

THE MAMMALS OF AFRICA

AN IDENTIFICATION MANUAL

Editors

J. MEESTER

H. W. SETZER

Smithsonian Institution Press • City of Washington

International Standard Book Number 0-87474-116-5

Library of Congress catalog number 70-169904

© Copyright 1971 by Smithsonian Institution

Printed in the United States of America

Distributed in the United States and Canada
by George Braziller, Inc., New York, N.Y.

Introduction

The idea of undertaking this work originated in discussions held during a colloquium on African rodents held in Brussels during October, 1964, as guests of the Institut Royal des Sciences Naturelles de Belgique. Subsequently, in early 1965, Dr. Francois Bourlière, one of the participants in the colloquium, persuaded Dr. S. Dillon Ripley, Secretary of the Smithsonian Institution, to sponsor the project as a United States contribution to the International Biological Programme. One of us (J.M.) was asked to edit the work, which was to be written by a panel of experts on the mammal groups concerned. During 1966 the status of the project was changed to that of a joint United States/South African contribution to I.B.P.

The purpose of the project, and therefore of this work, is twofold: in the first place, as its title suggests, it is intended to serve as an identification manual, for use by non-taxonomists. In recent years, partly as a consequence of the I.B.P., there has been a tremendous upsurge of interest in African mammals, particularly on the part of ecologists and conservationists. Their work has, however, been hampered by the unsatisfactory state of African mammal taxonomy. The most recent pan-African treatment is that of Allen (1939), which is now 31 years old. Since then a number of good regional studies (e.g. Ellerman et al. 1953; Schouteden, 1944-6; Swynnerton & Hayman, 1951; Smithers, 1968) as well as equally good studies of particular groups (e.g. Rosevear, 1965, 1969; Hill, 1963) have appeared, but no attempt has been made to put these into a pan-African perspective. At the same time many new species and subspecies, and even new genera (e.g. *Paracrociodura* Heim de Balsac, 1956; *Liberiictis* Hayman, 1958; *Delanymys* Hayman, 1962; and *Dendroprionomys* Petter, 1966) have been described, so that the non-taxonomist has been faced not only with the need to choose between often widely-divergent treatments of known groups, but also with a proliferation of new names that sometimes have been difficult to place in an acceptable context. Needless to say, some confusion has resulted. This work, by taking into account the progress that has been made during the past 31 years, and bringing it into the context of previous knowledge on a pan-African basis, is intended to reduce the confusion as far as possible at this stage.

It was accepted from the start, however, that it would be impossible to eliminate the confusion altogether. Much remains to be learnt about African mammal taxonomy, and much collecting and study will be required before a definitive treatment of this subject can be hoped for. From the point of view of the taxonomist, therefore, it was felt that an assessment of the state of knowledge, and of the most important problems we are faced with, would be of some value. From this arose the second purpose of this work: to identify the remaining problems most urgently in need of solution, and to assemble whatever evidence is available concerning them.

This dual task has been undertaken in two stages: the first stage was represented by the "Smithsonian Institution Preliminary Identification Manual for African Mammals" (edited by J.M.), and consisted of draft revisions by specialists on the groups concerned, which were circulated in parts by courtesy of the United States National Academy of Sciences, in serial form, to a limited number of colleagues with an interest in African mammal taxonomy. The comments and criticisms received were taken into account in the preparation of revised drafts, which constitute the subject matter of the present work.

This work will also appear in parts which will be published as they are completed, not necessarily in taxonomic order. However, each order will be published as a unit, although it may be composed of parts written by several people. All these parts will be numbered so that, when placed in numerical sequence, they will follow roughly the organization used by Simpson (1945). The different parts, and their authors, are listed on p vii

Where possible uniformity has been strived for in this work. However, complete uniformity has not been achieved, and neither do we regard it as desirable. For one thing, not all groups are equally well known, and some are vastly more complex taxonomically than others. So, while it has been possible to provide workable keys to species level in most cases, in others (such as the Soricidae and some of the Anthropeidea) this has not been possible.

Besides this, not all the authors involved in this identification manual have had the same aim in mind, nor have they used exactly the same approach. Some have been concerned mainly with providing the non-taxonomist with workable keys; others have emphasised more the needs of the taxonomist. Some have, of necessity, placed their reliance on diagnostic characters of the skull; others have, again of necessity, relied more on external features. All factors taken into account, the departures from uniformity in the various treatments are less surprising than is the degree of uniformity actually achieved.

Geographically, this manual covers roughly the area dealt with in Allen's (1939) checklist, i.e. the African continent up to the Suez Canal, and sometimes the Sinai peninsula; Madagascar; and other off-shore islands. Geographic names present a problem. As a byproduct of the political changes which have taken place in Africa during recent years, many place names have been changed, and are continuing to do so. To keep up with these name changes, particularly in a publication appearing in sections over a considerable period of time, would be impossible. Accordingly, December 31st, 1967, has been regarded as a deadline; and while we have attempted to take into account all geographic name changes until that date, subsequent changes have been ignored. The names here used are, with minor changes, those given by Ansell (1968) in his draft revision of the Artiodactyla for the Preliminary Identification Manual. The map reproduced on p. v.... taken, with modification, from the same source.

This work involved the active co-operation of a number of persons and organizations, and it is a most pleasant duty to express our indebtedness to them. First of all, our warmest thanks must go to the contributors to this manual whose names and contributions are listed on p. vii. Without their knowledge and hard work this project could quite literally not have been undertaken. Our thanks go further to Dr. S. Dillon Ripley, Secretary of the Smithsonian Institution for initiating this project, and for his active support and encouragement thereof; to Dr. Richard S. Cowan, Director of the Museum of Natural History, Smithsonian Institution, for his encouragement, confidence and patient support while it has been under way; and to Mr. Anders Richter and the Smithsonian Institution Editorial staff, for copying and duplicating the Preliminary Identification Manual, as well as for their assistance in planning and executing this final version of the manual. Sincere thanks are due also to Col. Harvey E. Sheppard and the U.S. National Academy of Sciences for circulating the Preliminary Identification Manual to an ever-growing host of recipients; and to the U.S. National Committee of the International Biological Programme for generous financial support.

The South African National Committee of the I.B.P. deserves thanks for kindly granting further financial support. So does the Institute for Information and Research Services, South African Council for Scientific and Industrial Research, particularly Messrs. P.J. v.d. Westhuizen and J.F. Herbst and Dr. W.O. Everest, for their active co-operation, particularly in proof-reading and typing the revised text.

Mrs. Loma R. Whitehead kindly placed at our disposal the meticulous notes prepared by her late husband, Mr. G.H. Swynnerton, for an unpublished revision of Allen's (1939) checklist. These notes were invaluable in the preparation of this Manual, and it is a pleasure to express to her our sincere thanks for them.

To the University of Pretoria, and particularly the Chairman of the Department of Zoology, Prof. F.C. Eloff and his staff, our sincere thanks for permission to undertake this task, and for willingly suffering the inevitable consequence of reduced productivity by J.M. in other directions.

Originally we intended to thank individually all those who responded to our request for comments and criticism on the original draft revisions of the Preliminary Identification Manual. Some of these have indeed been thanked by the authors of drafts on which they have commented. However, it soon became clear that there were far too many to thank personally. At the same time, and for this very reason, their contribution has been invaluable, and in extending our warmest thanks to all of them we wish to assure them that their contributions are no less sincerely appreciated for not being individually specified.

Finally, nowhere more than in taxonomy is progress dependent on previous work. We would be remiss, therefore, if we did not thank the many men and women, scientists and amateurs, alive or long dead, on whose contributions, large and small, this work is based.

J. Meester,
Pretoria,
South Africa.

H.W. Setzer,
Washington D.C.,
U.S.A.



Political subdivisions of Africa

LITERATURE CITED

- Allen, G.M. 1939. A checklist of African mammals. *Bull. Mus. Comp. Zool. Harvard* 83: 1-763.
- Ellerman, J.R., Morrison-Scott, T.C.S. and Hayman, R.W. 1953. *Southern African mammals 1758 to 1951: a reclassification*. British Museum (Natural History).
- Hill, J. Edwards 1963. A revision of the genus *Hipposideros*. *Bull. Brit. Mus. Nat. Hist. (Zool.)* 11: 1-129.
- Rosevear, D.R. 1965. *The bats of West Africa*. British Museum (Natural History).
- _____. 1969. *The rodents of West Africa*. British Museum (Natural History).
- Schouteden, H. 1944-46. De zoogdieren van Belgisch Congo en van Ruanda-Urundi. *Annl. Mus. r. Congo belge Sér. 4to Zool.* (2) 3: 1-576.
- Simpson, G.G. 1945. The principles of classification and a classification of mammals. *Bull. Amer. Mus. Nat. Hist.* 85: 1-350.
- Smithers, R.H.N. *A checklist and atlas of the mammals of Botswana*. Trustees, National Museums of Rhodesia.
- Swynnerton, G.H.S. and Hayman, R.W. 1951. A checklist of the land mammals of the Tanganyika Territory and the Zanzibar Protectorate. *Jl. E. Africa Nat. Hist. Soc.* 20: 274-392.

LIST OF PARTS AND CONTRIBUTORS

Part

| | | |
|------|---|----------------------------------|
| | Introduction: | J. Meester and H.W. Setzer |
| 1 | Order Insectivora, main text: | H. Heim de Balsac and J. Meester |
| 1.1 | Subfamilies Tenrecinae and Oryzorictinae: | H. Genest and F. Petter |
| 1.2 | Subfamily Potamogalinae: | G.B. Corbet |
| 1.3 | Family Chrysochloridae: | J. Meester |
| 1.4 | Family Erinaceidae: | G.B. Corbet |
| 1.5 | Family Macroscelididae: | G.B. Corbet |
| 2 | Order Chiroptera: | R.W. Hayman and J. Edwards Hill |
| 3 | Order Primates, main text: | P. Dandelot |
| 3.1 | Infraorder Lemuriformes: | A. Petter and J.J. Petter |
| 3.2 | Infraorder Lorisiformes: | W.C. Osman Hill and J. Meester |
| 4 | Order Pholidota: | J. Meester |
| 5 | Order Lagomorpha: | F. Petter |
| 6 | Order Rodentia, main text: | X. Misonne |
| 6.1 | Family Sciuridae: | E. Amtmann |
| 6.2 | Family Nesomyinae: | F. Petter |
| 6.3 | Subfamily Gerbillinae: | F. Petter |
| 6.4 | Genera <u>Tatera</u> and <u>Gerbillurus</u> : | D.H.S. Davis |
| 6.5 | Genus <u>Acomys</u> : | H.W. Setzer |
| 6.6 | Genus <u>Aethomys</u> : | D.H.S. Davis |
| 6.7 | Genus <u>Leggada</u> : | F. Petter |
| 6.8 | Genus <u>Steatomys</u> : | C.G. Coetzee |
| 6.9 | Family Bathyergidae: | G. de Graaff |
| 7 | Order Cetacea: | P. Best |
| 8 | Order Carnivora, main text: | C.G. Coetzee |
| 8.1 | Family Felidae: | R.H.N. Smithers |
| 9 | Order Pinnipedia: | J.A.J. Nel |
| 10 | Order Tubulidentata: | J. Meester |
| 11 | Order Proboscidea: | W.F.H. Ansell |
| 12 | Order Hyracoidea: | J. du P. Bothma |
| 13 | Order Sirenia: | P. Best |
| 14 | Order Perissodactyla: | W.F.H. Ansell |
| 15 | Order Artiodactyla, main text: | W.F.H. Ansell |
| 15.1 | Genus <u>Gazella</u> : | A.W. Gentry |
| | Conclusion: | J. Meester and H.W. Setzer |
| | Index | |

ORDER PERISSODACTYLA

INTRODUCTION

As a group the odd-toed ungulates have long passed their zenith. They are today represented only by a few species in three families, of which two rhinoceroses and four equids (plus one which became extinct during the last century) occur in Africa. Several of these have been reduced in range and numbers, but recently conservation measures have, at least for some of them, been effective in halting, and to some extent reversing, the downward trend. The general considerations given in the introduction to Part 15 of this work (Artiodactyla), including the zoogeographical zones, apply *mutatis mutandis* to the Perissodactyla. I have taken into account all data and references available to me up to May 1971.

1. Build heavy; skin very thick; three digits on each foot; two "horns" on the nose* RHINOCEROTIDAE
Build lighter; skin comparatively thin; one digit on each foot; no nasal "horns" EQUIDAE

Family RHINOCEROTIDAE

1. Larger; upper lip square; pronounced nuchal hump visible when head is raised; skull longer and narrower, with occipital part produced backwards behind condyles *Ceratotherium*
Smaller; upper lip pointed and prehensile; no such nuchal hump; skull shorter and broader, with occipital part not produced backwards behind condyles *Diceros*

Note: Ellerman, Morrison-Scott & Hayman (1953: 163) regarded *Ceratotherium* as only a subgenus of *Diceros*, but Cave (1962) listed many differences and considered them separate genera. The skull and teeth of each are well illustrated by Rode (1944, Figs 127 to 133). Each has only one living species. Blancou (1954; 1958a: 313) reported claims of a form of rhinoceros in parts of the Lowland Forest zone, but as no specimen or other evidence has been produced it cannot be discussed further.

Genus *Ceratotherium* Gray, 1867

Ceratotherium simum (Burchell, 1817) Square-lipped rhinoceros

Original distribution: Strikingly discontinuous. Between the Zambezi and Orange rivers, and again west of the Nile from northwestern Uganda to southern Chad.

The original southern range was widespread between the Zambezi and Orange rivers, though the exact westward limits are uncertain. Shortridge (1934: 427) cited specimens from Omaruru and Ugab rivers in South West Africa, also linguistic indication of former occurrence in the Gobabis and Grootfontein districts, and (Great) Namaqualand. Gaerdes (unpubl. Ms) accepts that it formerly occurred in the Kaokoveld. It occurred in southeastern Angola. Though unproven, it may also have been found between the Zambezi and Mashi rivers in southwestern Zambia (Ansell, 1959). In Mozambique Vaughan-Kirby did not find the animal itself (Bigalke, 1963: 12), but in 1904 found two skulls near the southern bank of the Zambezi above the Shiré confluence

* In the African species--two of the three Asiatic species have only one horn.

(Vaughan-Kirby, 1920: 224). This distribution covers part of the Southern Savanna and part of the South West Arid zone and, as stated by Player & Feely (1960: 3), available evidence points to an original range in southern Africa corresponding to the "Bushveld" of Acocks (1953) and Wellington (1956), which would include Mozambique south of the Zambezi, but (*pace* Shortridge, 1934: 427) not Namaqualand. The map in Bigalke (1963: 10-11) omits the northwestern part of South West Africa, and Mozambique north of the Limpopo, but includes all the Transvaal, though this author cited no actual record from those areas of the Transvaal omitted by Player & Feely (*loc. cit.*). He mentioned, however, a skull found near Kroonstad, and a semi-fossilized one from Fauresmith, both localities in the Orange Free State, slightly south of the present-day Bushveld limit.

The original northern range comprised northwestern Uganda and the southern Sudan west of the River Nile; the northeastern Congo (K.); the eastern part of the Central African Republic; and southern Chad. The exact northwestern limits are somewhat uncertain, but it may have ranged as far west as Lake Chad itself (Schomber, 1966, Fig. 4), whence two horns were said to have come (Lydekker, 1908: 37). Harper (1945: 408) pointed out that the northern range corresponded approximately with the eastern part of the Ubangi-Uele Savanna District of Chapin (1932: 90), or the Ubangi Savanna District of Bowen (1933: 256, 258). L. S. B. Leakey (*in litt.*) states that specimens have been found in Iron Age material from Kenya, but there appears to be no good evidence that it survived later in this area, and in more recent times the River Nile has evidently been its eastern limit. I accept the opinion of Heller (1913: 34) that early reports from Kenya by Speke, Grant and others must really have referred to *Diceros bicornis*.

Present distribution: The southern, nominate, subspecies was virtually exterminated shortly after the end of the 19th Century, except in Zululand. Reports of possible survival in Rhodesia (Fleming, *in litt.*, *cit.* Shortridge, 1934: 426; Fraser, 1958: 470) and in southeastern Angola (Guggisberg, 1966: 80) were never confirmed; nor was a sight record from the Kaokoveld (Barnard, 1952: 76, which Bigalke, *in litt.*, finds unconvincing). However, it evidently did survive until at least as late as 1935 in the Gorongosa area of Mozambique, though believed no longer to occur there (Sidney, 1965: 61).

However, with adequate protection the southern subspecies has eventually increased so much that it has been removed from the list of endangered mammals (Red Data Book, 1966), and has been re-introduced to the Kruger National Park, and on a smaller scale elsewhere, including other parts of South Africa, Botswana, Rhodesia, Mozambique and Swaziland (Anon., 1965a; Anon., 1965b; Bigalke, 1963: 13; Condy & Davison, 1964; Player, 1967; Rochat & Steele, 1968; Roth, 1967: 228-229; Pienaar, 1970). In the Kruger Park the species may be considered safely re-established (I. Player, *in litt.*), and in Rhodesia too the re-introduction has probably been successful (J. Vincent, *in litt.*). Outside the natural range it has been imported to other parts of South Africa; into Zambia (Attwell, 1964: 9-10) where the three survivors of the original four, plus three calves born there, are now kept in semi-captivity in Livingstone (Bainbridge, 1965: 11, and subsequent data); and into Kenya where six were being kept in semi-captivity in the Meru Game Reserve (Anon., 1966; Ansell, 1966). Totals exported from Zululand, including those sent to zoological gardens overseas, were summarized in Anon. (1968) and Vincent (1969, 1970a, 1970b, 1971).

The status and distribution of the northern subspecies, *cottoni*, is not as favourable. It was discussed in detail by Schomber (1966) but his estimate of numbers in the Congo (K.) is now out of date, and probably also that for the Sudan. The great reduction in total range is shown in his Fig. 4. It is believed extinct in Chad; reduced to a few survivors in the Central African Republic; and there has been a drastic decline in recent years in Uganda and the Congo (K.) (Red Data Book, 1967: 2; Cave, 1963; Curry-Lindahl, 1966). In view of disturbed political conditions in the Sudan it seems likely that a comparable reduction has also taken place there, so Schomber's (1966: 225) optimistic figure of 2000 may be well in excess of present numbers. The northern form is listed by the Red Data Book as apparently endangered, but further study is needed of its exact status.

In Uganda Savidge (1965) recorded that by 1964 twelve had been transferred from west of the River Nile and released in the Murchison Falls National Park, which is outside the natural range.

C.s. simon (Burchell, 1817). Southern square-lipped rhinoceros.* The southern range of the species (Player & Feely, 1960, Map 1; Bigalke, 1963: 10-11). (Including *canus* Griffith, 1827; *burchelli* Lesson, 1827; *oswelli* Gray, 1854; and *crossi* Gray, 1854.)

C.s. cottoni (Lydekker, 1908). Northern square-lipped rhinoceros. The northern range of the species.

Genus *Diceros* Gray, 1821

Diceros bicornis (Linnaeus, 1758)

Black rhinoceros

Original distribution: South of the Zambezi it occurred virtually throughout the South West Cape and Southern Savanna zones. It was also widespread, and in places common, in the South West Arid zone until at least the late 18th Century. For example Vedder (1938: 35-40) recorded that 65 were killed in 1792 between the present-day Karrasberg and Rehoboth, and a certain Pienaar saw many in the lower Swakop area near Walvis Bay around 1793; while Sargent (1954: 41) cited several place names deriving from the species in the

* The older name "white rhinoceros" is better discontinued. It is not a suitable name, and its origin has never been satisfactorily explained.

northern Cape Province and southern South West Africa.

Northwards the distribution did not exactly coincide with the main biotic zones. In Angola restricted to the south, exact limits uncertain (da Silva, 1952). In Zambia virtually throughout except the extreme west and northwest (Ansell, 1969). In the Congo (K.) only in the southeast (Schouteden, 1927: 24, rejected a second-hand report that it was formerly present in the northeastern Uele until wiped out by rinderpest*). Eastern Rwanda (Sidney, 1965: 78), though not mentioned by Frechkop (1944) even as formerly occurring there; and eastern Burundi (Schouteden, 1945: Fig. 287). Widespread in Mozambique, Tanzania and Kenya. Somalia, except the extreme northeast, from which there is no record. In Uganda the north, centre and east, but not the west or south (Sidney, 1965: 77). Eastern, southern and western Ethiopia, and as far north as the Anseba River, 16° N, 38° E. In the Sudan widespread from about El Damar, c. 17° 35' N, along the Atbara River, and thence between the Nile and the Ethiopian border south to the Kenya and Uganda borders; west of the Nile recorded only from 40 miles south of Lake Keilak, 10° N, 29° E, and north and west of Wau, 07° 43' N, 28° E (Mackenzie, 1954: 20; Sidney, 1965: 78). It is not clear whether the species had been reduced to remnant populations in the Sudan west of the Nile by human agency, or whether such isolation was of long standing. Groves (1967) assigned specimens from the Bahr-el-Ghazal area to the subspecies *brucii*, the form occurring in the northeastern Sudan, thereby implying a continuous distribution in the not too distant past, and Guggisberg (1966: 52-53) seemed inclined to accept a former wide distribution west of the Nile. Blancou (in litt.) considers that up to the beginning of the present century the range could have extended continuously between the present-day Central African Republic and the southwestern Sudan. It is, however, worth noting that *Ceratotherium simum* in this same area had, at the time of its discovery there, not suffered comparable reduction, although no less vulnerable to human predation.

Farther west *D. bicornis* once ranged through the central areas of the Central African Republic, west of about 23° E; southern Chad; northern Cameroun; northeastern Nigeria; and the vicinity of N'guigmi on the northwestern side of Lake Chad, just within the boundary of the present Niger Republic.

It seems likely that *D. bicornis* may have survived between Lake Chad and the upper Niger (about Niamey and Tillaberi, 13° - 14° N, 01° - 02° E) until fairly recent times, judging from reports quoted by Johnston (1906: 712-713)** and Bigourdan & Prunier (1937: 284-285).**

The latter also quoted a report of the species near Bouna, 09° N, 02° W, as late as 1905, but Roure (1962: 57, 174) did not mention it as ever having occurred there. Johnston (loc. cit.) mentioned reports from northern Liberia (which would be in the southern part of present-day Guinea—Kuhn, 1965: 322). While even the most western of the foregoing old records could be correct, no locality west of northeastern Nigeria has ever been confirmed by a collected specimen.

Present distribution: The species, although still covering a wide total range, has everywhere become localized, and in many places mere remnant populations or none at all remain. However, where protection is adequate good populations remain. Sidney (1965: 61-81) reviewed the more recent distribution in detail, which may be supplemented by the following more up-to-date information.

South of the Limpopo and Save rivers it is now found only in Zululand***, apart from a few re-introduced to the Addo National Park (Bigalke & Bateman, 1962: 92. The National Parks Board, in litt., confirms that they were from Kenya). In Rhodesia good numbers still occur in the middle Zambezi valley, and a few survive in one or two other places in the northeast and east; while it has been re-introduced in the Wankie National Park (Roth, 1967). In Botswana now restricted to a few in the north and northeast (Smithers, 1968: 96-97). In Zambia much reduced in range, but common in the Luangwa Valley, and viable populations remain in several other areas (Ansell, 1969). Scarce in Malawi (Sweeney, 1959: 57), but may still occur in the Wwaza Marsh (Ansell, 1969: 187). According to recent Malawi tourist literature, a few remain in the Kasungu Game Reserve in the Central Province. In the Congo (K.) believed extinct since about 1957 (K. Curry-Lindahl, in litt.). Six were re-introduced to Kagera National Park, Rwanda, from Tanzania (Haezaert, 1959). In Tanzania and Kenya the species still occurs in good numbers in many places. In Somalia it survives in the south, although almost extinct (Funaioli & Simonetta, 1966: 296). In Ethiopia the only definitely known survival areas are between the lower Omo Valley (05°30' - 06°30' N) and the Sudan border (09° - 10° N), between the Dabus River and the Sudan border, and at about 04° - 05° N in the Daua Parma Valley near the Kenya border (J. H. Blower, in litt.). In Uganda still common in the north (Bere, 1958: 419). In the Sudan no longer found in the northeast between the Nile and the Ethiopian border, and scarce elsewhere (Sidney, 1965: 78; Mackenzie, 1954: 20; Schomber, 1963: 32-33). Still found in the Central African Republic, Chad, and northern Cameroun. In Nigeria considered extinct (Petrides, 1965: 7), and must be completely absent west of Nigeria, whatever its former distribution there (see above under original distribution).

D. bicornis (Linn., 1758). Western Cape Province, and north at least to middle South West Africa. Extinct. (Including *africanus*, Blumenbach, 1803; *keitloa* A. Smith, 1836; *gordoni* Lesson, 1842; *niger* Schinz, 1845; *camperi* Schinz, 1845; and *capensis* Trouessart, 1898.)

D. b. shobiensis Zukowsky, 1964. Konsumbia, parent streams of the Loma, tributary of the Cuando,

* Rinderpest is a bovine disease and is not known to affect rhinoceros.

** These authors simply referred to "rhinoceros", but this can doubtless be taken as *D. bicornis*.

*** Guggisberg (1966: 48, footnote) stated that four were transferred from Umfolozi to the Kruger National Park in 1961, but this was not mentioned by Pienaar (1963).

Angola. Known only from southeastern Angola, where it appears to be isolated, with *minor* west as well as east of it.

D.b.minor (Drummond, 1876). Transkei (where now extinct), and northern South West Africa, northeastwards to Lake Victoria and northeastern Tanzania. It is not clear whether this would be the Botswana form, or whether the latter might be closer to *chobiensis* (see Groves, 1967: Fig. 2). (Including *major* Drummond, 1876; *keitloa* Drummond, 1876, *nec* A. Smith, 1836; *holmwoodi* Sclater, 1893; *occidentalis* Zukowsky, 1922; *punyana* Potter, 1947: 385; *angolensis* Zukowsky, 1964: 73; *nyasae* Zukowsky, 1964: 93; and *rowumae* Zukowsky, 1964: 94. Mertens, 1966, pointed out that the last two names are invalid.)

D.b.michaeli Zukowsky, 1964. Between Engaruka and Serengeti. Kenya east of the Rift Valley, and extreme northern Tanzania. (Including *rendilis* Zukowsky, 1964: 122.)

D.b.brucii (Lesson, 1842). Northern Somalia and Ogaden to Sennaar and Bahr-el-Ghazal district. (Including *keitloa* Blanford, 1870, *nec* A. Smith, 1836; *somaliensis* Potocki, 1897; *palustris* Benzon, 1947: 529; and *atbarensis* Zukowsky, 1964: 141.)

D.b.ladoensis Groves, 1967. Shambe, upper Nile, near Lado. Shambe and Gondokoro to Baringo district, thence to Lake Naivasha. (Including *somaliensis* J. Allen, 1914, *nec* Potocki, 1897; and *ladoensis* Zukowsky, 1964: 124, invalid--see Mertens, 1966.)

D.b.longipes Zukowsky, 1949. Described from Mogrum, Chad. Extends over the species range from Chad and the Central African Republic westwards.

Note: The works of Hopwood (1939) and Zukowsky (1964) have been superseded by Groves (1967), whose classification is followed here. Hollister (1924: 136) considered *brucii* (Lesson, 1842) a nomen nudum, but Groves accepted it as valid. *D.b.ladoensis* must date from Groves, 1967, Zukowsky's proposal of the name being invalid (Mertens, 1966). Groves omitted mention of *Rhinoceros cucullatus* Wagner, 1835, which was regarded by Hollister (*loc. cit.*) as unidentifiable, perhaps even referring to an Asiatic species. Joubert (1970), who did not cite Zukowsky (1964) or Groves (1967), considered the form in northern South West Africa inseparable from that of Natal. But he had not examined specimens from southern South West Africa or the western Cape Province and so used the name *D.bicornis bicornis*, which Groves (*op. cit.*) restricted to the form in these southwestern areas. Apart from this Joubert's conclusion supports that of Groves.

Family EQUIDAE

Genus *Equus* Linnaeus, 1758

I follow Ellerman & Morrison-Scott (1951: 341), Ellerman et al. (1953: 164), and Azzaroli (1966) in regarding *Equus* as the only valid genus for the living species of the family with *Asinus*, *Dolichohippus* and *Hippotigris* (including as synonyms *Quagga* and *Pseudoquagga**) as subgenera. The close affinity of the various species is evident from the readiness with which they interbreed in captivity (Gray, 1954: 45-59), though the hybrids are sterile.

Frechkop (1967) noted that in the family the chromosome numbers decrease from north to south. Chromosome numbers of the African species (King, Short, Mutton & Hamerton, 1966: 516, modified for *E.zebra* and *E.z.hartmannae* by Heinichen, 1967, 1969, 1970) are:

| | |
|--------------------|---------|
| <i>E.africanus</i> | 2n = 62 |
| <i>E.grevyi</i> | 2n = 46 |
| <i>E.burchelli</i> | 2n = 44 |
| <i>E.zebra</i> | 2n = 32 |

There are three living species of zebra. Skorkowski (1955) ranked both *grevyi* and *burchelli* as conspecific with *zebra* on craniometrical grounds. This is quite unacceptable, as it ignores not only their very distinct stripe patterns and other external differences, but also the different karyotypes noted above and sympatry. In South West Africa *E.burchelli* overlaps in range with *E.zebra* (Shortridge, 1934: 390; Bigalke, 1958: 487), and in the north of its range occurs alongside *E.grevyi* without hybridization (Keast, 1965).

Equus wardi Ewart, 1904 was based on a menagerie hybrid between *E.zebra* and *E.burchelli*. Similar crosses have been made several times since (Rzasnicki, 1941, 1951: 243-245).

Cabrera (1936), Lundholm (1951), Ellerman et al. (1953) and Azzaroli (1966) all accepted *E.quagga* as specifically distinct from *E.burchelli*. This is also my view.

* *Pseudoquagga* Hoffstetter, R., 1951: 690 proposed as a subgenus, type species *E.granti* de Winton, 1896.