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Coleura afra.

By Jenna Dunlop

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Coleura Peters, 1867

Coleura Peters, 1867:479. Type species *Emballonura afra* Peters, 1852:51.

CONTEXT AND CONTENT. Order Chiroptera, Suborder Microchiroptera, Superfamily Emballonuroidea, Family Emballonuridae, Subfamily Emballonurinae. Two species are recognized in the genus, one occurring from Mozambique, Angola, and Guinea-Bissau to northern Sudan and southwestern Arabia, the other restricted to the Seychelle Islands. The two species are distinguished as follows (Dobson, 1878; Hayman and Hill, 1971):

1. Length of forearm 45–52 mm, not more than three times skull length; lower lip not divided by groove in front. .... *C. afra*
Length of forearm 52–55 mm, more than three and one half times greatest length of skull; lower lip with distinct median groove in front .... *C. seychellensis*

Coleura afra (Peters, 1852)

African Sheath-tailed Bat

Emballonura afra Peters, 1852:51. Type locality "Tette, Portuguese East Africa" [=Mozambique].

Coleura afra Peters, 1867:479. First use of current name combination.

Coleura gallarum Thomas, 1915:576. Type locality "Zeyla, Somalia."

Coleura kummeri Monard, 1939:55–60. Type locality "Madina Boe, Portuguese Guinea" [=Guinea-Bissau].

CONTEXT AND CONTENT. Context same as for the genus. Three subspecies are currently recognized (Koopman, 1965):

C. a. afra Peters, 1867:479, see above (includes *kummeri*).
C. a. gallarum Thomas, 1915:576, see above.
C. a. nilosa Thomas, 1915:577, "mouth of Bahr-el-Zeraf, Upper Nile Province, Sudan."

A cline from large to small appears to distinguish the three nominal subspecies in the eastern part of the range of *C. afra*. The type locality of the larger *afra* is in the southern end of the range; the smaller *gallarum* and *nilosa* were described from specimens taken at the northern end. Within the northern range the pelage varies from darker in the Nile Valley to lighter in regions further east. These two patterns of variation are the basis for recognizing *gallarum* and *nilosa* as distinct from *afra*, but the subspecies are poorly defined (Koopman, 1975).

DIAGNOSIS. *Coleura afra* is the smallest emballonurid in its range. There are no sympatric congeners, and *C. afra* can be distinguished from sympatric emballonurids *Taphozous mauritianus*, *T. perforatus*, *T. nudiventris*, and *Saccolaimus peli* by the presence of three pairs of lower incisors versus two pairs of lower incisors in *Taphozous* and *Saccolaimus*. Also, the lower lip is not divided by a median groove in *C. afra* (Rosevear, 1965).

GENERAL CHARACTERS. This 10–12 g insectivorous bat has forearm measurements ranging from 45 to 55 mm (Nowak and Paradiso, 1983). The fur is a deep brown and bicolored and paler at the base than at the tip (Fig. 1). The ventral surface is a lighter shade of brown, and there is no sharp demarcation along the flank. The pelage is soft and ca. 5 mm long on the dorsal surface. The muzzle is simple and, when viewed from beneath, appears acutely conical with the summit of the cone formed by the nostrils and the extremity of the cone projecting beyond the lower lip. The rhinarium is black and naked, and the sides of the face appear blackish and are sparsely haired (Harrison and Bates, 1991). The lower lobe of the ear nearly reaches the corner of the mouth. The parallel-sided tragus is 3–4 mm long, with a small tubercle on its outer edge, but there is no expanded extremity. The translucent wing membranes are a lighter shade of brown (Rosevear, 1965), and there may be a faint white margin between the feet and the extremity of the fifth digits (Harrison and Bates, 1991). The calcaneum is nearly as long as the tibia, and the interfemoral membrane is furred dorsally to the exit or the exsertion of the tail from the uropatagium. There is no wing or gular sac. The basisphenoid pits are deep. There is no radio-metacarpal pouch (Dobson, 1878; Harrison, 1964).

The skull (Fig. 2) is delicate, elongated, and narrow. The rostral portion is 75% the length of the braincase and is sharply offset from the braincase by the narrow postorbital region. The braincase is ovoid. The outer edges of the zygomatic arches are straight and not outwardly flared. The postorbital processes curve downwards towards the zygomata (Harrison and Bates, 1991). There is a pear-shaped inflation of the bones on each side of the rostrum followed by a centralized frontal depression (Rosevear, 1965). There is a weak sagittal crest and only faint traces of lambdoid crests. The palate is emarginated anteriorly to the first premolar and projects posteriorly to behind M3. The infraorbital foramina are small. The coronoid process of the mandible is small and blunt, and the angular process is strongly developed and deflected outwards (Harrison and Bates, 1991).

Females are slightly larger than males (mean length of forearm 49.1 mm and 46 mm for females and males, respectively—McWilliam, 1987). Mean external and cranial measurements (in mm) for *C. a. gallarum* females ($n = 8$) and males ($n = 6$), respectively from the Arabian peninsula are as follows: total length, 63.9, 61.9; length of tail, 16.1, 14.5; length of hind foot 8.9, 8.5; length of forearm, 46.1, 46.5; length of ear, 13.1, 13.2; greatest length of skull, 16.4, 16.4; condylobasal length, 15.1, 15.0; zygomatic breadth, 8.9, 8.8; breadth of braincase, 7.0, 7.1; postorbital constriction, 2.6, 2.7; length of maxillary toothrow (C-M3) 6.1, 6.3; length of mandibular toothrow (C-m3), 6.6, 6.7; length of mandible 11.4, 11.4 (Harrison, 1964). These are slightly smaller than measurements of Nigerian *C. afra*, where the means (in mm) of 13

FIG. 1. Profile of *Coleura afra*. Photograph courtesy of Bat Conservation International.

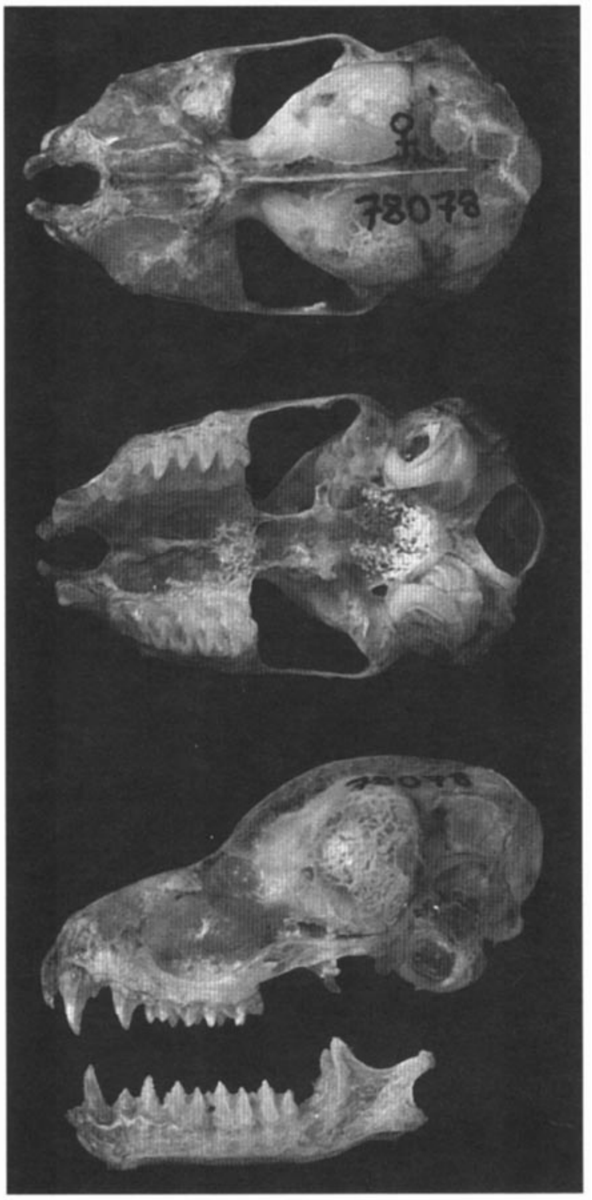

FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of lower jaw of *Coleura afra* from Diani Beach, Kenya (female, Royal Ontario Museum 78078). Greatest length of skull is 18.3 mm. Photographs courtesy of M. B. Fenton.

females and nine males, respectively, are total length 72.5, 71.2; length of tail 15.7, 15.5; length of forearm, 52.7, 51.1; length of hind foot, 9.8, 10.5; length of ear, 15.3, 14.7; greatest length of skull, 17.9, 17.7; condylobasal length, 16.5, 16.3; zygomatic breadth, 10.3, 10.3; breadth of braincase, 8.0, 8.0; postorbital constriction, 3.2, 3.3; length of maxillary toothrow (C-M3), 7.3, 7.1; length of mandibular toothrow (C-m3), 7.3, 7.2; length of mandible, 13.0, 12.9 (Harrison, 1968).

DISTRIBUTION. *Coleura afra* ranges from Mozambique, northern and eastern Zaire through northern Tanzania (including Zanzibar), Uganda, Kenya, Somalia, Ethiopia, Eritrea, southern and eastern Sudan and southwestern Arabia, west to Benguela on the western coast of Angola, Central Africa Republic, Nigeria, Togo, Ghana, Guinea and Guinea-Bissau Harrison and Bates, 1991; Kingdon, 1974—Fig. 3). There is no known fossil record for this species.

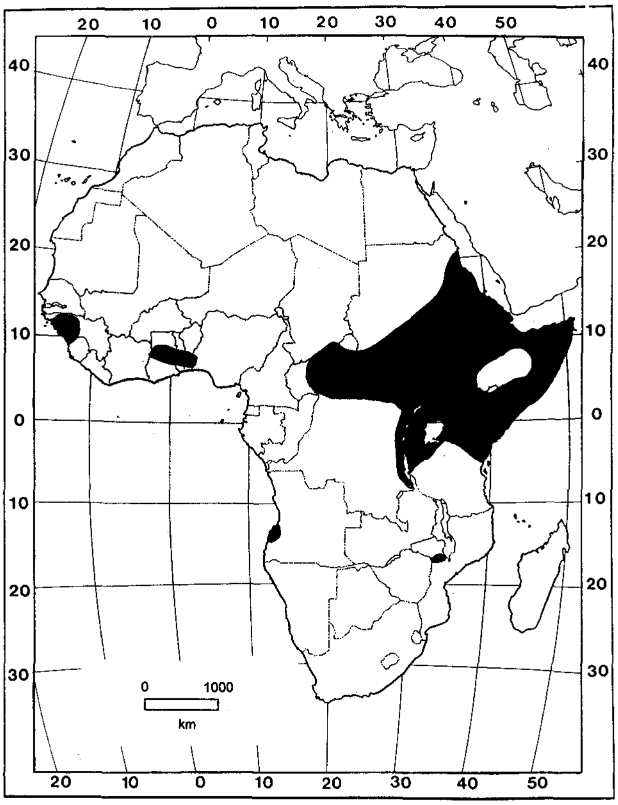

FIG. 3. Geographic distribution of *Coleura afra* (Smithers, 1983; K. F. Koopman, pers. comm.)

FORM AND FUNCTION. The dental formula is i 1/3, c 1/1, p 2/2, m 3/3, total 32 (Harrison and Bates, 1991). The upper incisors are tiny. The canines are large with well developed cingula and anterior and posterior cingular cusps. The first upper premolar is minute but is situated in the toothrow. The second upper premolar is large, with the main cusp being three quarters the height of the canine. The first and second upper molars both have a distinct hypocone, which is absent in M3. The metacone is the highest cusp on M1 and M2. The first upper molar has a small parastyle and a large mesostyle, whereas M2 has the parastyle larger than the mesostyle. The third upper molar lacks a metastyle, but the parastyle is almost as large as that on M2. The crown area of M2 exceeds M1. The lower incisors are tricuspidate and are no higher than the anterior cingular cusp of the lower canine. The posterior cingular cusp is more powerful than the anterior on the lower canine. The caniniform first lower premolar is small but is elevated in position such that its cusp is three quarters of the height of the strong second premolar and exceeds half the height of the lower canine. The lower third molar is smaller than either m1 or m2. The cusps and commissures of the three lower molars are similar (Harrison, 1964; Harrison and Bates, 1991).

The specialized hyoid morphology of *C. afra* is typical of the Emballonuridae (Griffiths and Smith, 1991; Griffiths et al. 1991), but shows several highly derived features as described by Griffiths et al. (1991). The trachea departs from the typical mammalian pattern, as the tracheal rings immediately posterior to the larynx are expanded to form a large postlaryngeal chamber. The ceratohyoideus muscle inserts on the posterior surfaces of the ceratohyal, epihyal, and the medial epihyal instead of on the posterior surface of the ceratohyal, epihyal, and the medial tip of the stylohyal bones. The geniohyoid is reduced in size and is fused to its antimere except at the tendinous origin. The sternohyoid, which is unusual in being strongly attached to the posterior larynx, is dorsally deflected by the postlaryngeal tracheal chambers (Griffiths et al. 1991).

In eastern Kenya histological analysis of female reproductive tracts from bats about to give birth, in either the long or short rainy season, show preimplantation morulae at identical stages of development. Pregnancy may be suppressed, particularly during the short rains. Histological sections of uteri with suppressed pregnancies show small corpora lutea present in the ovaries and no embryos present in the uterus (McWilliam, 1987).

ONTOGENY AND REPRODUCTION. In coastal Kenya the female reproductive cycle consists annually of two seasons of parturition, coinciding with the two rainy seasons. Long rains from March to June are followed by a long dry season from July to October, short rains from November to December, and finally a short dry season from January to March. Males increase in body mass and testicular activity at the end of the rainy seasons, and copulation ensues (McWilliam, 1987).

There is postpartum estrus, as indicated by simultaneous pregnancy and lactation. Almost all females give birth during the long rains, but a large proportion do not during the short rains. The gestation period during the long rainy season is ca. 114 days; it is ca. 8 days longer during the short rainy season (McWilliam, 1987). Parturition is highly synchronous, with 50% of young born within 3–4 days of each other. Only one young is produced at a time, and it is carried continuously by the mother. Although Kingdon (1974) states that mothers will not accept other young, McWilliam (1987) reports successful fostering of babies from a different colony.

Juveniles born during the short rains grow more slowly than those born during the long rains; however, they have a higher survival rate because juveniles born during the long rains are weaned immediately preceeding the long dry season. Female young remain in the natal cluster longer than male young. Twice as many males as females which were born either in the short rains of 1978 or long rains of 1979 had left their maternal clusters by November of 1979 (McWilliam, 1987). Males and females become sexually mature in their first year; however, females born in the short rainy season may suppress their first pregnancy because it would occur during the long dry season (McWilliam, 1987). Suppressing pregnancy would maximize lifetime reproductive success by increasing the probability that a female survives through the long dry season.

ECOLOGY AND BEHAVIOR. *Coleura afra* preferentially roosts in caves along the sea and lake shores (Kingdon, 1974), usually choosing open caverns or artificial structures such as cellars and native huts (Rosevear, 1965). In caves it roosts close to entrances in areas with more light.

Coleura afra shares caves with various species of bats, but it only roosts intermingled with *Taphozous mauritianus* in some coastal caves. Other species recorded in caves with *C. afra* include *Hipposideros caffer*, *Taphozous perforatus*, *T. hildegardeae*, *Triaenops persicus*, *Rhinopoma "hardwickei"* [=*macinnesi*] and *Asellia tridens* (Kingdon, 1974).

Colonies of *C. afra* in eastern Kenya can exceed 50,000 individuals. Each bat occupies a precise roosting position within the cave, either as a member of a stable cluster or as a solitary male in a fixed territorial site. There appears to be no monopolization by males of specialized roost or mating sites such as holes in cave walls. Clusters of up to 20 bats often split into smaller adjacent clusters during warm weather. During the cold of the long dry season, the entire colony often abandons individual clusters and forms a homogeneous group, suggesting a thermoregulatory advantage to clustering. There is reciprocal sharing of outer positions of clusters (McWilliam, 1987). Females show a greater tendency for gregariousness, as shown by the smaller proportion of solitary females than solitary males (McWilliam, 1987).

The majority of clusters are harems attended by a single adult male. Larger clusters may have a satellite male on the periphery. Peak competition between males for mating access to clustered females coincides with synchronous estrus and ovulation among females. The short estrus period favors mating access by the dominant male of the cluster and minimizes disturbance to the cluster created by intermale competition (McWilliam, 1987).

Active social interaction is seldom recorded. Grooming occupies 15% of diurnal roosting time, while the remainder is spent resting or shifting position within the cluster (McWilliam, 1987). An exaggerated emballonurid roosting posture, which consists of resting on all fours with the venter against the roosting surface and the head raised so the nose points upwards, has been observed.

Males maintain and defend individual feeding territories (McWilliam, 1987). Foraging groups are also observed, so females may possibly forage in groups similar to other emballonurids (Bradbury and Vehrencamp, 1976).

A number of parasitic mites have been reported from *C. a. afra* including *Afrolabidiocarpus longiscutatus*, *Dentocarpus exiguus*, and *D. tenuis* (Chirodiscidae); *Ichoronyssus miniopteri* and *Steatonyssus calcaratus* (Macronyssidae); *Olabidocarpus tanganyikensis* and *Notoedres benoiti* (Labidocarpidae/Chirodiscidae); and *Chirnyssus africanus* (Sarcoptidae). *Coleura a. nilosa* has been reported as a host to *Argus boueti* (Argasidae), and *C. a. gallarum* to *Notoedres benoiti*, *N. verheyeni*, and *Chirnyssus africanus* (Sarcopteridae; Anciaux de Faveaux, 1971, 1976).

GENETICS. Electrophoretic analysis of blood proteins of *C. afra* show that three of 22 loci are polymorphic (Robbins and Sarich, 1988). Values for albumin and transferrin immunological distances indicate that *C. afra* is more closely related to a group including *Emballonura* and the New World emballonurid genera than to *Taphozous* or *Saccolaimus* (Robbins and Sarich, 1988).

REMARKS. Barghoorn (1977) suggested that the loss of a pair of incisors in *Coleura* and in the New World emballonurids was a synapomorphy, and on this basis he placed *Coleura* in the clade that included the highly derived New World emballonurids. *Emballonura* was hypothesized to be the sister group to the entire *Coleura*-New World clade. Griffiths et al. (1991) believe that the dorsal deflection of the sternohyoid found in *Coleura* and *Emballonura* is a more likely synapomorphy and, following Robbins and Sarich (1988), they proposed that *Coleura* is most closely related to *Emballonura* and that New World emballonurids are a distinct and separate clade.

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Editors for this account were CYNTHIA E. REBAR, ELAINE ANDERSON, and KARL F. KOOPMAN. Managing editor was BARBARA H. BLAKE.

J. DUNLOP, DEPARTMENT OF BIOLOGY, YORK UNIVERSITY, 4700 KEELE STREET, NORTH YORK, ONTARIO, CANADA, M3J 1P3.