecologist, Dept. National Parks & Wildlife Management, Rhodesia.
1984-94: Specialist Agricultural Researcher, South African Dept. Agriculture.
1994- Current: Ostrich industry consultant.
2007- Current: Director of Fact and Faith Publications.

Author or co-author of 36 research papers in scientific journals or books and 68 popular science publications. Publications include 33 on ostrich related topics. Full CV in appendix.

Since 2007 I have also written books reconciling scientific discoveries with the Christian faith and I developed a webpage: www.factandfaith.co.za
Books include: God by Evolution. 600pp. ISBN 978-0-9802770-0-5.
Big Bang Christianity. 204pp.ISBN 978-0-9802770-1-2.
I also have an interest in African Renaissance and a re-discovery of first century Christianity: www.UbuntuChristianity.com.

Acknowledgements

I am grateful to Dr Dave Cumming who was Director of Research while I was employed by the Department of Parks and Wildlife Management in Rhodesia/Zimbabwe. His foresight allowed me to spend official time researching and developing the first ostrich farm in that country. The financing of this farm was enabled through income generating activities of Claire Jarvis. The industry developed into a viable part of the Zimbabwe agricultural economy during the 1980's, before going into serious decline due to a combination of politically motivated invasion of farms, resulting in many farms losing the ability to operate, combined with a downturn in the International Ostrich Industry.

Another memorable encounter was with the Canadian veterinarian Dr Bob Keffen. He visited a farm where I was investigating mass mortality of chicks and together we undertook many post mortems and research.

In 1983 I took up a research post with the South African Department of Agriculture at Elsenburg and Mike Walters, the Director of Research, encouraged my continued involvement with the ostrich Industry.

Another major milestone was the involvement of Con and Elaine Wegelin, who allowed me to conduct further research on their farm near Wellington in South Africa and they also invested time and finance into developing an ostrich farm on their land. Further feed trials were aided by co-operation with Reitz du Toit, owner of Graaf Reinet Feed Mill.

In 1993 I was invited to Texas to help a group of ostrich farmers connected to Alamo Ostrich Ranch, owned by Joe Simmons. This opened up opportunities to travel extensively in the USA, Canada, Europe, Australia

and New Zealand, attending conferences on ostrich farming, presenting papers on my own research and visiting a great variety of ostrich farming facilities.

My involvement in the USA and later development of Volos Ostrich Feeds in South Africa, was made possible through the financial backing and encouragement of Richard Allen, Director of Allen's Meshco in Cape Town and together we formed Volos cc to promote the production and sale of these feeds.

On my return to South Africa Meadow Feeds agreed to manufacture Volos ostrich feeds. Currently the feed is manufactured by Afresh Brands trading as Equi-Feeds. Further research was enabled through Meadow Feeds financing an Ostrich Research Farm near Malmesbury. This enabled me to undertake research and to test various feed formulations. The close proximity of this farm to Malmesbury Ostrich Abattoir enabled research into characteristics of slaughtered ostriches. I am grateful to the Directors of that abattoir, in particular Mr Gerrie Oberholzer and Mr Frikkie Bester. The abattoir manager Boet Otto gave me free access to all the abattoir facilities and operations, and to the associated tannery situated in Wellington.

In 1998 I was involved in the formation of Ostrich Strategies International, together with Charles de Villiers and Johan van der Merwe. For several years, as a result of negotiations with Pat Houlahan, we obtained raw leather from ostrich farmers in New Zealand and supervised its tanning here in South Africa. This enabled me to conduct further research into leather quality and its relationship to the age of slaughtered birds and its genetic origin.

Last but not least, I am most grateful to my loyal wife Anna who allowed her kitchen freezer to contain packets of ostrich stomach contents, to spread out ostrich ovaries on the kitchen table and she helped me in many ways on the research farm.

NOTE.
Unless otherwise stated all photographs and data in this manual are from my own research.

The contents of this manual are presented in good faith based on my own experience. I cannot take responsibility for any problems that may be encountered on other farms because conditions vary in many ways, such as soil type, water quality, climatic conditions, chick health, type of feed used, and other management factors.

The main motivation for compiling this manual is to document my personal experiences in the ostrich industry, so that potentially valuable information will be available for posterity and hopefully be a catalyst in developing the future ostrich industry.

CONTENTS Page

1 BACKGROUND INFORMATION

1.1 The species, sub-species and races of ostriches

All the ostrich types found in Africa are at present classified as one species *Struthio camelus* (Brown et al 1982). However, within this one species four major divisions are recognised in literature as races and I present new evidence that within each of these four major groups are several other very distinct racial groups. I will argue that the four 'races' are sub-species.

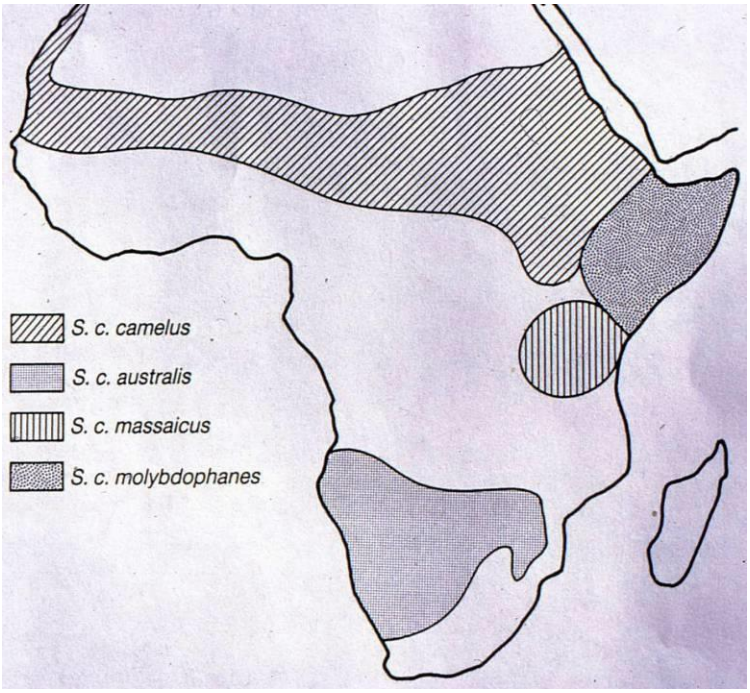


Figure 1. This map is from Bertram (1992).

In fact the distribution of wild ostriches is wider than shown here and within South Africa wild populations are still found down the west coast almost to Cape Town and also on the south coast between Cape Agulhas and Infanta.

The distribution of wild ostriches has decreased due to hunting and habitat being taken over by agriculture. As a result wild ostriches have in many cases been reduced to pockets within their original distribution.

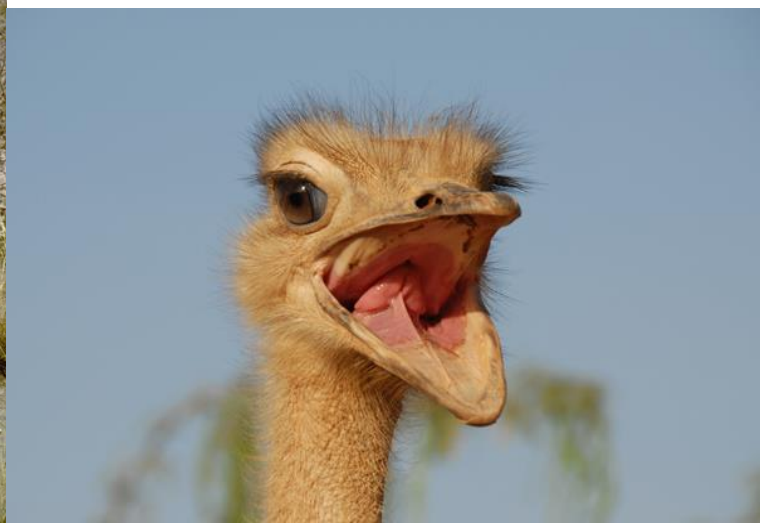
North African ostrich (Photos: Sahara Conservation Fund. www.saharaconservation.org)
This conservation project is vital for the survival of the north African ostriches because they have been eliminated from much of their former range. I suggest you visit the webpage.

The northern birds are known scientifically as *Struthio camelus camelus.* They vary in appearance within their sub-Saharan range and birds in some areas have outstanding feather quality.

This feather quality of some

birds led to importations of this genetics to South Africa during the 1800's, in order to cross them with South African birds and so improve feather quality. At that time ostrich feathers were the really valuable product from ostrich farming.
Some cock birds have white primary wing and tail feathers but others have light brown tail feathers. Also the degree of pink on the skin varies from area to area. All of them have a characteristic bald patch on the top of the head. Adults average between 120 and 140kg.

Hens have grey-brown plumage and the same pale brown eyes as males. Chicks are a much paler colour than those of other races and eggs are rounder than in other races.

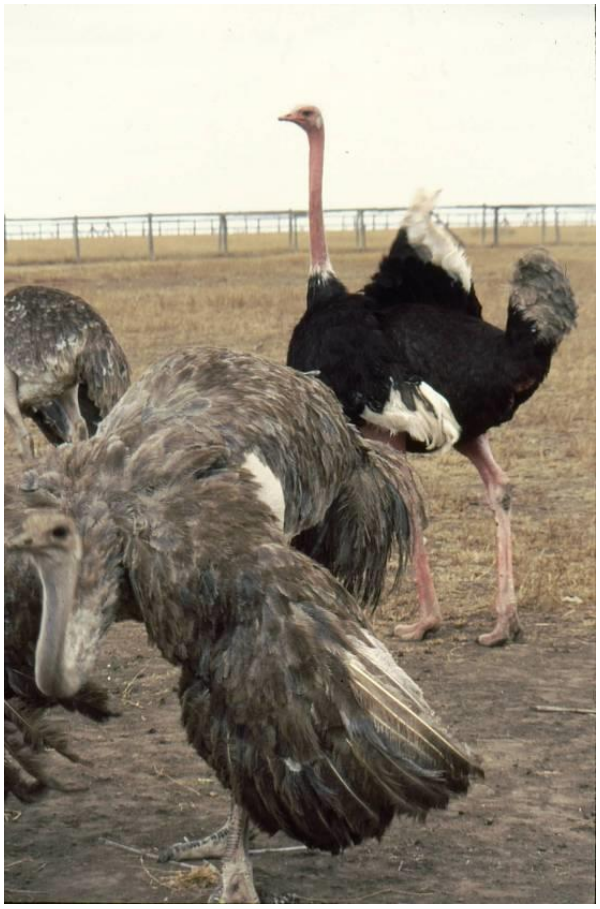


Above is a female north African Ostrich showing short 'downy' plumage on the head and neck and the relatively flat body plumage, compared with many of the Oudtshoorn domesticated birds that have more 'fluffy' plumage.

North African ostrich chicks and adults have a bald patch on top of the head but it is not dark grey as in Somali chicks and is hard to see on these pictures of the chicks.

Massai ostriches

Struthio camelus massaicus are sometimes referred to as Massai ostriches or 'red necks'. They occur mainly in land originally occupied by the Massai tribe in Kenya and Tanzania and have the largest body size of the ostrich races. The mature cock has pink skin all over his body. The hen has very long primary wing feathers and the body feathers of both sexes are not as fluffy as in domesticated southern African birds or as is found in some of the Northern African birds. The hen's tail feathers are grey-brown in colour and their eyes are reddish brown. Adult birds can weigh as much as 180 kg, probably averaging 155 kg.

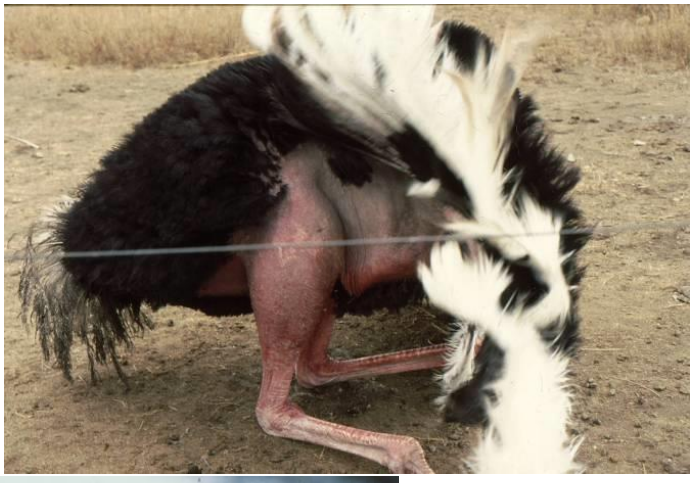


The man in this picture is Jim Gardener, manager of Nairobi Ostrich Farm. He is over 6 ft tall (183 cm). This helps gain an idea of the large size of these birds.

Massai ostrich hens appear to have very long wing feathers compared with southern African ostrich races although I did not have an opportunity to measure them.

Hens of all ostrich races have grey-brown feathers. The Massai hen can be distinguished by her generally smooth body feathers (not with fluffy edges) and a row of dirty white feathers low down between her tail and legs on the side of her body, as shown in the picture. Her body skin colour can be described as grey-pink.

This group of mature Massai ostrich hens at the Massai Mara Ostrich Farm of Hugo Wood are very large, as seen by comparing the size of people and vehicle.



A Massai ostrich cock performing his dance reveals the red skin covering his whole body.

A close up of the Massai ostrich head shows its relatively long beak and dark brown eye. The tip of the upper mandible has a downward bend (hook) that is not clearly seen in the photo.
North African birds also have this hook on the upper mandible but it is not seen in southern African ostriches.
The pink skin colour intensifies during the breeding season.

Massai ostriches have a reputation for being the most aggressive of the different races when farmed. However, on this Kenya farm, workers moved freely within areas with potentially aggressive breeding birds. The secret was in the way these birds are raised as chicks. Whenever a young bird showed any aggression towards farm workers they whipped them on the neck with a thin flexible cane. As a result whenever a worker moves through a breeding area he carries a stick as a reminder of who is 'in charge'. The normally aggressive birds have learnt to respect this and so keep their distance.

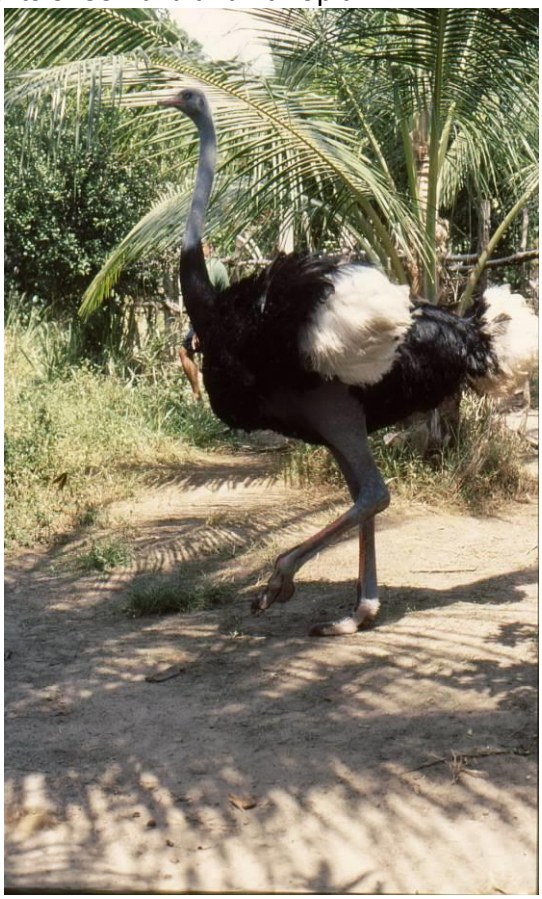
Massai chicks have pale pink skin and long necks. They and adults do not have a bald patch on the head.

As mentioned for north African birds, there is considerable regional variation in plumage amongst Massai ostriches. For instance some cock birds have whiter tails and some have more 'fluffy' feathers. For instance birds in parts of Tanzania differ from those in central Kenya.

Below: Ostrich in Ngorongoro, (Photo: Wikimedia Commons, the free media repository)

Somali or 'Blue ostrich'

This conspicuous bird *Struthio camelus molybdophanes* occurs in eastern Kenya right down to the coast but also extends northwards into parts of Somalia and Ethiopia.



Genetic studies by Freitag & Robinson (1993) have shown that these birds are the most different from any other genetically studied ostrich population.
The genetic differences from all other ostriches can be seen in their colour, including having pale blue eyes, but also in their voice, eggs and behaviour.

Distinctive colouration of the cock is the pure white wing and tail feather, the blue body and neck skin colour, the blue eyes, and the lower leg scales (scutes) of cocks are not all red as in other ostriches. Black scales extend from the toes about a third way up the leg.

The cock bird also has a different call. Other ostriches have a triple 'boom' call but these have a single boom call. They also have a display where the wing and tail feathers are spread outwards like a fan (see picture above left).
Skin of cock birds is deep blue and hens a pale pinkish/brown.

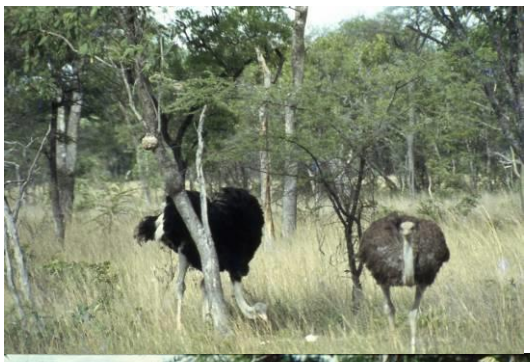
Somali Blue hens appear visually to have shorter wing feathers than their close neighbour Massai ostriches and they lack the line of dirty white feathers low down on the side of their abdomen.
Both sexes normally weigh less than Massai ostriches, probably averaging 140kg.

Somali ostrich chicks. Note the dark grey bald patch on its head

On the left is a Massai ostrich egg and on the right a Somali ostrich egg, with more prominant pores containing a dark grey pigment.

Southern African ostrich in Zimbabwe

Although all wild ostriches within southern Africa have been classified as belonging to the same race, *Struthio camelus australis,* there are in fact some major differences between birds found in various parts of southern Africa. We will look at some of these differences later.



The wild ostriches in Zimbabwe are very similar to wild birds in northern Botswana. They are a bit smaller than east African Massai ostriches, normally weighing between 145 and 160kg when adult.

Note the grey plumage of hens. Although they have dirty white feathers under their body this does not extend up the sides of the body. The male usually has pale brown tail feathers.

Mature southern African birds have dark brown eyes although some juveniles may initially have light grey eyes.

The bill is shorter than with Massai ostriches and the neck skin is covered with a fine down, unlike the almost naked neck and head skin of Massai birds.

This Zimbabwe chick plumage is ideally adapted for camouflage in dry grasslands.

Chicks from wild Zimbabwe ostriches. Many have a thin bald streak on the head but adults do not normally have a bald patch on their heads.

Table 1. Summarised differences between main ostrich 'races'

Feature	North African	Massai	Somali	Southern African Zimbabwe
Crown bald?	Yes	No	Yes	No
Cock neck skin	pink	pink	blue	grey
White neck collar on cock bird	wide	thin	nil	very thin
Neck bare on cock	yes	yes	no	no
Neck bare on hen	no	no	no	no
Eye colour	brown	brown	blue	brown
Body skin of cock	pink	pink	blue	grey
Body skin of hen	grey-brown	pale brown	pale brown	grey-brown
Leg scales on cock	red	red	black(lower)	red
Cock tail colour	rusty or white	grey to white	white	pale brown
Hen tail colour	grey/white	pale brown	grey/brown	grey
Estimated average weight (kg)	120-140	150-180	130-150	140-170

It should be emphasised that within each of the main sub-groups there is considerable variation in colouration and average body size. Also note that the cock's skin colouration intensifies during the breeding season.

NOTE: Dennis Pascall from Sherwood Tobacco Estate, Zimbabwe, weighed their breeding ostriches at 160 kg (range 20 kg) for cocks and 150 kg for hens (personal communication).

Variations between wild ostriches WITHIN southern Africa

I undertook a study of body shape and size among some wild ostriches in Zimbabwe, southern Botswana, Namibia and the coastal areas of South Africa. From this study I can show that there are large differences in shape, growth rates and adult live weights. These parameters can be compared with what is known about the so-called domestic ostriches farmed in South Africa, sometimes referred to as *Struthio camelus domesticus.*

Ostriches in southern Botswana and Kalahari semi-desert

In southern Botswana and the Kalahari arid regions of South Africa, wild ostriches have distinctively long legs and necks and their bodies are long and shallow in shape. Some people describe them as 'boat shaped'.

Another characteristic of this population of southern African ostriches is seen in mature cock birds having vivid rusty brown tail feathers. Both cocks and hens have fairly dense short whitish feathers on their necks and heads. Newman (1981) noted these birds with rusty tail feathers and asked whether this was typical of southern African ostriches. In fact it is only typical of this one population of southern birds since others lack this feature.

Photo of ostriches in Kgalagadi Transfrontier Park (formerly Kalahari Park). The park includes a northern extension of Northern Cape Province and an area of South West Botswana. Picture www.southafrica.net Note rusty red tails of cocks.

West and south coast 'pygmy' ostriches

On the South African west coast, from near Cape Town up to Alexander Bay and also on the south coast between Cape Agulhas and Infanta, we find a population of 'pygmy ostriches'. Adults of these birds rarely exceed 80 kg live body weight, compared with other southern African adult birds that mainly exceed 125kg.

These small adult birds from the south and west coast areas of South Africa are the least suitable for farming. This is because of their small size. Also note short legs and necks.

The picture at left shows one adult male from the West Coast population. Compared with the handlers and Dr Willem Burger (at right) we can see its small size.

Anatomical differences between ostriches will be considered in greater detail in the next chapter.

Some of this 'pygmy' genetics extends northwards into the Namib dessert of Namibia.

In northern Namibia and southern Angola the birds are larger, more similar to those in Zimbabwe and north-eastern Botswana.

Northern Namibia genetics

These two birds in Etosha Pan, Namibia are larger than in the Namib desert birds.


Detailed comparisons between some southern African ostrich types

Figure 2. Measurements on adult ostriches are shown below (Jarvis data)
Each measurement was given a numeral and results shown in following tables.
Girth just behind wing (9), Girth just behind leg (10), Body length under belly (11)
Distance from ground to top of back (4), Distance from ground to under belly (3)
Full neck measurement (8), Neck from base to end of feathers (12), Head length (6),
Culmen: beak tip to front of nostril (7).

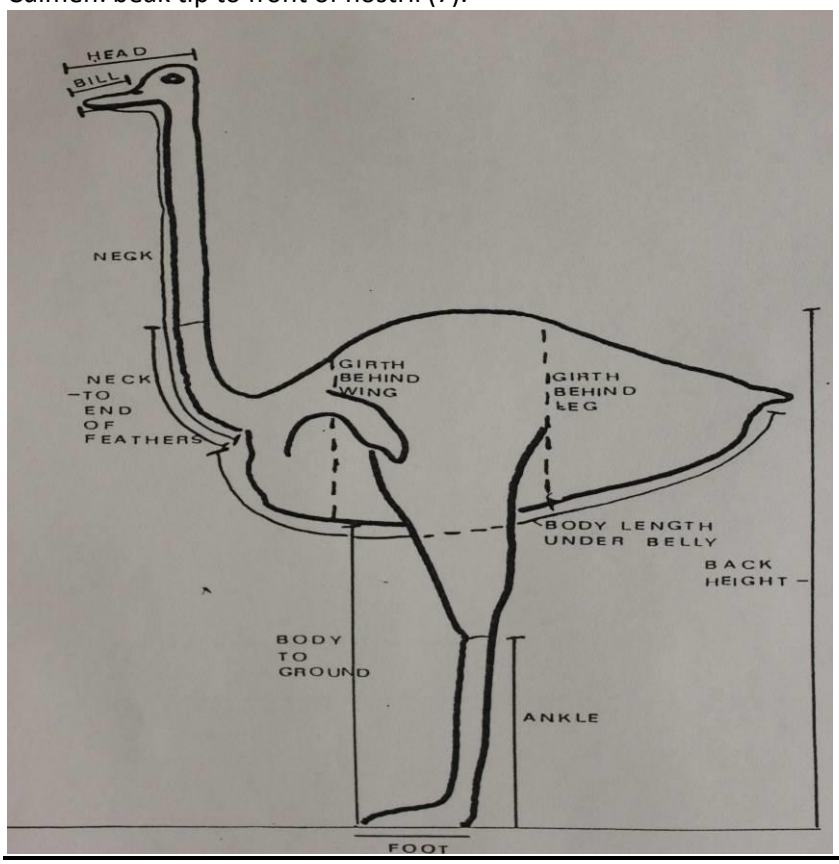


Table 2. **Measurements on ostriches from various locations**

Weight & Sex	girth Front 9 Cm	girth rear 10 cm	length ventral 11 cm	ground to back 4 cm	ground to belly 3 cm	neck full 8 cm	neck lower 12 cm	head length 6 cm	head width cm	culmen 7 mm	toenail width mm
Male birds (M): (South coast genetics)											
84 M	101	108	127	136	95	106	42	21	10	52	24
55 M	92	66	112	121	79	94	30	19	8.3	42	20
86 M	103	114	117	129	90	106	41	20	11	50	24
88 M	105	115	124	133	92	101	37	21	10	45	25
72 M	94	107	124	129	84	87	33	19	10	39	22
79 M	104	106	129	125	84	61	33	22	...	49	24
90 M	102	106	129	127	89	108	40	....	....	46	27
86 M	101	114	129	132	89	98	33	18	10	43	25
Mean	100.25	104.5	123.88	129.0	87.75	95.13	36.13	20	9.89	45.75	23.88
STD	4.71	16.02	6.29	4.75	5.12	15.50	4.49	1.41	0.87	4.40	2.10

Weight & Sex	girth Front 9 Cm	girth rear 10 cm	length ventral 11 cm	ground to back 4 cm	ground to belly 3 cm	neck full 8 cm	neck lower 12 cm	head length 6 cm	head width cm	culmen 7 mm	toenail width mm
Female birds (F) (South coast genetics)											
96 F	104	116	132	130	84	108	48	19	10	42	26
71 F	94	104	123	123	98	95	32	19	10	43	23
87 F	108	114	125	129	82	104	43	21	10	48	24
76 F	97	108	122	133	87	105	42	19	10	44	23
Mean	100.75	110.5	125.5	128.75	87.75	103	41.25	19.5	10	44.25	24
STD	6.40	5.51	4.51	4.19	7.14	5.60	6.70	1.00	0.0	2.63	1.41
Combined males and females											
Mean	100.42	106.5	124.42	128.92	87.75	97.75	37.83	19.82	9.93	45.25	23.92
STD	5.04	13.43	5.60	4.38	5.53	13.27	5.61	1.25	0.65	3.84	1.83

sex	9 Cm	10 cm	11 cm	4 cm	3 cm	8 cm	12 cm	6 cm	7 mm
Adult (14 month old) (Oudtshoorn genetics) slaughtered at Malmesbury abattoir									
M	104	128	118	131	79	103	36	18.3	58
M	106	128	108	132	85	91	47	19.0	64
M	109	117	114	131	83	94	46	19.5	67
M	108	141	118	133	84	94	47	18.7	62
M	110	131	120	135	83	101	50	19.3	66
M	114	126	126	133	85	112	46	20.2	67
M	111	115	118	134	87	109	40	20.5	75
M	104	111	104	131	85	108	39	18.8	59
M	110	116	120	129	86	110	46	19.3	69
M	110	114	112	128	80	113	47	20.5	69
Mean	108.6	122.7	115.8	131.7	83.7	103.5	44.4	19.41	65.6
STD	3.17	9.55	6.43	2.16	2.54	8.15	4.45	0.77	5.08

sex	9 Cm	10 cm	11 cm	4 cm	3 cm	8 cm	12 cm	6 cm	7 mm
Adult 14 month old (Oudtshoorn genetics) slaughtered at Malmesbury abattoir									
F	108	125	113	132	82	109	39	19.3	62
F	108	116	118	134	86	109	41	19.8	67
F	103	126	112	126	79	97	48	18.3	62
F	108	134	111	127	78	94	43	18.0	62
F	108	121	116	125	77	100	42	17.8	59
F	109	116	122	127	81	97	47	19.2	60
F	106	117	122	134	90	108	46	19.9	70
F	110	121	119	131	84	101	45	20.5	69
F	108	117	113	129	80	113	48	19.6	69
F	111	117	124	135	87	99	40	19.8	65
Mean	107.9	121	117	130	82.4	102.7	43.9	19.22	64.5
STD	2.18	5.85	4.69	3.68	4.25	6.48	3.35	0.90	4.03
Combine males and females									
Mean	108.25	121.85	116.4	130.85	83.05	103.1	44.1	19.32	65.05
STD	2.67	7.75	5.51	3.07	3.47	7.18	3.82	0.82	4.50

Sex	9 cm	10 cm	11 cm	4 cm	3 cm	8 cm	12 cm	6 cm	7 mm
De Rust. Large birds 2.5 years old (Oudtshoorn genetics)									
M	118	135	129	136	75	113	...	18.6	62
M	121	137	130	136	80	112	43	20.2	64
M	119	136	130	137	81	109	45	20.3	75
M	118	133	120	137	81	113	43	19.5	64
M	114	141	128	140	82	121	38	20.0	73
M	127	146	124	136	79	111	44	19.3	63
Mean	119.5	138	126.83	137	79.67	113.17	42.6	19.65	66.83
STD	4.32	4.73	4.02	1.55	2.50	4.12	2.70	0.65	5.64
F	128	128	129	139	81	112	39	18.7	68
F	119	132	134	148	89	109	49	19.7	71
F	118	148	129	136	81	118	43	20.2	73
F	125	150	140	134	76	113	49	20.7	72
F	124	140	131	140	85	115	45	20.1	72
Mean	122.8	139.6	132.6	139.4	82.4	113.4	45	19.88	71.2
STD	4.21	9.63	4.61	5.37	4.88	3.36	4.24	0.75	1.92
Combine males and females									
Mean	121.0	138.73	129.45	138.09	80.91	113.27	43.8	19.75	68.82
STD	4.40	7.00	5.07	3.78	3.83	3.61	3.58	0.67	4.75

Comparison of data from cocks (M) and hens (F) showed no statistically significant difference. The combined data was then used to make comparisons between the various genetic and age groupings, as in the following table.

Sex	9 cm	10 cm	11 cm	4 cm	3 cm	8 cm	12 cm	6 cm	7 mm
Kleinzee wild west coast ostriches: 6 month old									
M	85	91	89	102	59.0	83	35	16.1	54
?	86	95	97	101	61.5	86	29	15.3	49
?	71	92	84	92	50.5	70	31	14.8	49
?	84	92	93	91	57.0	82	26	15.2	49
?	74	91	92	93	53.5	79	29	14.3	46
Mean	80.0	92.2	91.0	95.8	56.3	80.0	30.0	15.14	49.4
STD	6.96	1.64	4.85	5.26	4.37	6.12	3.32	0.67	2.89
Kleinzee adults									
M	108	129	104	129	81	100	44	17.2	57
F	106	125	105	130	79	95	38	18.2	66
Mean	107	127	104.5	129.5	80	97.5	41	17.7	61.5
STD	1.41	2.23	0.71	0.71	1.41	3.54	4.24	0.71	6.36
Alexander Bay 8 to 9 months									
M	97	111	104	117	77	95	36	19.2	72
M	104	132	108	120	73	99	38	18.6	61
?	98	98	96	112	72	93	44	17.2	69
F	101	111	112	123	77	82	32	17.9	58
F	104	115	106	115	66	100	41	17.4	52
F	100	120	105	118	74	91	32	18.0	61
F	99	116	111	116	71	97	40	17.7	60
Mean	100.43	114.71	106	117.29	72.86	93.86	37.57	18.0	61.86
STD	2.76	10.29	5.32	3.55	3.80	6.12	4.54	0.70	6.72

Sex	9 cm	10 cm	11 cm	4 cm	3 cm	8 cm	12 cm	6 cm	7 mm
Botswana Mature M and F plus one juvenile									
F	110	139	140	146	95	116	48	20.7	72
M	111	137	136	132	86	117	48	19.9	66
Mean	110.5	138	138	139	90.5	116.5	48	20.3	69
STD	0.71	1.41	2.83	9.90	6.36	0.71	0.00	0.57	4.24
J	81	99	98	114	72	88	40	16.2	49

Sex	9 cm	10 cm	11 cm	4 cm	3 cm	8 cm	12 cm	6 cm	7 mm
Namibian genetics at Experimental Farm in Oudtshoorn: 3 to 4 years old									
M	116	133	121	144	88	111	46	20.1	73
M	118	141	115	135	80	106	39	19.8	68
M	116	138	116	137	84	105	45	20.0	72
M	116	130	122	134	79	100	41	19.8	76
M	116	142	106	135	82	108	41	20.0	74
Mean	116.4	136.8	116	137	82.6	106	42.4	19.94	72.6
STD	0.89	5.17	6.36	4.06	3.58	4.06	2.97	0.13	2.97
F	100	129	116	132	80	109	45	19.9	73
F	102	119	107	136	89	107	39	20.2	71
F	97	131	104	127	79	108	45	19.4	72
F	112	129	110	132	79	110	52	19.7	71
F	107	120	109	131	79	109	44	191	68
F	108	129	117	136	80	106	39	19.3	67
F	109	122	113	135	85	115	49	18.5	63
Mean	105	125.57	110.86	132.71	81.57	109.14	44.71	19.44	69.29
STD	5.42	5.03	4.74	3.25	3.90	2.91	4.79	0.56	3.50
Combined males and females									
Mean	109.75	130.25	113	134.5	82.0	107.83	43.75	19.65	70.67
STD	7.12	7.54	5.83	4.08	3.64	3.64	4.14	0.49	3.58

Comparing dimensions of adult ostriches from various areas (Sexes combined)

Ostrich type		9 Cm	10 cm	11 cm	4 cm	3 cm	8 cm	12 cm	6 cm	7 mm
De Rust breeders (Oudtshoorn genetics (11 adult birds)										
	Mean	121.0	138.73	129.45	138.09	80.91	113.27	43.8	19.75	68.82
	STD	4.40	7.00	5.07	3.78	3.83	3.61	3.58	0.67	4.75
Malmesbury abattoir (Oudtshoorn Genetics) (20: 14 month old birds)										
	Mean	108.25	121.85	116.4	130.85	83.05	103.1	44.1	19.32	65.05
	STD	2.67	7.75	5.51	3.07	3.47	7.18	3.82	0.82	4.50
Botswana mature birds (2 birds)										
	Mean	110.50	138.0	138	139	90.50	116.50	48.00	20.3	69.00
	STD	0.71	1.41	2.83	9.90	6.36	0.71	0.00	0.57	4.24
Namibian genetics at Experimental Farm in Oudtshoorn (12 adult birds)										
	Mean	109.75	130.25	113.0	134.5	82.00	107.83	43.75	19.65	70.67
	STD	7.12	7.54	5.83	4.08	3.64	3.64	4.14	0.49	3.58
South Coast ostrich genetics (12 adult birds)										
	Mean	100.42	106.5	124.42	128.92	87.75	97.75	37.83	19.82	45.25
	STD	5.04	13.43	5.60	4.38	5.53	13.27	5.61	1.25	3.84
West Coast genetics at Alexander Bay 8 to 9 month birds) (7 birds)										
	Mean	100.43	114.71	106.0	117.29	72.86	93.86	37.57	18.0	61.86
	STD	2.76	10.29	5.32	3.55	3.80	6.12	4.54	0.70	6.72
Klein zee adults (2 birds)										
	Mean	107	127	104.5	129.5	80	97.5	41.00	17.7	61`.5
	STD	1.41	2.23	0.71	0.71	1.41	3.54	4.24	0.71	6.36
Zimbabwe (9 months)Average live weight 100 kg (25 birds)										
	Mean				137.60					57.28
	STD				4.36					3.78

Table 3: Statistically significant differences in measurements of ostriches at 90% and 99% levels

Groups compared	Measurements taken on birds								
	9	10	11	4	3	8	12	6	7
Oudtshoorn breeders Vs. South Coast breeders									
Sig at 90%	y	y	y	y	y	y	y	no	y
Sig at 99%	y	y	no	y	y	y	y	no	y
Oudtshoorn breeders Vs Namibian breeders									
Sig at 90%	y	y	y	y	no	y	no	no	no
Sig at 99%	y	no	y	no	no	y	no	no	no
Oudtshoorn breeders Vs Botswana breeders									
Sig at 90%	y	no	y	no	no	y	y	no	no
Sig at 99%	y	no	no	no	no	no	y	no	no
Oudtshoorn breeders Vs Kleinzee breeders									
Sig at 90%	y	y	y	y	no	y	no	y	no
Sig at 99%	y	no	y	y	no	no	no	no	no
Oudtshoorn breeders Vs Oudtshoorn 14 month old slaughter birds									
Sig at 90%	y	y	y	y	no	y	no	no	y
Sig at 99%	Y	Y	y	y	no	y	no	no	no
Oudtshoorn 14 month old slaughter birds Vs South Coast breeders									
Sig at 90%	y	y	y	no	y	no	y	no	y
Sig at 99%	y	y	y	no	no	no	y	no	y
Oudtshoorn 14 month old slaughter birds Vs Namibia breeders									
Sig at 90%	no	y	no	y	no	y	no	no	y
Sig at 99%	no	y	no	no	no	no	no	no	y
Oudtshoorn 14 month old slaughter birds Vs Botswana breeders									
Sig at 90%	y	y	y	no	no	y	y	no	no
Sig at 99%	no	y	no	no	no	y	y	no	no
Oudtshoorn 14 month old slaughter birds Vs Kleinzee breeders									
Sig at 90%	no	no	y	no	no	no	no	y	no
Sig at 99%	no	no	y	no	no	no	no	no	no
Namibian breeders Vs. South Coast breeders									
Sig at 90%	y	y	y	y	Y	Y	Y	no	y
Sig at 99%	y	y	y	Y	y	no	y	no	y
Namibian breeders Vs Botswana breeders									
Sig at 90%	no	y	y	no	no	y	y	no	no
Sig at 99%	no	no	no	no	no	y	y	no	no
Namibian breeders Vs Kleinzee breeders									
Sig at 90%	no	no	y	y	no	y	no	y	no
Sig at 99%	no	no	y	y	no	no	no	no	no
Oudtshoorn 14 month slaughter birds Vs Zimbabwe 9 month									
Sig at 90%				y					y
Sig at 99%				y					y

Comments Regarding the statistical significance of measurements comparing Oudtshoorn breeders with south coast breeders (Pygmy ostriches):

Girth in front of the wing and behind the leg was significantly smaller in south coast birds at 99% level.

Belly height above ground was greater in south coast birds at 99% level.

Back height above ground was smaller for south coast birds at 99% level, indicating that the body was small when measured dorso-ventrally in the south coast birds.

Body length under the bird, from base of neck to just below the tail was small in the south coast birds at 90% level.

Neck length was shorter in the south coast birds at 99% level.

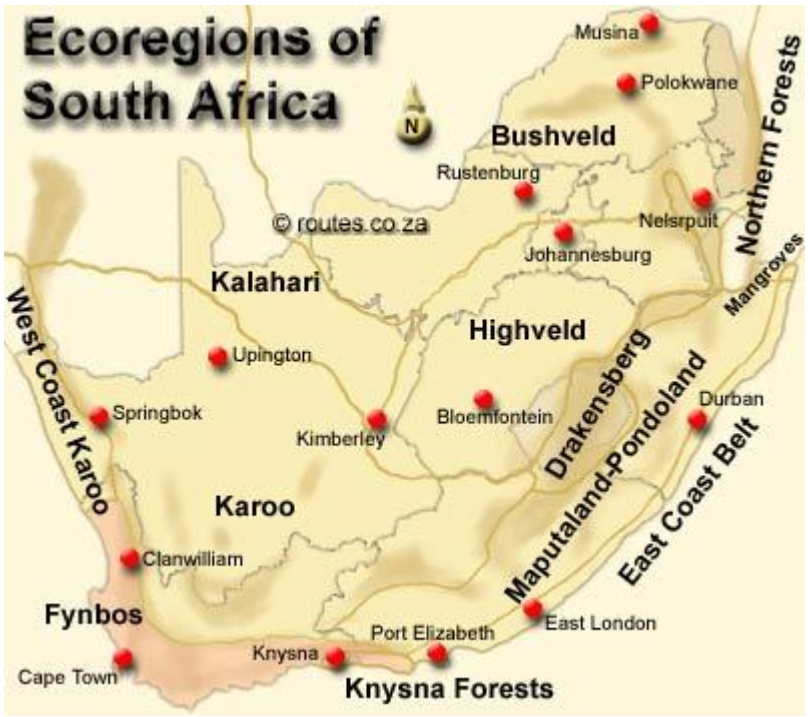
Culmen length was smaller in south coast birds at 99% level.

Overall, the south coast breeding ostriches had longer legs than Oudtshoorn breeders but smaller bodies, especially in measurements of girth and the dorso-ventral measurement. South coast birds also had shorter necks.

Comparisons of Oudtshoorn birds with Namibian breeders, Botswana breeders and Kleinzee breeders showed highly significant differences in body proportions, even though the Kleinzee and Botswana samples were only two birds in each locality.

Clearly there is scope for more detailed research into regional differences in morphology of Southern African ostrich populations, with a view to quantifying possible racial differences. In this regard ostriches in the Kalahari area appear from photographs to have very long legs and pronounced 'boat shaped bodies', meaning that the body is dorso-ventrally compressed when compared with Oudtshoorn birds. The body of Kalahari birds also appears from photographs to be longer. They also appear to have very long necks.

Figure 3. Some ecological regions of South Africa.

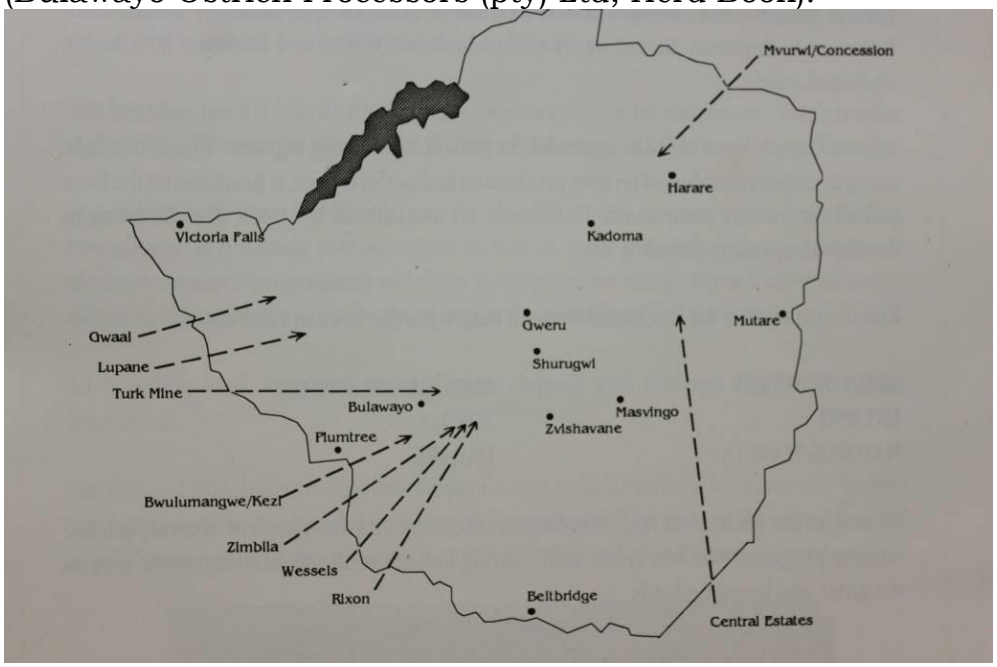


These measurements of southern African ostrich groups suggest several racially distinct populations. This was also recorded for northern African birds by Thornton when visiting various locations to find birds with superior feather quality for importations into South Africa (Smit 1984). He went to several North African locations before finding a group of wild ostriches with superior quality feathers.

Similar variations are found in Somali ostriches, looking significantly different in Northern Kenya than they do in Ethiopia, judging by photographs.

Within Zimbabwe the ostrich industry recognised differences in appearance between wild ostriches in various parts of the country, as detailed in their 'Herd Book'.

Figure 4.Major bloodline areas identified by ostrich farmers in Zimbabwe (Bulawayo Ostrich Processors (pty) Ltd, Herd Book).



Thornton (1910), noted that wild birds of Zoutpansberg District, Transvaal, South Africa, were different to those in Oudtshoorn. He wrote: *The majority of these birds(domesticated) produce feathers equal to average good-plucking birds of the Cape Colony, and occasionally ones show quality quite fit to breed from. They are in size quite one-third larger than the ordinary domesticated bird (reared under like conditions with same), so I think there would be an advantage in crossing the two to get the stronger constitution of the wild bird in the tame one.*

With reference to the 'pygmy ostriches' found on the south and west coast of South Africa, the smaller size is genetically determined, as shown by an experiment conducted at the Alexander Bay Ostrich Farm. Terblanche (pers comm) a previous manager of the farm, reared wild west coast chicks and Oudtshoorn domesticated ostrich chicks on the same feed and identical facilities. He noted that west coast chicks grew slower, took two or more months longer to reach a slaughter weight than the Oudtshoorn genetics and failed to reach the same adult weight as Oudtshoorn genetics, mainly only reaching about 80 kg live weight compared with 85 to 90 kg by 10 months for Oudtshoorn genetics.

Within each group of ostriches there is also considerable variation in egg size, shape and surface markings, as is shown in this collection of Zimbabwe ostrich eggs.
Ostrich hens use these differences to help recognise their own eggs and to selectively move out eggs of other hens if the nest has too many eggs in it for effective incubation.

This variation in egg size and shape within any one regional population of ostriches can explain why comparisons between regions shows divergent characteristics. Since ostriches cannot fly it means that geographical barriers can restrict gene spread over wide areas and each area can develop its own characteristic egg shape and size depending on which hens left the most surviving offspring, forming the next generations of breeding birds in the area.

Bertram (1979) suggested that each hen lays eggs of fairly consistent size and shape. As a result dominant hens can identify their own eggs and exclude eggs from other hens if too many have been laid in a nest for ease of incubation.

I tested this consistency of egg characteristics from individual hens, by keeping hens in individual camps and recording their egg dimensions, as shown below.

Table 4: <u>Measurements of eggs from hens in single hen pens at Langkloof Farm</u>

Hen no.		Fresh weight Grams	Egg index	Number of eggs
3	Mean	1575.33	84.59	15
	STD	65.12	1.64	
AJ	Mean	1772.00	79.82	25
	STD	72.11	2.82	
32	Mean	1313.52	81.80	27
	STD	46.61	1.79	
31	Mean	1638.89	84.47	18
	STD	102.72	2.52	
1	Mean	1850.50	83.62	20
	STD	75.29	2.24	
5	Mean	1558.13	80.62	16
	STD	72.87	1.99	
34	Mean	1551.00	77.66	21
	STD	70.35	1.96	

If we compare eggs from all of the above hens we find that the characteristics of eggs from any one hen are statistically different from other hens. The egg index is calculated by egg width divided by egg length X 100.

This finding serves to confirm suggestions made by Bertram (1979) where he suggested that the dominant hen recognises her own eggs and then pushes eggs of other hens out of the nest, if the total exceeds about 20 eggs. Ostriches cannot effectively incubate more than about 20 eggs in a nest.

Table 5: Comparison of egg characteristics from individual hens at 90% and 99% significance level

Hens compared	Egg index Sig Difference	Fresh weight Differences
3 vs AJ	99%	
3 vs 32	99%	
3 vs 31	no	90%
3 vs 1	no	99%
3 vs 5	99%	
3 vs 34	99%	
AJ vs 32	99%	
AJ vs 31	99%	
AJ vs 1	99%	
AJ vs 5	no	99%
AJ vs 34	99%	
32 vs 31	99%	
32 vs 1	99%	
32 vs 5	90%	99%
32 vs 34	99%	
31 vs 1	99%	
31 vs 5	99%	
31 vs 34	99%	
1 vs 5	99%	
1 vs 34	99%	

Clearly there are statistically significant differences between the shapes (Egg Index) of eggs from individual hens.
In the three cases where the egg shapes were very similar the differences in egg weights are significantly different in all but one case. These differences in egg shape and egg size, combined with other features such as surface texture, suggest how ostrich hens can recognise their own eggs.

Regarding regional differences in ostrich egg characteristics, a comparison of average egg sizes from the sample localities shows that the so-called 'Pygmy ostriches' were much smaller than in most ostrich populations. In most cases the measurements taken of ostrich eggs from different ostrich populations did not include the egg fresh weights. For this reason I tested a formula that can determine fresh egg weight from the length and width measurements of eggs.

I tested the accuracy of a formula derived by Hoyt et al (1978).

Used formula :Egg weight = Egg volume x density
Egg volume = $29 + (0.5105 \times L \times W^2)$
Egg density = 1.16

Table 6: Fresh egg weight compared with calculated weight :Testing the formula

	Fresh egg Weight(g)	Egg length mm	Egg width mm	Egg index	Calculated weight(g)
	1392.7	145	127	87.586	1384.97
	1495.3	151	130	86.093	1511.22
	1540.1	154	129	83.766	1517.62
	1311.3	152	122	80.263	1339.76
	1142.0	139	116	83.453	1107.64
	1581.0	152	133	87.500	1592.24
	1480.8	153	127	83.007	1461.38
	1340.3	150	124	82.667	1365.84
	1432.1	150	127	84.667	1432.72
	1182.0	141	120	85.106	1202.40
	1364.2	153	123	80.392	1370.77
	1157.8	145	116	80.000	1155.45
	1367.3	153	123	80.392	1370.77
	1179.8	147	116	78.912	1171.38
	1324.3	154	121	78.571	1335.23
	1383.7	151	124	82.119	1374.94
	1328.0	149	124	83.221	1356.73
	1452.8	157	127	80.892	1499.58
	1380.9	150	125	83.333	1387.96
	1396.0	160	120	75.000	1364.42
	1627.5	163	130	79.755	1631.31
	1358.8	154	123	79.870	1379.73
	1374.2	156	123	78.846	1397.65
	1335.5	151	121	80.132	1309.22
	1379.0	149	123	82.550	1334.94
	1419.7	150	125	83.333	1387.96
	1521.9	156	127	81.410	1490.03
	1623.5	165	129	78.182	1626.02
	1466.4	163	124	76.074	1484.21
	1487.3	154	128	83.117	1494.18
	1480.5	154	127	82.468	1470.93
	1496.7	152	128	84.211	1474.78
	1240.5	138	122	88.406	1216.37
	1510.0	157	127	80.892	1499.58
	1413.1	154	123	79.870	1379.73
	1158.3	149	114	76.510	1146.73
	1510.7	156	129	82.692	1537.33
	1344.1	151	123	81.457	1352.86
	1180.4	144	116	80.556	1147.48
	1598.0	166	128	77.108	1610.61
	1416.0	154	125	81.169	1424.97
	1380.5	149	125	83.893	1378.70
	1348.3	150	123	82.000	1343.90
	1090.0	138	114	82.609	1062.08
AVG	**1386.19**			**81.683**	**1383.73**
STD	**132.95**			**2.950**	**138.58**

Conclusion: The difference between actual weight and calculated weight is not statistically significant, confirming that the formula gives accurate fresh egg weights from egg length and width measurements. This facilitates comparison of egg characteristics of ostriches from various locations. In most cases actual egg weights were not recorded but these weights can be derived by using this formula based on egg dimensions.

Table 7: Comparison of ostrich egg characteristics from various localities

Area and Number of eggs	Mean and Standard error of the mean			
	length cm	width cm	calculated mass (g)	roundness Index
Oudtshoorn				
103	14.72	11.93	1284	81.17 (mean)
	0.084	0.061	18.52	0.326 (STD)
Kleinzee				
58	13.79	11.67	1151	84.69
	0.097	0.070	19.87	0.434
Zimbabwe 1				
56	14.75	12.23	1342	82.96
	0.069	0.049	14.99	0.353
Zimbabwe 2				
66	14.17	12.24	1296	86.35
	0.068	0.061	18.17	0.205
Zimbabwe 3				
121	14.33	12.07	1273	84.28
	0.053	0.034	10.25	0.271
Zimbabwe 4				
26	14.35	12.29	1322	85.66
	0.133	0.104	30.24	0.472
Zimbabwe 5				
280	14.520	12.41	1363	85.50
	0.041	0.030	9.45	0.152
Oasis farm				
159	14.83	12.22	1350	82.41
	0.048	0.042	11.95	0.235
Massai Nairobi				
39	15.68	12.94	1592	82.58
	0.095	0.072	24.54	0.403
Massai at Hugo	15.99	12.60	1543	78.97
13	9.63	4.28	182.10	2.98
Somali at Hugo	16.12	12.77	1590.94	79.24
13	3.41	2.59	85.97	1.58
Botswana				
6	14.92	12.13	1337	81.54
	0.396	0.131	56.76	1.691
North Africa				
43 (Duerden)	15.62	15.14	2153.35	96.80

Duerden (1918) points out that the eggs from north African birds (imported to South Africa by Thornton) are larger, rounder and the surface of the shell is completely smooth, while that of the South African birds are generally less round and the surface of shells are pitted to varying extent.
Crosses between the two genetics showed that the egg characteristics was only determined by the hen.
He gives average dimensions of eggs from 43 Nigerian birds as 15.62 X 15.14cm. In other words these eggs were almost spherical and the calculated fresh weight was far heavier than eggs of all other races. The heaviest egg I recorded from Oudtshoorn genetics was 2419g but this one instance shows me that the 2153g average for northern African birds, derived from Duerden's egg measurements, is within the possible range.

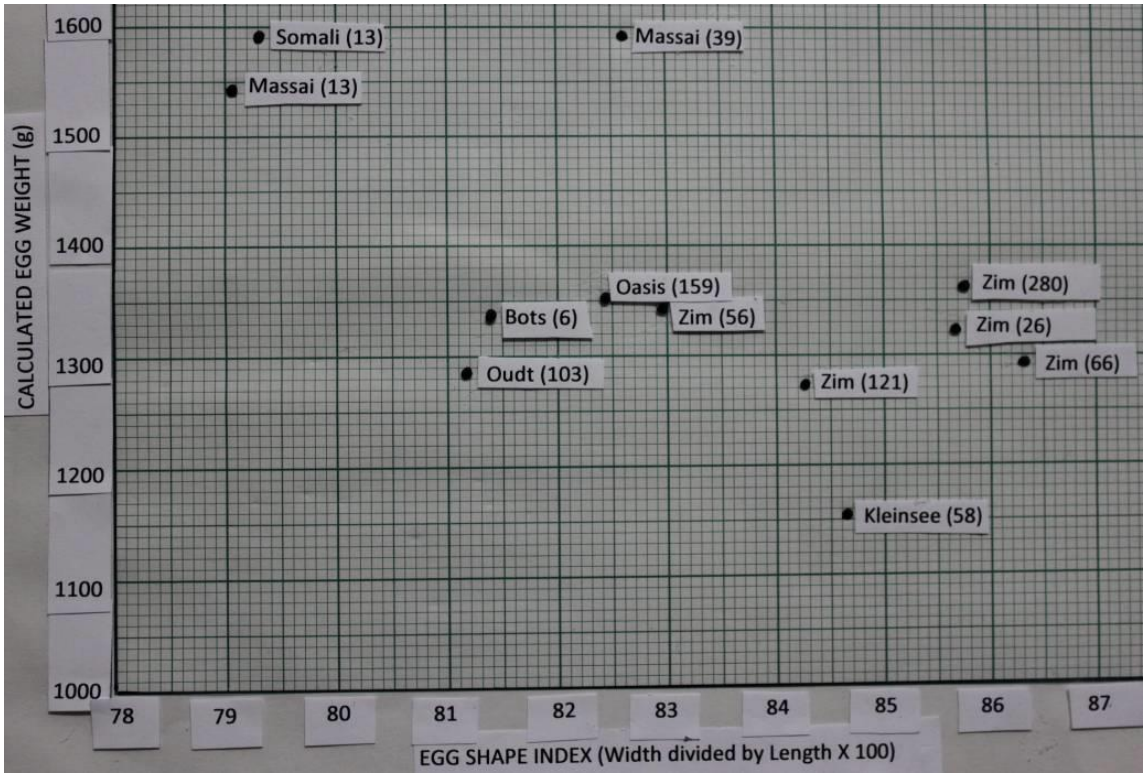
Table 8: Statistically significant differences in egg characteristics between areas

Comparisons	Index Sig diff	Weight sig diff
Oudtshoorn vs Kleinzee	99%	99%
Zimbabwe 1 vs Zimbabwe 2	99%	99%
Zimbabwe 1 vs Zimbabwe 3	99%	99%
Zinmbabwe 1 vs Zimbabwe 4	99%	99%
Zimbabwe 1 vs Zimbabwe 5	99%	99%
Zimbabwe 2 vs Zimbabwe 3	99%	99%
Zimbabwe 2 vs Zimbabwe 4	99%	99%
Zimbabwe 2 vs Zimbabwe 5	99%	99%
Zimbabwe 3 vs Zimbabwe 4	99%	99%
Zimbabwe 3 vs Zimbabwe 5	99%	99%
Zimbabwe 4 vs Zimbabwe 5	90% NO	99%
Oasis vs Oudtshoorn	99%	99%
Oasis vs Kleinzee	99%	99%
Oudtshoorn vs Kenya	99%	99%
Oasis vs Kenya	90%	99%
Zimbabwe vs Kenya	99%	99%
Zimbabwe vs kleinzee	99%	99%
Massai vs Somali at Hugo	90% NO	99%
Kenya Massai vs at Hugo	99%	90% NO
Kenya Massai vs Hugo Somali	90% NO	99%

Conclusion: Each area has characteristics of egg Index and average calculated egg weight.
When plotted on a graph the differences become more apparent.
A comparison of Massai ostriches from the Nairobi Ostrich Farm and from the Massai Mara Farm of Hugo Wood, revealed a surprising difference in eggshell thickness. The shells measured at Nairobi averaged 2.0mm (5 eggs). However at Hugo's farm the shells were all much thinner, averaging 1.6mm (6 eggs). I suspect this difference is due to different nutrition given on the two farms. Keffen and Jarvis (1984) found that wild Zimbabwe eggs averaged 1.79mm (STD 0.18) but eggs on farms in Oudtshoorn often averaged 1.83mm (SDT 0.12). On some Oudtshoorn farms eggshell thickness averaged 2.0mm, and this was apparently due to the higher calcium content of breeder bird feeds used in Oudtshoorn.

In Figure 5 the northern African ostrich eggs are so much heavier and rounder than all other measured eggs that they cannot be plotted on the following graph.

Figure 5. Egg Index vs Egg weight for ostrich eggs from various locations and genetics.



Regional differences revealed by measuring hides at crust stage of tanning

I undertook an investigation at the request of the police who had confiscated a large number of tanned ostrich hides. This was at a time when South African law still prohibited any trade in ostrich products unless conducted via the Klein Karoo Co-operative.
I examined hides from known Oudtshoorn birds and hides from known Botswana birds. It had been claimed by the accused that the confiscated leather was in fact from Botswana birds. The hides were measured at the Klein Karoo Co-operative tannery facilities.

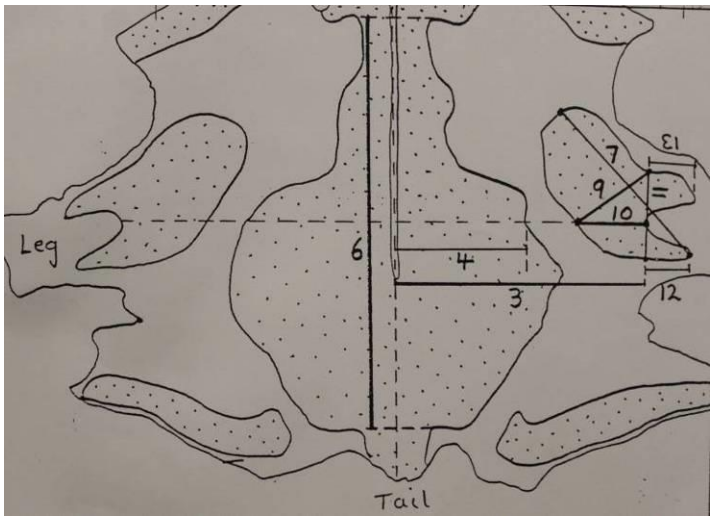


Figure 6. Measurements taken on ostrich hides. The diagram shows an ostrich hide with the numerals indicating where the measurements were taken. Areas with dots are the locations where feathers were situated.

Table 9: Measurements taken on ostrich hides, -

Origin of hides	Measurements taken (to nearest cm)										
	3	4	6	7	9	10	11	12	13	3-4	index
Botswana ostriches	63	33	100	45	21	17	22	5	8	30	50.00
	59	29	89	42	22	19	19	19	8	30	50.00
	61	35	89	52	20	18	19	6	9	26	25.00
	58	29	83	41	20	17	19	2	10	29	60.42
	53	26	83	37	20	13	19	3	8	27	67.50
	61	30	90	41	22	16	19	2	8	31	77.50
	69	31	99	50	28	25	21	3	8	38	79.20
	59	30	89	43	26	19	23	35	8	29	51.79
	59	28	93	41	22	18	20	6	9	31	77.50
	64	32	100	45	25	20	25	5	9	32	61.54
	56	28	86	42	22	16	22	4	9	28	50.00
	60	30	88	42	23	17	24	5	9	30	62.50
	62	29	93	45	25	20	21	4	9	33	68.75
	66	33	99	47	26	21	21	4	9	33	58.93
	60	32	100	47	23	16	26	6	12	28	36.84
	64	33	94	46	24	19	22	4	9	31	51.67
	62	31	100	48	22	17	20	2	8	31	45.59
	64	32	99	48	24	13	27	6	12	32	50.00
	66	32	93	50	24	19	22	5	10	34	53.13
	61	34	99	46	22	13	24	5	12	27	35.53
	69	34	96	49	26	21	22	5	12	35	62.50
	64	31	91	45	21	18	20	5	8	33	68.75
	61	32	93	40	20	13	22	5	10	29	65.91
	62	33	95	45	21	16	22	5	11	29	45.31
	64	31	95	46	20	16	21	3	7	33	63.46
	62	31	93	49	20	16	20	5	10	31	43.06
	62	31	95	46	21	17	22	5	10	31	51.67
	61	30	92	50	21	17	22	4	9	31	40.79
	65	32	101	47	23	18	20	5	9	53	68.93
Means	61.87	30.93	93.40	45.33	22.50	17.47	21.50	4.83	9.23		55.65
STD	3.43	2.20	5.32	3.50	2.19	2.64	2.11	2.92	1.43		13.09

Hide proportions index: $\frac{3\text{-}4 \times 100}{7-(3-4)\times 4}$ **Index= 55.65**

Origin of hides	Measurements taken (to nearest centimetre)										
	3	4	6	7	9	10	11	12	13	3-4	index
Oudtshoorn Ostriches	58	29	85	45	23	19	21	7	9	29	45.31
	60	30	90	48	24	22	19	6	9	30	41.67
	58	29	91	46	25	18	20	7	8	29	42.65
	58	28	86	47	25	18	22	7	7	30	44.12
	57	29	83	43	22	19	19	4	7	28	46.67
	59	29	86	47	22	17	22	4	8	30	44.12
	56	28	85	44	22	17	23	6	9	28	43.75
	54	28	81	40	22	17	20	4	11	26	46.42
	57	30	82	42	24	20	19	4	8	27	45.00
	56	29	86	46	24	15	26	6	11	27	35.53
	57	28	85	40	21	16	19	4	8	29	65.91
	54	31	84	39	21	15	20	5	8	23	35.94
	59	30	85	44	21	17	20	5	10	29	48.33
	56	30	81	43	18	13	21	4	10	26	38.24
	54	28	85	42	21	15	22	7	11	26	40.63
	55	29	83	44	22	18	22	4	8	26	36.11
	53	27	84	41	20	14	21	6	11	26	43.33
	58	29	86	44	22	19	20	5	9	29	48.33
	59	28	85	42	23	19	20	4	8	31	70.45
	57	28	83	43	24	18	21	5	9	29	51.79
	56	29	84	40	24	18	20	4	8	27	51.92
	59	29	83	44	24	19	22	6	10	20	20.83
	56	28	82	43	20	17	20	6	9	28	46.67
	59	31	86	45	22	16	21	4	11	28	41.18
	60	28	83	42	24	20	21	3	9	32	80.00
	54	27	84	40	23	16	22	5	9	27	51.92
	57	28	85	47	23	16	21	6	9	29	40.28
	60	30	90	45	26	24	19	2	6	30	50.00
	57	30	83	43	24	18	22	5	8	27	42.19

Oudtshoorn continued											
	56	28	83	41	22	18	19	5	7	28	53.85
	58	29	89	43	22	18	18	2	7	29	51.79
	61	28	83	46	24	22	19	3	5	33	63.46
	58	29	85	42	20	16	19	5	10	29	55.77
Means	57.15	28.82	84.73	43.36	22.55	17,70	20.61	4.85	8.70		47.26
STD	2.02	1.01	2.44	2.36	1.73	2.31	1.58	1.35	1.49		11.14

Hide proportions Index: $\frac{3\text{-}4 \times 100}{7 - (3\text{-}4) \times 4}$ **Index** = **47.26**

origin of hides.	Measurements taken (to nearest centimeter)										
	3	4	6	7	9	10	11	12	13	3-4	Index
Massai	55	29	85	43						26	36.43
ostriches	55	28	87	43						27	40.15
(Kenya)	57	32	89	48						25	28.49
	59	33	94	49						26	27.13
	58	32	96	45						26	32.69
	54	27	85	43						27	42.19
	53	31	86	45						22	23.95
Means	55.86	30.29	88.86	45.14						25.21	33.00
STD	2.19	2.29	4.45	2.48						1.63	6.88

Hide proportions Index: $\frac{3\text{-}4 \times 100}{7 - (3\text{-}4) \times 4}$ **Index** = **33.00**

COMPARISONS:

Comparing Botswana hides with Oudtshoorn: Statistically significant difference at 99% level.
Comparing Botswana hides with Massai: Statistically significant difference at 99% level.
Comparing Oudtshoorn hides with Massai: Statistically significant difference at 99% level.
These calculated Index values show that regional differences in ostrich body shapes, between various ostrich races, can be quantified from study of hides.

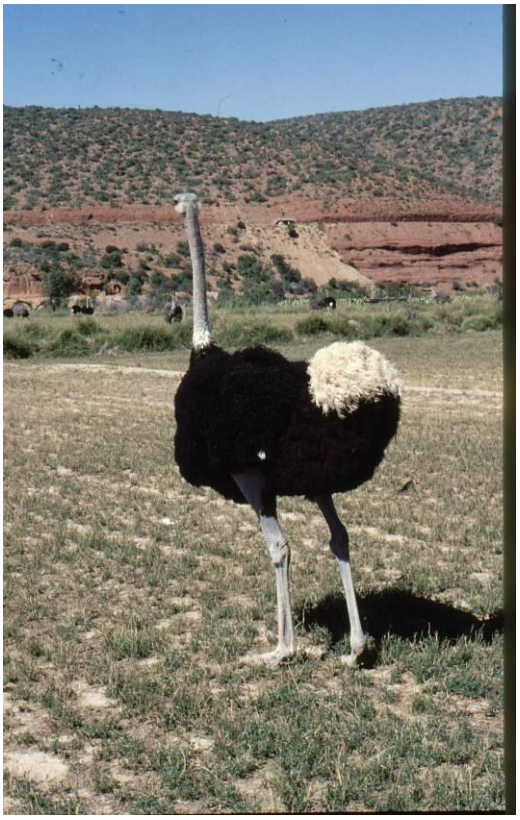
I derived the formula for Hide Index after comparing all the measurements.
This enabled the conclusion that the confiscated hides were of South African domestic ostrich genetics rather than the claimed origin in Botswana.

Comparison of Oudtshoorn domesticated ostriches with Zimbabwe birds

Growth potential of Zimbabwe type ostriches can be compared with that from domesticated birds in the main southern African ostrich farming areas.

I reared these Oudtshoorn type birds on the same feed that I used in Zimbabwe. At 10 months of age they averaged 90kg live weight, compared with 9 month old birds in Zimbabwe that averaged just over100kg.

Clearly the growth characteristics were genetically determined.
The South African domesticated birds are the result of crossing imported North African birds with South African wild stock. As a result they have on average feathers that are more fluffy and this can be an advantage regarding the value given to feathers.



Many of the domesticated birds show that they have some North African genetics by the white tail feathers, compared with the predominantly brown to rusty brown of wild South African birds. Although many of the North African cock birds have rusty colour tails, amongst the birds imported into South Africa some had fluffy white tail feathers.
Domesticated birds still show a variety of intermediate plumage, body size, skin colour and egg shapes and sizes.
The situation has been further complicated by some Oudtshoorn ostrich farmers collecting chicks from the Pygmy Ostriches of the south and west coasts. This has resulted in some of this genetics remaining within the domesticated flocks.
As a result we find some domesticated breeding birds that are very small and the overall average size of domesticated birds is smaller than wild Botswana or Zimbabwe birds.

Some farmers have continued to select breeding stock producing the most fluffy feathers.

Kobus Terblanche in Oudtshoorn (at left) with prize winning feathers from his breeding ostriches that have been selected for feather quality.

Duerden (1918) noted that the northern birds all had a bald patch on the head and crosses between northern and southern birds all had this bald patch. Eggs laid by crosses revealed a variety of intermediate features.

However, after many generations since the north African ostrich importations, it is now rare to find birds in Oudtshoorn with the northern characteristics, such as a bald patch on their head, or the very round and smooth eggs and very few cock birds show pink colouration on their body skin, except for on the lower legs.

Revising the classification of ostriches

In the light of the marked regional differences in body proportions, growth rates and egg characteristics within each of the four main groups of ostriches, I believe we need to revise the classification. We can recognise one ostrich species, namely *Struthio camelus,* but we then have four Sub-species, namely *Struthio camelus camelus* (North African), *Struthio camelus massaicus* (Massai Ostrich), *Struthio camelus molybdophanes* (Somali Ostrich) and *Struthio camelus australis* (Southern African ostrich).

Within each of these four sub-species we can recognise distinct races. These racial characteristics have not been studied except for the evidence I have listed for within the southern African sub-species. For instance, we have seen that within southern Africa we have at least three distinct races, namely the coastal Pygmy Ostrich, Kalahari Ostrich and Zimbabwe/Northern Botswana Ostrich.

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1.2. Potential to select better genetics for farming

In 1995, when the ostrich industry was expanding overseas in America and Canada, I attended some auctions of birds destined for export from Canada to Australia. At one auction there were enormous birds weighing over 200kg, such as these shown below.

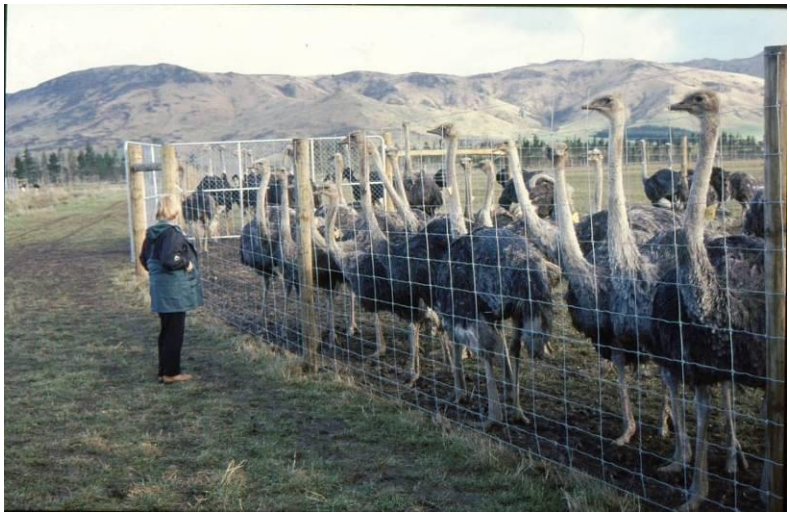
Some of these enormous birds were crosses between ostriches from Zimbabwe and Massai ostriches. However, Somali Ostrich genetics was also involved. In other words, various combinations of genetics resulted in these large birds.

Although large birds are more difficult to handle than smaller ones and need higher fences (2m), the potential advantage is that chicks can reach a good slaughter weight of 90kg at a younger age, at least by 7 months. This can have enormous advantages as far as meat production is concerned and, provided the nutrition is correct, the leather from younger birds is also a top quality product.
I cover details on leather quality in later chapters on ostrich leather and meat.

In the picture at left the bird next to the photographer had Massai Ostrich genetics as one of the crosses, as shown by the pink neck and legs. However, the bird on the right has evidence of Somali Ostrich genetics, as shown by its blue skin and it had black on lower leg scales, which is a characteristic of Somali birds.

During the 1990's there was a renewed attempt to start an ostrich industry in New Zealand. One farm on South Island was New Zealand Ostrich Export Co Ltd. At my suggestion they undertook genetic selection for larger breeding stock. Under the expert direction of Darrin and Robyn Day this resulted in larger breeding birds than are generally found in southern Africa.

It is a pity that economic considerations have led to the collapse of the industry in New Zealand but no doubt some of those genetically superior birds still exist in that country.
This situation in New Zealand convinced me that cross breeding between ostrich races (Jarvis 1998) and vigorous selection of beneficial size and growth rate characteristics, can rapidly produce marked improvements within the Ostrich Industry.

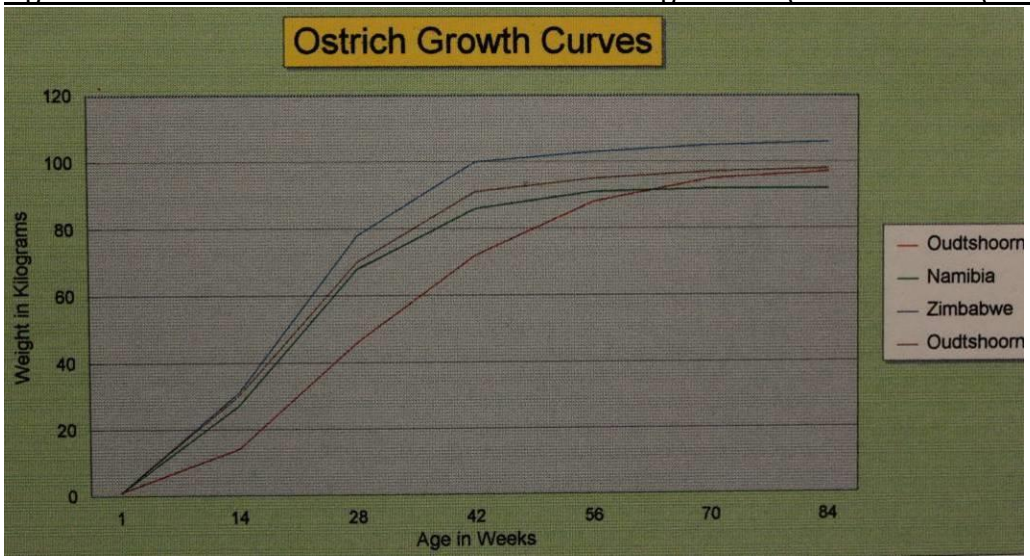


Some of the breeding stock on the New Zealand farm. Most of these birds were crosses between Zimbabwe Blue's and domesticated birds from Oudtshoorn. This showed the potential for breeding larger birds by crossing existing races.

The potential for Zimbabwe/Botswana type ostriches to improve the Industry

As mentioned elsewhere, Zimbabwe genetics produced faster growth to a good slaughter weight than did Oudtshoorn domesticated genetics and wild Namibian genetics.

Figure 7. Growth curves for three different ostrich genetics. (du Preez et al (1992)



Birds weighed in these feeding trials were not all on the same feed. However, the Namibian and Oudtshoorn birds were on the same feed and facilities at the Oudtshoorn Experimental Farm. Namibian genetics initially grew as fast as some Oudtshoorn birds but then ended off lighter. The top curve for Zimbabwe birds shows the faster growth to a greater end weight.

Chicks from Zimbabwe stock were easy to handle and grew faster than Oudtshoorn genetics.

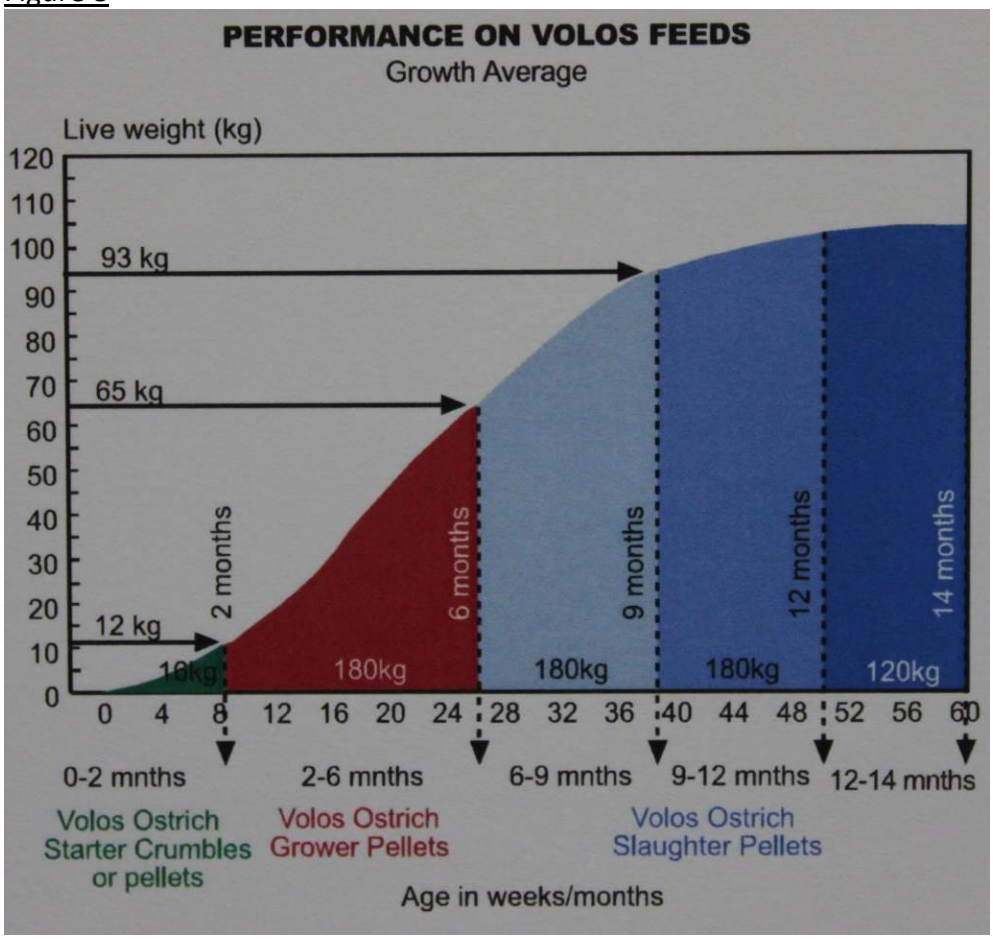
Zimbabwe birds (below) at five months of age. Their legs were longer than most Oudtshoorn birds but the body was also larger. However, body feathers were much flatter and less ‘fluffy’ than average birds in Oudtshoorn.

I weighed these tagged Zimbabwe birds once a month until the age of 9 months, using this converted cattle scale. The average weight at 9 months was just over 100kg compared with 90kg that I obtained with Oudtshoorn genetics by 10 months of age on the same feed.

After leaving Zimbabwe I continued work on improving feed for ostriches, based on my observations of wild ostrich food preferences. As a result we further improved performance of Oudtshoorn birds and, when management was optimal, achieved an average of 93kg by 9 months on the commercially produced VOLOS feed that I formulated.

Growth and feed intake are discussed further in chapter 9 ‘Choosing the right nutrition’.

Figure 8



It is possible to further improve nutrition to achieve even faster growth to early slaughter weight (Jarvis 1998). This is enabled by introducing a slightly higher energy feed for the first 4 weeks. It can achieve an average of 85kg live weight by 7 months of age. Some individual birds reached 90kg by 7 months and this shows that, within the genetic pool there exists genetics that can be selected for, so as to improve growth to early slaughter age.

The advantage of slaughtering by 7 months is that the feed conversion ratio up to 7 months is very good. After 7 months the feed conversion deteriorates rapidly meaning that more and more feed is required to produce each kilogram increase in ostrich body weight.

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