

STANDARDISATION OF FIELD DATA ON MAMMALS

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Uniformity in recording field data on mammals, though clearly desirable, is not always achieved, with the result that information from different sources may not be truly comparable.

The Salisbury symposium provided an opportunity to try to reach agreement on procedure and to eliminate ambiguities. A background memorandum was first circulated among mammalogists in Africa and overseas. Forty replies were received, and were summarised to serve as a basis for discussion at the meeting. It would in due course be desirable to obtain adoption of the recommendations at international level to form a generally accepted set of standards, not necessarily restricted to African mammals. Meantime, they are put forward as interim suggestions of the symposium. Where no firm conclusion was reached the recommendation stands as my own, this being made clear in each case.

DATE

Because of possible ambiguity in using Arabic numerals for both day and month, the symposium recommended that the month be spelt, with three-letter abbreviations acceptable; Roman numerals could constitute a permissible alternative. The century should also be given i.e. 1964 rather than 64.

Normally the date on a label should indicate the date of death of the specimen, but where animals have been kept in captivity the date of removal from natural habitat should also appear. Month and year alone, or even only the year, may be given if nothing else is known. When a skin has been made up from an alcohol or formalin specimen, the date of such preparation should be stated.

LOCALITY

Labels should indicate locality in such a manner as to be traceable by anyone not personally familiar with the area. Latitude and longitude are unimpeachable, and where complete accuracy is not possible the reference may be prefixed by "c." (*circa*) or "approx.". The country should be stated. Place names should supplement rather than replace co-ordinates, and names of minor features unlikely to be on published maps should be avoided.*

The symposium unanimously recommended that the C.C.T.A. grid maps, now available from the University of the Witwatersrand, should be adopted as standard plotting maps

* Particular care is needed over provenance of skins obtained from African villages, especially such species as Colobus monkeys or genets, which may be transported by way of trade away from the place of origin. It is suggested that such specimens might be designated "trade skins".

(see Davis 1965). I suggest that the $\frac{1}{4}^{\circ} \times \frac{1}{4}^{\circ}$ ($\frac{1}{16}$ square degree) locus, corresponding to the 1:50,000 map sheet, is the most generally useful locus for mammal labels.

FLESH MEASUREMENTS: GENERAL

What seemed to emerge most clearly from replies to the questionnaire and the discussion was not so much that collectors should be bound by any prescribed procedure, but that the label should show clearly just what had been done. The suggestion was mooted that certain measurements should be taken as standard, and only departures therefrom noted, but this perpetuates just that uncertainty it is desired to avoid.

Dr. P. A. Jewell has made detailed tests of alternative methods of measuring Muridae using to-root-of-tail, to-anus and to-pelvis measurements, with both dividers and pins, and has compared his "within animal" variances with some of mine. Of his own figures he writes: "There was a difference in the consistency that was achieved with each method, and some of these differences reached conventional levels of significance, but even so no method had a very wide variance and our own bias from practice with some methods could have given spurious results"; and of the comparison with my data: "Your variance figures fall within these ranges. My impression is that all methods are equally reliable *in the hands of an operator experienced in that particular method* . . . What can one really say except that investigators *must* indicate the method of measurement on the card?"

Of the measurements discussed below, total length, head and body, tail, hind foot, and ear are standard and should always be taken. The others may be regarded as desirable, either generally or for particular purposes.

MEASURING APPARATUS

The idea of a standard apparatus for measuring small mammals on the pattern of Sumner (1927) or Smith (1955) did not find favour, only two respondents to the questionnaire even thinking it worth considering. Measurements down to 1 mm. should be obtainable by an experienced collector by direct reading from the ruler, though for some (e.g. ear) dividers may be used if preferred. Measurements to 0.1 mm. require vernier or dial calipers. Most people would probably find the latter more convenient.

STANDARDS OF ACCURACY

Attention is particularly drawn to the exposition of mensuration problems and related philosophical concepts in Simpson, Roe and Lewontin, 1960 (chapters 1 and 2). With such considerations in mind, theoretically desirable standards for various groups of mammals were drawn up (Table 1). The 0.1 mm. standard for hind foot and ear was considered impracticable,

but the other suggested standards were accepted as worth attempting, though perhaps not always attainable. The number of units within the observed range necessary for efficient statistical treatment (Simpson *et al.*, 1960, 7) might in theory be obtainable using a half-millimetre standard, but this would be awkward, and found no favour with the symposium.

TABLE 1: SUGGESTED STANDARDS OF ACCURACY DESIRABLE FOR FLESH MEASUREMENTS OF MAMMALS

HEAD AND BODY

(also tail*, and, where applicable, height)

1 mm.	1 cm.	10 cm.
Macroscelididae	Cercopithecidae	Elephantidae
Soricidae	Carnivora (except those in col. 1)	Rhinocerotidae
Potamogalidae	Very large rodents (e.g. <i>Hystrix</i>)	Hippopotamidae
Chiroptera	Manidae	Giraffidae
Galagidae	Orycteropodidae	
<i>Helogale</i>	Ungulates (except the very	
<i>Poecilogale</i>	largest)	
Leporidae		
Rodents (except the very largest)		

* Where the tail is very short in relation to the body the suggested standard may need modification, e.g. *Hippopotamus* which has a short tail in relation to the body size.

HIND FOOT

0·1 mm.	1 mm.	1 cm.
Soricidae	Macroscelididae	
Microchiroptera	Megachiroptera	<i>Panthera</i>
Muscardinidae	Potamogalidae	<i>Acinonyx</i>
Muridae	Cercopithecidae	Hyaenidae
Cricetidae	Lesser Felidae	Elephantidae
	Viverridae	Equidae
	Protelidae	Rhinocerotidae
	Canidae	Hippopotamidae
	Rodents (other than in col. 1)	Suidae
	Leporidae	Giraffidae
	Procaviidae	Bovidae
	Manidae	Orycteropodidae

EAR

0·1 mm.	1 mm.	1 cm.
Soricidae	Macroscelididae	Elephantidae
Potamogalidae	Pteropodidae	Rhinocerotidae
Microchiroptera	Galagidae	Giraffidae
Sciuridae	Carnivora	
Muscardinidae	Procaviidae	
Muridae	Equidae	
Cricetidae	Hippopotamidae	
	Suidae	
	Bovidae	
	Rodents (other than in col. 1)	
	Leporidae	
	Orycteropodidae	

HEAD AND BODY AND TAIL MEASUREMENT

For measuring purposes mammals may be arbitrarily divided into large and small, the latter up to about the size of a cat or large mongoose.

Small Mammals

It seems generally agreed that head-and-body length is the total length less tail, whether obtained by direct reading or by subtraction. The measurement of total length by placing the specimen on its back and measuring between pins illustrated by Morrison-Scott (1939), Anthony (1945) and Dekeyser and Villiers (1948) is well known. More recently Setzer (1963) has suggested taking it by direct reading, with the animal laid flat along the ruler. This would probably be facilitated by a stop at the end of the ruler (as used by ornithologists for wing measurements). Either method should give the same result.

There are, however, three distinct ways of taking the tail length. First is the "traditional" one of measuring along the upper side of the tail from its junction with the body, illustrated by Anthony (1945), Setzer (1963) and the British Museum (Natural History) pamphlet, N.H.M. Form 173. The tail is held at right angles to the back. An alternative manner of getting the same measurement is to hang the body over the edge of a table. The head and body length is obtained by subtracting tail from total length. Morrison-Scott (1939) criticised this, and advocated measuring the tail from the anus, a modification of a method originally proposed by Chapellier (1932). It was later recommended also by Dekeyser and Villiers (1948). This gives a shorter tail measurement, with consequently longer head and body* and, *pace* Morrison-

* In 47 specimens of 20 different genera measured by both methods I found only three exceptions, in which the tail measured the same by either method. These were one of three *Tadarida condylura*, one of three *Praomys natalensis*, and the only *Dendromus mystacalis*. All other specimens had the tail shorter when measured from the anus.

Scott, such figures are not comparable with those obtained by the older method. In one instance (Hanney and Morris, 1962) the tail measurement of a (Zambia) specimen taken by the old method has been lumped with others taken from the anus, and there may have been other cases.

It has recently been found that in some male rodents the position of the anus may be altered by enlargement of the testes (P. A. Jewell, *in litt.*; G. Corbet, *in litt.*), so measurement from anus can no longer be accepted for this group, and appears to have little advantage for others except where it is the only one practicable (e.g. *Potamogale velox*, *Manis* spp. and a few others).

The third method has recently been developed by Corbet (in Southern, 1964, p. 117).* It is a modification of the second in which the pin, instead of being placed level with the anus, is slid along the tail until resistance of the pelvis is felt. As in measuring from the anus, both head-and-body and tail lengths are obtained direct without the need for subtraction. Corbet (*in litt.*) considers that measuring from the pelvis gives a similar reading to that taken from above, but is more consistent. I have not found this so, however, with African mammals, the pelvis measurement usually giving a shorter tail reading, but sometimes longer, and evidently only occasionally the same (see Table 2). This further emphasises the need to indicate methods on the label.

TABLE 2

	Species	Total length	Tail from above	Tail from pelvis
♂	<i>Crocidura hirta</i>	150 (mm.)	59	61
♂	<i>Petrodromus tetradactylus</i>	382 (mm.)	196	187
♂	<i>Cercopithecus aethiops</i>	107 (cm.)	62	60
♀	<i>Cercopithecus aethiops</i>	99 (cm.)	56	53
♂	<i>Cercopithecus aethiops</i>	115 (cm.)	68	65
♀	<i>Cercopithecus aethiops</i>	91 (cm.)	53	51
♂	<i>Cercopithecus aethiops</i> (Imm.)	426 (mm.)	253	256
♀	<i>Herpestes sanguineus</i>	513	239	239
♀	<i>Herpestes sanguineus</i>	523	253	277
♀	<i>Mungos mungo</i>	638 (mm.)	267	267
♀	<i>Mungos mungo</i>	580	243	236
♂	<i>Paraxerus cepapi</i>	377 (mm.)	191	183
♀	<i>Paraxerus cepapi</i>	346 (mm.)	173	169
♂	<i>Pelomys fallax</i>	282 (mm.)	149	152
♂	<i>Pelomys fallax</i>	310 (mm.)	156	160
♀	<i>Thryonomys swinderianus</i>	448 (mm.)	216	232

It is possible that variation between operators may be less by Corbet's than by the traditional method, but the personal factor cannot be altogether eliminated, and, as noted above, all methods seem equally reliable *per se*.

* This was unpublished at the time of the symposium, but had been described by Dr. Corbet in reply to my questionnaire, so was brought to the notice of the meeting.

Workers using material from varied sources cannot possibly guess the method used by each collector, or even infer it from current practice at the museum to which the specimens belong. It is thus clearly essential that labels should indicate how the figures have been arrived at, and it is strongly recommended that tail length should be followed by the appropriate suffix as follows:

Traditional method	..	..	..	..	..	(Root), or abbreviated to (R)
From pelvis	..	..	..	..	..	(Pelvis), or abbreviated to (P)
From anus	..	..	..	..	..	(Anus), or abbreviated to (A).

The total length should be given as well as the head-and-body length.

Large mammals (Fig. 1)

Many large mammal specimens in collections lose value by being unmeasured. The alternative methods of measuring length of large mammals are "between pegs" and "over the curves", the former the equivalent of measuring small species between pins on a board, except that the animal is laid on its side (Fig. 1, A-B). In the other way the measurement is along the contours of the body in the mid-line, starting from the end of the nose, then over head, neck and back to the tail. Dekeyser and Villiers (1948) recommended "over curves" while Miller (1925, 12) indicated "between pegs". Anthony (1945) simply stated "as for the chipmunk", while Setzer (1963) did not make any particular recommendation.

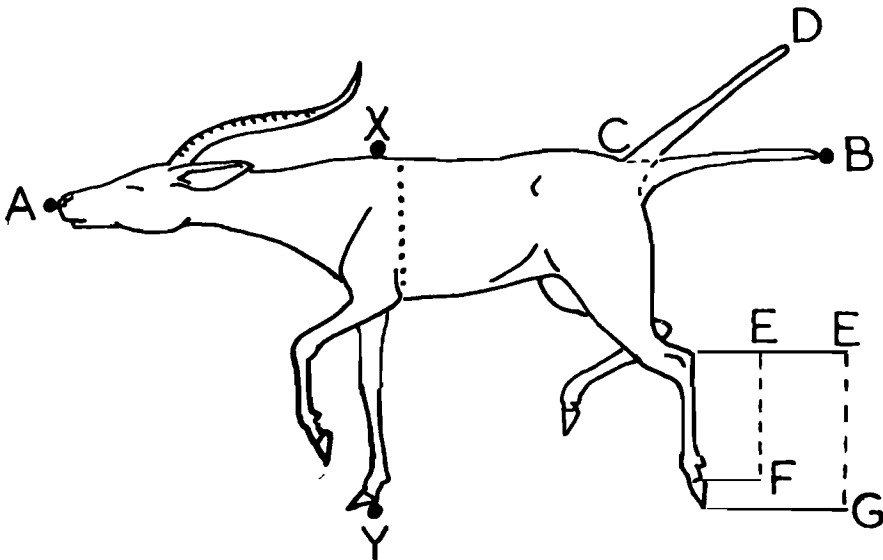


FIGURE 1. A-B, Total length between pegs; C-D, Tail length (angle BCD 30° to 40°); E-F, Hind foot (*s.u.*); E-G, Hind foot (*c.u.*); X-Y, Height at withers; A-X, Head plus neck. Black dots indicate of pegs, and dotted line position of girth measurement.

The majority agreed that "between pegs" is preferable. However, "over curves" is the only practicable method of measuring large mammals which are immobilised by drugs and afterwards released, so it may be desirable to measure collected museum specimens in both ways. The method should be indicated on the label. "Between pegs" and "Over curves" may be abbreviated to "Pegs" and "Curves" respectively.

Care should always be taken that the pegs are properly placed vertically, and the tape held straight between them just clear of the body.

The tail of large mammals is normally taken from its junction with the body, and is the equivalent of "R" for small mammals (C-D in Fig. 1). Where this is difficult or impossible (e.g. *Orycteropus afer*), the measurement can be taken from the anus. Again, it is recommended that the label should record (R) or (A) as appropriate. (Pelvis measurement of tail does not seem called for in larger mammals, but if ever used should duly be specified by (P).)

I have found that the tail in ungulates is best measured at an angle of 30°-45° to the horizontal rather than at right angles. For certain species, e.g. elephant or giraffe, special modifications may be needed, and additional measurements required. However, these animals are seldom collected and then usually by specialists, who can note the method at the time.

HIND FOOT

Hind foot is measured from the heel (or hock) to the end of the longest digit, either including the nail, hoof or claw, known as "*cum ungue*" or "*c.u.*"; or without it, known as "*sine ungue*" or "*s.u.*".

For ungulates "*c.u.*" seems preferable, "*s.u.*" for species with retractile claws, and for other groups either may be used. Conventionally Americans measure *cum ungue*, and others *sine ungue*, but there are exceptions. To avoid ambiguity it was agreed that *c.u.* or *s.u.* should be specified on the label, and the suggestion was advanced that, wherever possible, the hind foot should be measured in *both ways*.

As discussed, the symposium considered that for the smallest species the theoretically desirable accuracy of 0.1 mm. was impracticable. My own opinion is that, while this standard may be attainable (and if so very useful) by an investigator measuring the specimens himself in any particular study,* such figures would probably not be strictly comparable with those obtained by another observer, even if equally competent, and I agree that the 1 mm. standard is the best that can be expected for routine measurement. It has to be remembered that (unlike cranial measurements) the hind foot measurement is taken from a fairly flexible part and slight differences in the way in which it is held, or in the amount of pressure applied to place it in position, might well make a difference of 0.1 mm.

EAR

The conventional dimension from notch to tip calls for no particular comment, except that

* See, for example, Fig. 6 in Southern, 1964.

care is needed to get the bottom notch in some bats, shrews and other species with complicated ear structure. Similar considerations apply as to the hind foot, regarding the 0·1 mm. standard for the smallest species. Measurement from the crown is seldom used, and appears to have nothing to recommend it, except possibly in hares and rabbits, for which I would suggest that *both* notch and crown measurements be taken.

CHIROPTERA

In the Chiroptera the fore-arm measurement is most important, and in the smaller species accuracy to 0·1 mm. is desirable, though the majority of the symposium thought this impracticable, and most collectors in the field take it to the nearest millimetre only. The following are my further recommendations arrived at after valuable personal discussion with Dr. D. L. Harrison.

The measurement of the fore-arm is from the end of the ulna to the end of the *carpus*, as shown in Fig. 2, A–B. (The actual end of the fore-arm bone is of course the tip of the radius, but it is not a suitable measuring point.) Despite some post-mortem shrinkage, the fore-arm can be measured reasonably well from a dried skin, provided the specimen has been properly prepared. The practice adopted by some preparators of cutting the fore-arm bone is therefore entirely wrong. A fault in the opposite direction is to wrap the lower part of the fore-arm with wool, continuing up the humerus, which makes subsequent measurement of the fore-arm impossible. This is quite unnecessary with small bats, and even in large species where there is a considerable mass of muscle that has to be skinned out, it is usually sufficient just to remove this and apply preservative powder without inserting wool.

The upper part of the humerus is the best point at which to sever the limb from the body, as shown on the left side of Fig. 2. Wool can then be attached to the severed end in the approximate shape and size of the upper humerus, scapula, and associated muscle mass to stuff out the fore part of the body. As well as ensuring that the fore-arm is not damaged or obscured at the proximal end, the bat should be pinned out so as to facilitate subsequent measurement and examination of the fore-arm.

Wing-span may be measured between pins from tip to tip, with the specimen on its belly and the wings spread naturally, but not unduly stretched. As it is not a measurement that can be taken very accurately, its value is limited, and it is probably sufficient to measure only one or two out of a series.

Setzer (1963) recommended also measuring the ear tragus.

HEIGHT

The symposium agreed that height (measured in ungulates particularly) should be taken from the top of the withers to the *base* of the foot (X–Y in Fig. 1). This gives the approximate standing height of the animal, for which the limb should be placed as nearly as possible in

the natural position, not stretched out. It is taken between pegs. An alternative is to measure to the tip of the hoof (Ledger 1963). This does not give the standing height but, if used, I suggest that the words "to hoof-tip" be added. The measurement of height is not capable of great accuracy anyway.

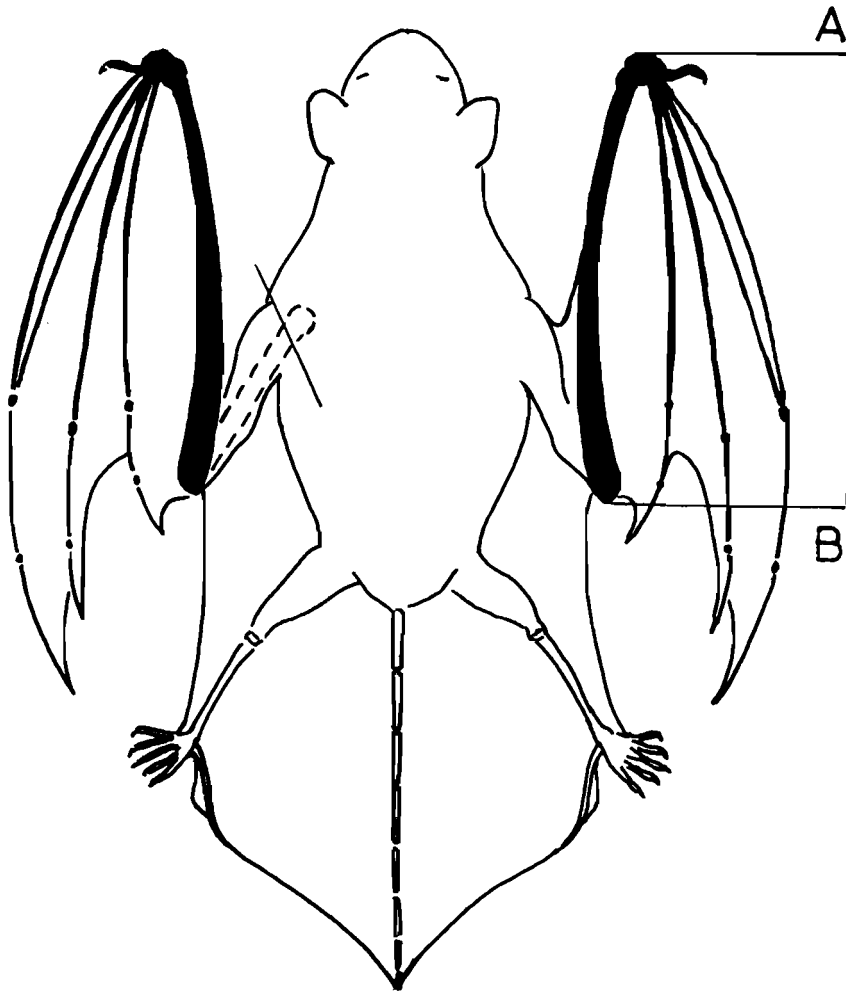


FIGURE 2. Diagrammatic outline of a bat, showing the fore-arm measurement A-B on the right side and, on the left, the point at which the humerus may be severed in preparing the specimen. (The fore-arm itself should *not* be cut).

WEIGHT

Weight should always be recorded where possible, and it was agreed that it should be specified as gross weight or, where appropriate, dressed weight. Weight of foetus should be noted if possible. For game animals a standard dressed weight definition has recently been proposed by Ledger (1963). This is the carcass less hide, head (severed at the atlas joint), legs (severed at knees and hocks), tail (severed at sacral/coccygeal vertebrae junction), diaphragm (trimmed off close to the rib wall), genitalia and viscera (except the kidneys and kidney fat, which are left in). If recorded at the time of dressing it is termed Hot Carcass Weight (H.C.W.) and if cold, i.e. after 24 hours in a cold room, it is Cold Carcass Weight (C.C.W.).

GIRTH

For certain domestic animals there exists a method of assessing weight from girth measurement. Should there prove to be similar correlation between girth and weight in wild ungulates it could be useful in game management, but present data are inadequate. Thus a series of ungulate girth measurements and weights are worth taking. The measurement is made close behind the shoulders, as soon after death as possible (see Fig. 1) and in any case before the carcass has become distended.

In very large mammals, such as elephant or hippopotamus, it may not be possible to pass the tape all round the body, so the distance from the centre of the spine to the pectoral midline may be measured, but recorded as "half girth", which may still be useful for calculation of girth : weight ratio but is more of an approximation. I am grateful to several correspondents and delegates for pointing out that half girth should *not* be doubled and recorded as whole girth.*

Dr. Pereira (*in litt.*) has pointed out that body volume can be calculated using as body length the usual head-and-body measurement, less the distance in front of the withers. This is X-A in Fig. 1, and may be recorded as "head plus neck".

MAMMAE

Mammary formulae may be constant in number and position throughout a whole order, or variable within groups. The Muridae and Cricetidae show most variation, and in one or two extreme instances the number may even vary somewhat individually. Experience will usually indicate what is worth recording and what is mere repetition. Only parous females can normally be used, and it must be remembered that some mammae may be non-functional, and thus not discernible without careful examination. Mammae are recorded in pectoral, abdominal and inguinal pairs (Fig. 3). The thoracic mammae could perhaps be further subdivided into pectoral

* I have since made tests on a female puku *Kobus vardoni* and a zebra male *Equus burchelli*, which gave girth and half girth measurements of 88 cm./47 cm. and 155 cm./80 cm. respectively.

and axial (Dekeyser 1956: 197), but such separation may not be clear cut, and the majority agreed that there seems no particular advantage in this.

For Muridae and Cricetidae the formula is written in pairs with the total mammae (not total pairs). Thus 1-2=6 indicates one pair pectoral, two pairs inguinal, total six. In these groups the absence of abdominal mammae (except for the few multimammate species mentioned below), is usually taken for granted, though an alternative way of writing the above formula could be 1-0-2=6 (Hatt 1940: 539). It should be noted that this conventional manner of recording mammae does not apply to other small mammals, for which position as well as number should be specified.

In two multimammate African mice, *Praomys natalensis* (more usually known as *Mastomys natalensis*) and *Steatomys pratensis*, the mammae are spaced all along the underside, and not necessarily paired. For these I suggested recording for Left side, Right side, and total (e.g. L.9, R.8=17), and the majority concurred.

I would also suggest routine recording of mammae in Carnivora, lower primates, Lagomorpha and Rodentia, and any rarely collected species of other groups. Regular recording is

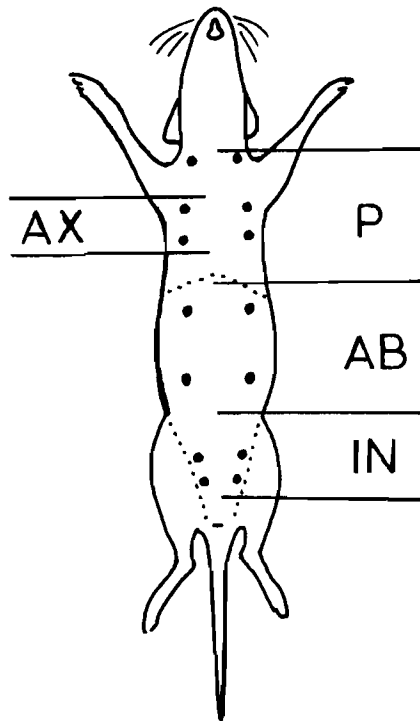


FIGURE 3. Hypothetical small mammal, showing position of mammae; AX, axial; P, pectoral; AB, abdominal (upper and lower); IN, inguinal.

not necessary in Chiroptera, higher primates, and most ungulates,* though occasional aberrant individuals may be found and should be recorded as such.

SPECIMENS EX FORMALIN OR SPIRIT

It was agreed that where specimens are skinned ex formalin or spirit, this should be recorded, with date, on the label. If measurements are made on specimens preserved thus, this fact should also be recorded.

LABELS

Most mammal labels used in museums are similar, and there would seem little point in attempting further standardisation. However, in view of the prevailing agreement to specify method of measurement, I suggest that labels might show alternatives, the inapplicable to be deleted. This would ensure that the method was not left unstated.

FOETAL DATA

Records of foetuses should be kept, and it is often useful to preserve them, together with the reproductive tract. No formal recommendation by the symposium seemed necessary, but the following are my own suggestions, taking into account various views expressed by correspondents and delegates.

Weight of foetus, and of the whole reproductive tract, should be taken if possible. Useful measurements are: Sitting height for small foetuses, replaced for older ones by crown/rump length and finally forehead/rump length; dorsal curvature length (D.C.L.); hind foot (*c.u.*), this somewhat approximate in ungulates due to the soft tip of the hoof; and head length, from top of poll to muzzle. These are shown in Fig. 4.

V. J. Wilson and I have found head length particularly useful. Where a whole foetus cannot be preserved the head only can be saved, and as the measurement is virtually unaffected by immersion in preservative, comparison can be made with field records of material not preserved. There is the further advantage that foetal head length can be measured in the field with reasonable accuracy between pins or pegs where calipers are not available.

ECOLOGICAL TERMS

General

The foregoing mainly concerns specimens collected as museum material. The following points, however, apply to records of living animals in the field, and on the whole, it was not so easy to get agreement. In publication there is normally indication of methods used, and,

* An interesting exception is in the southern races of *Giraffa camelopardalis*, where recent investigation has shown the need to supplement previous scanty and somewhat conflicting data.

where necessary, definition of particular terms employed. Nevertheless, it would seem desirable to achieve a reasonable measure of standardisation here too. Dr. Mossman has kindly drawn my attention to a "Glossary of terms used in animal behaviour" (Guhl, undated), and has stressed the need for terms used in animal behaviour and related matters to be as far as possible applicable without redefinition. Certain terms in this glossary are relevant to points discussed by the symposium and are considered below in the appropriate place.

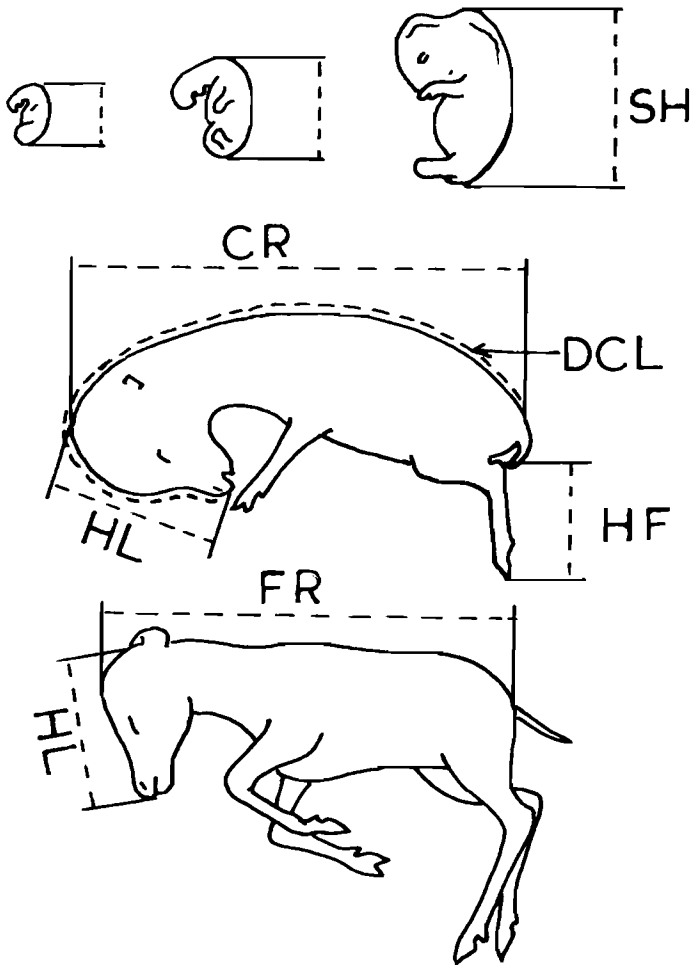


FIGURE 4. Measurements of embryos and foetuses. In the upper figure sitting height SH is shown. In the middle figure, CR is the crown/rump length (C/R), DCL is the dorsal curvature length, HL the head length, and HF the hind foot (*c.u.*). In the lower figure, FR is the forehead/rump length (F/R).

Breeding Season

In American usage "breeding season" seems applied mainly to the time of mating activity, while elsewhere usually or often it means the time the young are born. I have elsewhere suggested that in view of this it would be preferable to use "mating season" and "season of birth" respectively (Ansell 1960). "Rut" is a shorter, equally unambiguous, term for "mating season". The symposium agreed that such avoidance of ambiguity is desirable.

Dr. P. A. Jewell and Mr. P. Hanney have, however, pointed out (*in litt.*) that "breeding season" could have a definite unambiguous meaning in certain groups, e.g. many rodents, where mating and birth times are substantially the same, with males in rutting condition, and females pregnant, suckling, or both, at one period, followed by a sexually quiescent period. I suggest, therefore, that "breeding season" could be retained in this definite sense only. Otherwise it should be replaced by the terms noted above.

Collective Group Names and Alternative Terms

"Herd" is sometimes used to denote all members of a species in a given area. Perry (1953: 103) supported such usage in the case of elephant because groups frequently split up, rejoin, and mingle with other groups, so that it is impossible to define a herd in the sense of any definite unit. Capt. C. R. S. Pitman (*in litt.*) has pointed out that in elephant the unit is the family (in the social, not taxonomic, sense). The symposium agreed, however, that herd should be used to indicate any group of a species living and moving together in close association, which accords with its dictionary meaning (Concise Oxford Dictionary, Ed. 4, 1958). In the Ecological Glossary "Herd" does not appear, but "Band", cited from Dice (1952: 266), appears synonymous, being "A concrete social group of mobile animals of any kind composed of two or more individuals" . . . "a social group of indefinite composition".

The important thing is to avoid use of the word "herd" when "population" is meant, and the symposium agreed that for the total number of animals in a given area "population" is correct and unambiguous. It may be used as necessary for more than one species (e.g. "total ungulate population"), one species (e.g. "population of giraffe"), or part of one species (e.g. "population of adult male impala").

Most correspondents and delegates regarded alternative group names for certain species as permissible. Though such usage might cause difficulty to persons unfamiliar with English, ambiguity cannot be pleaded, and for a few species alternatives to the special term, if not actually incorrect, may at least not conform to accepted usage. An example is "pride", which is in *de facto* use for lions, which applies to no other species, and which can surely not be correctly replaced by "herd", even though it would not cause actual misunderstanding. On the other hand "leap" of leopards, frequently seen in lists of group names, can have no sensible meaning and it is difficult to guess how it may have originated. There are also terms which, while not incorrect as alternatives to "herd" (e.g. "flock" of impala), do not have any particular advantage, but reduce standardisation.

Manville (1962) has summarised a number of special terms for different mammal groups, many of which are in fairly general use. A recent proposal to introduce a multiplicity of artificial

group names (de Souza 1963) cannot be given serious consideration. The question of alternative terms for the birth season is subject to similar considerations.

I have compiled a suggested list of group names and other terms applicable to African mammals (Table 3). This is not exhaustive but sets out what seems to be correct actual usage, avoiding undue multiplicity. In the few instances where an alternative is given, the preferred name comes first.

TABLE 3: SUGGESTED GROUP NAMES AND OTHER TERMS FOR AFRICAN MAMMALS

Species, etc.	Adult ♂	Adult ♀	Juvenile	Parturition	Group name
Elephant ..	Bull	Cow	Calf	Calving	Herd
Zebra ..	Stallion	Mare	Foal	Foaling	Herd
Rhinoceros ..	Bull	Cow	Calf	Calving	Herd*
Large antelopes	Bull	Cow	Calf	Calving	Herd
Small antelopes	Ram	Ewe	Lamb, calf†	Lambing, calving	Herd
Giraffe ..	Bull	Cow	Calf	Calving	Herd
Hippopotamus ..	Bull	Cow	Calf	Calving	School, herd‡
Wild pigs ..	Boar	Sow	?Piglet§	Farrowing§	Souder
Chiroptera ..	—	—	—	—	Colony (1 species); Mixed Colony (more than 1 species); Flock (when on the wing)
Monkeys ..	—	—	Infant	—	Troop
Baboons ..	Dog	—	Infant	—	Troop
Wild dog ..	Dog	Bitch	Cub, pup	Whelping	Pack
Lion ..	Lion	Lioness	Cub	?	Pride
Cheetah ..	—	—	Cub	?	? Troop
Gregarious mon- gooses	—	—	Kitten, cub	—	Troop

* Seldom applicable to *Diceros bicornis*.

† Kid and fawn quoted by Manville (1962) are not used much, if at all, in Africa.

‡ School is widely used. Either group name applies really only to the diurnal resting period, as feeding is usually nocturnal and more or less solitary.

§ There seems to be no widely used term in Africa. (Calf and calving or lamb and lambing would certainly be incorrect.)

“Gregarious”, “Communal”, “Colonial”

The majority of the symposium agreed that “gregarious” should be restricted to species which spend both foraging and resting period together, as for example a herd of buffalo, using “communal” or “colonial” for those which spend their resting time together but forage more or less independently.

Colonial implies a permanent home, as for example a number of bats resting together in a cave. The Ecological Glossary defines “colony” from Dice (1952: 266) as “an aggregation composed of individuals of one species which has a more or less permanent location in the community”. I suggest that this could be amplified to “mixed colony” where two or more species of bat live together.

It has to be remembered that, however such terms are defined, there may be exceptions which do not fit in exactly. For example there may be a gathering of a normally solitary species at a good food source, or individuals may forage over a common range while sleeping in separate, but not widespread, holes. The term “aggregation”, cited in the Ecological Glossary from Dice (1952: 266), would seem applicable in such cases.

Age Grades in Field Recording (mainly applicable to ungulates)

Recording herd structure is particularly important in game management for assessing reproduction potential, herd viability, permissible off-take and related matters, but there seems to be no standard terminology.

“Adult” is used for mammals in three different meanings, (a) physically mature, i.e. having reached maximum bodily development; (b) with complete permanent dentition (a frequent taxonomic criterion of adulthood); and (c) sexually mature. The three do not necessarily coincide. For instance many ungulates are capable of reproduction before attaining full dentition, while rodents may have all teeth erupted well before reaching puberty.

“Subadult” is a rather useful, though not very precise, term for animals clearly too old to be classed as dependent young, though still not full grown. It may be noted that subadult females may already be pregnant, and thus included in the reproductive potential of the herd.

It was hardly possible to reach general agreement over the best nomenclature for recording herd structure, and it may be that simply recording as males, females, undetermined sex and juvenile, as used by the Game and Fisheries Department in Zambia is the best that can be attempted. However, the subjective element in such recording is almost certain to be considerable.

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