

Cephalophus sylvicultor. By Susan Lumpkin and Karl R. Kranz

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Cephalophus sylvicultor (Afzelius, 1815)

Yellow-backed Duiker

Antilope silvicultrix Afzelius, 1815:265. Type locality "in montibus Sierra Leone & regionibus Sufuenfium fluvios Pongas & Quia [Guinea] adjacentibus frequens" (implicitly restricted to Sierra Leone by Lydekker and Blaine, 1914:64).

Cephalophus punctulatus Gray, 1850:11. Type locality Sierra Leone.

Cephalophus longiceps Gray, 1865:204. Type locality "Gaboön" (Gabon).

Cephalophus ruficrista Bocage, 1869:221. Type locality "l'intérieur d'Angola" (interior of Angola).

Cephalophus melanoprymnus Gray, 1871:594. Type locality "Gaboön" (Gabon).

Cephalophus sclateri Jentink, 1901:187. Type locality Grand Cape Mount, Liberia.

Cephalophus thomasi Jentink, 1901:187. Type locality "Banana, Congo" (Banana, Zaire).

Cephalophus coxi Jentink, 1906:117. Type locality "North-Western Rhodesia" (Zambia) (restricted to the Lwampaji stream, locus 1224-C.1 by Ansell (1978:56) in accordance with criterion no. 4 of Recommendation 72E of the International Code of Zoological Nomenclature).

Cephalophus ituriensis Rothschild and Neuville, 1907:98. Type locality "de la vallée de l'Ituri" (Ituri Valley, Zaire).

Synonymy adapted from Allen (1939).

CONTEXT AND CONTENT. Order Artiodactyla, Family Bovidae, Subfamily Cephalophinae. The genus *Cephalophus* contains 12 species (Groves and Grubb, 1981), 13 species (Heyden, 1969), 14 species (Haltenorth, 1963), 15 species (Ansell, 1971), or 16 species (Honacki et al., 1982). Three subspecies of *C. sylvicultor* are recognized (Ansell, 1971) as follows:

C. s. sylvicultor (Afzelius, 1815:265), see above (*punctulatus* Gray, *longiceps* Gray, *melanoprymnus* Gray, *sclateri* Jentink, and *thomasi* Jentink are synonyms).

C. s. ituriensis Rothschild and Neuville, 1907:98, see above.

C. s. ruficrista Bocage, 1869:220, see above (*coxi* Jentink a synonym).

The validity of these subspecies is in some doubt (Ansell, 1971). *C. s. ruficrista* may be intermediate between *C. s. ituriensis* and *C. s. sylvicultor* but this requires confirmation. There is much variation in horns and skin that cannot be related easily to geographical distribution (Ansell, 1971).

DIAGNOSIS. *Cephalophus sylvicultor* is not likely to be confused with the other large duikers, *C. spadix* and *C. jentinki*, because it is the largest species and has a diagnostic yellow rump patch. Juvenile *C. sylvicultor* and *C. jentinki* may be confused; however, they are sympatric only in Liberia and western Ivory Coast, and therefore usually can be distinguished by locality. This confusion does not arise between allopatric *C. spadix* and *C. sylvicultor*.

Heyden (1969) found that adult *C. sylvicultor* could be distinguished from other duikers on the basis of basal skull length (from ventral rim of the foramen magnum to tip of premaxilla). The average basal skull length (in mm) of *C. sylvicultor* was 255 (240 to 274, $n = 27$); of *C. spadix* 194 (maximum 196, $n = 6$); and of *C. jentinki* 265 (260 to 269, $n = 3$). Although there is overlap in the basal skull lengths of *C. jentinki* and *C. sylvicultor*, the two species differ in the mesopterygoid fossae, the former with small mesopterygoid fossae deeply cut into the palatine and the latter with much broader and shorter mesopterygoid fossae (49 mm in length in *C. sylvicultor*, 55 mm in *C. jentinki*; Heyden, 1969). The

mesopterygoid fossae in *C. spadix* are narrow and parallel-sided, but in *C. sylvicultor* they are wedge-shaped (Ansell, 1971). In addition, *C. jentinki* has straight horn cores, swollen maxillary regions, rounded edges on the infraorbital foramina, posterior notches of the palate of unequal width, secondary inflation of the bullae, and inguinal glands, whereas *C. sylvicultor* has curved horn cores, unswollen maxillary regions, sharp edges on the infraorbital foramina, posterior notches of the palate of equal width, no secondary inflation of the bullae, and no inguinal glands (Ansell, 1971; Thomas, 1892). It is not known whether inguinal glands are present in *C. spadix* (Ansell, in litt.). In a recent systematic revision of the genus, Groves and Grubb (1981) concluded that *C. spadix* and *C. sylvicultor* constituted a superspecies.

GENERAL CHARACTERS. The largest of the Cephalophinae, the yellow-backed duiker has a convex back, higher at the



FIGURE 1. Photograph of an adult male yellow-backed duiker, captured in Sierra Leone, and now at the National Zoological Park, Washington, D.C.



FIGURE 2. Dorsal, ventral, and lateral views of the cranium and lateral view of the lower jaw of a male yellow-backed duiker from Zaire (USNM 220127).

rump than at the shoulders (Fig. 1). The head is large with a crest of longer hairs between the horns; the ears are relatively short, oblong, and slightly pointed; and the muzzle and insides of ears are naked. Horns are short, cylindrical, ribbed at the base, and lie in the same plane as the face or slightly curved back below the facial plane (Ansell, 1969). Both sexes are horned. The skull is broad and stout with relatively narrow muzzle and large lacrimal fossa (Fig. 2). The tail is short and the distal half forms a tuft. Preorbital or maxillary glands are well developed, inguinal glands absent, and pedal glands present (Fig. 3). Four inguinal mammae are present. Color, except for the yellow dorsal patch, head, rump, and perineal area, is a uniform blackish-brown. The crest is rufous, sides of muzzle are grey to light brown, underside of muzzle is light grey, and inside of ears is white along perimeter. There is a grey area, often edged with yellow, on the rump behind the dorsal patch. White streaks are visible along the edges of the perineum beneath the tail. Neck and shoulder hairs are shorter than other body hairs. Neck and shoulders appear "dusty" in captive specimens because of an accumulation of dandruff. Females are slightly larger than males. Haltenorth (1963) provided a detailed description of the species and gave the following measurements (mm): total length, 1,260 to 1,620; length of body, 1,150 to 1,450; length of tail, 110 to 180; height at shoulders, 650 to 850; length of horns, 80 to 200 (record length 213; Best and Raw, 1975); weight, 45 to 80 kg. Ansell (1973a), Kranz and Lumpkin (1982), Machado (1969), and Walker et al. (1975) provided photographs of living specimens.

DISTRIBUTION. *Cephalophus sylvicultor* has the widest distribution (Fig. 4) of the forest duikers (Ansell, 1971). The yellow-backed duiker ranges from Senegal and probably Gambia (although its presence in Gambia requires confirmation; Harper, 1945) east to southwestern Sudan and western Uganda. It usually ranges as far north as 08° to 09°N latitude in Central and East Africa; one

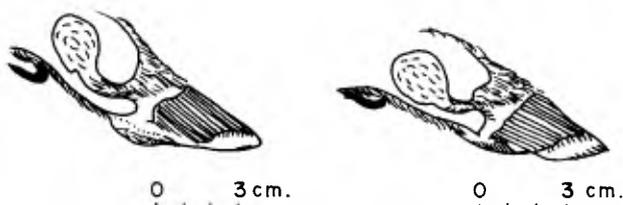


FIGURE 3. Section of right forefoot (left) and section of left hindfoot (right) to show pedal gland in *C. s. ruficrista*. Figure redrawn from Ansell (1960a) with permission.

record at 09°N in Chad was considered to be outside its usual range (Malbrant and Quijoux, 1958). An isolated population occurs in the Mau Forest of Kenya (Bally, 1946; Ionides, 1946). The range extends southward through Ruanda, Burundi, Zaire, most of Zambia west of the Muchinga/Zambezi escarpment (Ansell, 1978), and northern Angola. The southern and southwestern limits are not definitely known but a specimen in the U.S. National Museum was obtained in southwestern Angola at Silva Porta (12°25'S, 16°56'E). This may be the extreme limit of the southwestern range of *C. sylvicultor* as this area borders desert; such requires confirmation as it is not known whether the specimen was collected or merely purchased at this location. The distribution of *C. sylvicultor* probably is not continuous through this wide range; most of the localities in which its presence has been confirmed (Fig. 4) are in marginal areas between the rainforest and the savanna.

FOSSIL RECORD. The fossil record of the Cephalophinae was reviewed by Gentry (1978). Cephalophines are uncommon as fossils because they are primarily forest dwellers; there are no known fossils of *C. sylvicultor*. The earliest fossil records possibly of a duiker are a fragmentary maxilla from the mid to late Miocene of East Africa and a third molar identified as *Cephalophus* sp. (Armbourg, 1959) from the Miocene of North Africa. Heyden (1969) also reported *Cephalophus* from the Pliocene of North Africa. *Cephalophus parvus* Broom, 1934, was described from the Pliocene or early Pleistocene of South Africa based on a maxilla with two teeth. Broom (1934) believed *C. parvus* was closely related to *C. monticola* and Wells (1967) thought they were conspecific. A broken mandible with two teeth from the Pleistocene of South Africa was considered by Wells and Cooke (1956) indistinguishable from the living blue duiker (*C. monticola*). Wells and Cooke (1956) identified a fossil species from the early Pleistocene of South Africa referred to as *C. pricei*. This species has teeth with features similar to both *Cephalophus* and *Sylvicapra* but the shape of the horns is most like that of *Cephalophus*. Klein (1972) noted the presence of fossil remains of *C. monticola* in upper Pleistocene to recent South African archaeological sites.

FORM AND FUNCTION. The preorbital or maxillary glands (Schaffer, 1940; Weber, 1888) of the Cephalophinae are structurally different from those of all other artiodactyls and are located farther forward on the face than in any other ruminant (Pocock, 1910). Pocock (1918) considered the maxillary glands of the Cephalophinae among the most primitive in the bovids. These glands are large, elongated, ovate swellings located below and in front of each eye (Fig. 1). Richter (1973) gave the following measurements (mm): length, 70; width, 42; thickness, 20. A black, sticky secretion is extruded from 16 to 20 groups of pores along a 1 to 2 mm wide by 50 mm long hairless strip that extends along the medial crest of the gland (Richter, 1973). The secretion is produced by both apocrine and sebaceous glandular components; the brown-black color probably is melanin (Richter, 1973).

The pedal glands are located posterior to the interdigital clefts (Fig. 3). The glands are enclosed in a thin muscular tissue, the inside wall of which has a granular appearance. There are small hairs in the tube leading from the gland to the external orifice; these hairs are white near the gland and dark at the orifice (Ansell, 1960a). The pedal glands produce a yellow, waxy substance with a musky, aromatic odor; the function of the secretion is not known. In the red duiker (*C. natalensis*), the pedal glands have both apocrine and sebaceous components, but the former are more developed (Mainoya, 1978). Mainoya (1978) also noted that the pedal glands of *C. natalensis* were equally prominent in both forefeet and

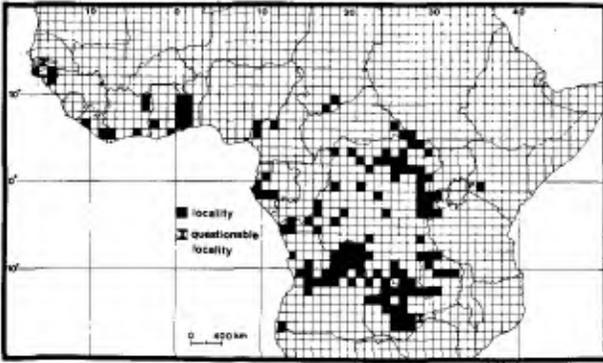


FIGURE 4. Central Africa, showing distribution of the yellow-backed duiker. Based on an unpublished map by W. F. H. Ansell.

hindfeet. Ansell (1960a, 1964) noted a 2- to 3-mm bare streak between the horns and traces of yellow, pollen-like substance (possibly dandruff) with a faint odor on the rufous crest hairs. To Ansell this suggested glandular activity but no intercornual gland was found.

The characteristic feature of the duiker skull (Heyden, 1969) is a large lacrimal fossa formed in part by the joining of the lacrimal and nasal bones that prevents a free ethmoid fissure. The foramen magnum is large and round, occipital condyles small, and tympanic bullae are high and narrow. Teeth are medium sized with low crowns. The dental formula is $i\ 0/3, c\ 0/1, p\ 3/3, m\ 3/3$, total 32.

Selected cranial measurements (in mm) provided by Heyden (1969) are (geometric $\bar{X} \pm SD$): basal length, 255 ± 3.5 ($n = 27$); zygomatic breadth, 120 ± 3.7 ($n = 27$); occipital condyle breadth, 73 ± 4.7 ($n = 27$); nasal length, 115 ± 6.9 ($n = 27$); length of upper toothrow, 84 ± 5.2 ($n = 25$); length of horns tip to tip, for males, 78 ± 25.5 ($n = 9$), for females, 56 ± 10.2 ($n = 5$).

The brain of *C. sylvicultor* is like that of the other Cephalophinae in having few sulci; these are deeper and are less ramified than those of the Antilopinae (Haarman and Oboussier, 1972). The gyral pattern of the Cephalophinae resembles that of the cervids (Oboussier, 1966). Haarman (1975) gave the following measurements for the brain of one 45-kg male yellow-backed duiker: mass, 170 g; surface area of the neocortex, 12,566 mm²; average number of pyramidal cells/100 μ^2 neocortex, 15; cephalization coefficient, 0.165; gray cell coefficient, 34; cortex coefficient, 5.4. Relative to body mass, these values are similar to those of other Cephalophinae. The Cephalophinae have higher cephalization and cortex coefficients than the Tragulidae and Antilopinae; on this basis, Haarman (1975) suggested that the Cephalophinae were the most intelligent of the bovids studied thus far.

Hofmann (1973) noted that the following characteristic features of the stomachs of small bush and forest antelopes, including duikers, that feed selectively on plants or plant parts of high nutritional value: relative capacity of the rumenotriculum small in relation to the capacity of the peritoneal cavity; rumen small with relatively even papillation; rumenotriculum a simple structure; ingesta pass rapidly within the stomach because of a wide *ostium intraruminale*, incomplete development of the coronary pillars, and a large *ostium reticulo-omasicum* leading into a small tube-like, although externally kidney-shaped, omasum; small omasum acting as a "filtration-weir-cum-muscular transfer-pump" (p. 50); and reticulum large with dense papillation of the dorsal quarter or third. Of the Cephalophinae, the stomach of only *C. harveyi* has been described in detail (Hofmann, 1973). The gall bladder is lacking in the genus (Pocock, 1918). According to Hofmann and Scholz (1968), the spleen is small and the heart is large; the relative weight of the heart is twice that of the human heart.

The body shapes of ruminants were divided into three major types that are related functionally to habitat and anti-predator behavior (Hofmann and Scholz, 1968). A convex back with a high point in the lumbar region is characteristic of duikers (Type C). This type, often correlated with reduced horn size, is found in species that move rapidly through thick bush and forest and "dive" into underbrush for cover. Dubost (1979) found that the body sizes of *C. sylvicultor* and other forest artiodactyls were adapted to conditions imposed by the structure of the undergrowth. The primarily frugivorous yellow-backed duiker that seeks food on the ground occupies a biotype that is "encumbered at chest height by

terminal shoots that carry leaves and little encumbered at the legs" (p. 15). Cephalophines also have a thickening of the skin in the lumbar region that may function to protect against mechanical impacts during progression through dense vegetation (Dubost and Terrade, 1970).

The radius and metapodials are relatively short, the tibia is shorter than the femur, the metatarsal is short, and the proximal segments compose a relatively large percentage of the limb. Duikers were characterized by Scott (1979) as short-legged animals with forelimbs and hindlimbs not specialized for speed.

ONTOGENY AND REPRODUCTION. Estrus in *C. sylvicultor* occurs at about 30-day intervals (Farst et al., 1980) and females also exhibit a postpartum estrus within a few days. A single calf is produced after a gestation period of about 151 days (Farst et al., 1980); Jeannin (1936) reported a gestation of about 4 months. Females are thought to produce one calf per year in the wild (Asdell, 1964); captive females exhibit a median interbirth interval of 399 days (Kranz and Lumpkin, 1982). Ansell (1960a) found two wild lactating females, one in March and another in July, and noted a record of a juvenile estimated about 2 weeks old in December; Ansell (1973b) also reported a small fetus from a female shot in August. These observations suggest that breeding is not highly seasonal.

One hand-reared male calf weighed 6 kg at 4 days of age and another 6 kg at 9 days of age. Both nearly doubled their body masses between weeks 1 and 4 of life, thus, like some of the smaller duikers (*C. dorsalis* and *C. rufilatus*; Dittrich, 1972), this species appears to achieve about 18% of adult mass by 4 weeks of age. One captive, mother-reared female weighed 36 kg at 130 days of age, which is about 57% of adult weight and comparable with that of small duikers (Dittrich, 1972). Young are weaned at about 4 to 6 weeks of age but begin to eat solid food much earlier (Kranz and Lumpkin, 1982).

Neonates are uniformly brownish-black in color, horns are not apparent, and crest hairs are lighter and shorter than those of adults (Kranz and Lumpkin, 1982). Horns first appeared at 30 days of age in one captive male. Also at about 30 days, a thin strip of hair along the spine begins to lighten in color. The yellow stripe is obvious by 118 to 140 days of age and, over the next 4 to 5 months, the caudal section of the stripe gradually broadens to form the fully developed triangular rump patch. Hairs of the rump patch also more than double in length to reach adult size by about 5 months of age. Crest hairs lighten and triple in length by 5 months of age (Kranz and Lumpkin, 1982).

Mentis (1972) cited two longevity records for *C. sylvicultor* in captivity: 7 years, 4 months, and 18 days (Crandall, 1964), and 8 years, 11 months, and 26 days (Flower, 1931). However, one wild-caught female lived in captivity for 10 years and 4 months (Kranz and Lumpkin, 1982) and another wild-caught female lived over 10 years in the Dallas Zoo, Texas (Wortman, pers. comm.).

ECOLOGY. The yellow-backed duiker belongs to a group of morphologically, ecologically, and behaviorally convergent mammals, including species of artiodactyls, rodents, and lagomorphs. These species exhibit what Rathbun (1979:64) referred to as the "microcursorial adaptive syndrome." The basic features of this syndrome are tropical and subtropical distribution; small body size; swift, cursorial locomotion; browsing on high energy food; precocial young; and a facultatively monogamous (Kleiman, 1977, 1981) social structure. Within this group, ecological equivalents can be found among species living in similar niches in South America, Asia, and Africa. Dubost (1968) noted the convergence between *C. sylvicultor* and the brocket deer (*Mazama gouazoubira*) of South America that appears to include size, body build, horn (or antler) reduction, habitat, diet, social structure, escape reactions, gait, and communication. Both its ecology and behavior suggest that the yellow-backed duiker is a generalist, exhibiting broad ranges in habitat, diet, and time of activity.

The yellow-backed duiker is associated with semi-deciduous forest (Heymans and Lejoly, 1981), rain forest (Walther, 1968), gallery forest, riparian forest, and montane forest (Ansell, 1971). However, it occurs in open bush (Ansell, 1960b), in isolated forest islands (Dekeyser and Villiers, 1955), in clearings, and on the savanna (Malbrant and Maclatchey, 1949). In Zaire, it lives in primary forest areas adjacent to expanses of tall semi-aquatic vegetation (Heymans and Lejoly, 1981). Christy (1924) noted that the range of *C. sylvicultor* extended beyond the confines of the dense

Ituri Forest (Zaire) into far outlying strips of gallery and riverain forest. Thus, Ansell (1971) concluded that the yellow-backed duiker was adapted to marginal habitats and not confined to dense forests as are some of the Cephalophinae (Malbrant and Maclatchey, 1949).

Jarman (1974) placed the duikers with his Class A species: those that feed selectively on a wide range of plant species and use only particular plant parts usually of high nutritional value. Yellow-backed duikers primarily are frugivorous browsers, and feed on fruit, leaves, shoots, seeds, bark, and buds. Analysis of stomach contents of four yellow-backed duikers from Gabon showed that fruit constituted 71.3% and leaves 28.6% of the dry matter (Gautier-Hion et al., 1980). In Northern Rhodesia (Zambia), Ansell (1960a) found leaves and berries of *Canthium venosum*, fruits of *Oncoba spinosa* and *Pseudolachnostylius dekindtii*, pods of *Swartzia madagascariensis*, other unidentified leaves, and some ground moss of *Cryptosepalum* forests in the stomach of an adult female. *P. maprounefolia* ("duiker tree") fruits, seeds and hard shells of the fruit of *Strychnos* sp., seeds of *Justicia betonia*, and leaves and twigs were found in the rumen of an adult male. Malbrant and Maclatchey (1949) reported large quantities of seeds of *Klainedoxa gabonensis*, and seeds of *Scyphocephalum ochocoa* and of "M'bebam," in the stomach of a yellow-backed duiker from equatorial west Africa. In Angola, yellow-backed duikers were reported to prefer fruits of *Crhysophyllum* sp. and *Garcinia* sp. (Machado, 1969). Ionides (1946) reported *C. sylvicultor* to feed on fallen berries of *Podocarpus milanjanus* and *Syzygium* sp. Gautier-Hion et al. (1980) also found animal matter, representing 0.1% of dry matter, in stomach contents of three of four duikers. Yellow-backed duikers may eat carrion (Dekeyser and Villiers, 1955), but a yellow-backed duiker in captivity was observed to capture, kill, and eat pigeons (*Columba livia*) (Kranz and Lumpkin, 1982); this behavior also was described for several other Cephalophinae (Ganslosser, 1981; Grimm, 1970; Kurt, 1963). Hillman (in litt.) reported *C. sylvicultor* in the Sudan to use salt licks.

Possible but unconfirmed predators on *C. sylvicultor* are lions (*Panthera leo*) and leopards (*P. pardus*) (Ansell, 1969). Ansell (in litt.) observed wild dogs (*Lycan pictus*) to feed on a carcass. Dekeyser (1956) listed a number of parasites of the Cephalophinae, but only specifically mentioned *C. sylvicultor* as the host of a tick (*Ixodes rasus*). At the National Zoological Park, protozoan parasites of the yellow-backed duiker include coccidia cysts (*Eimeria* was identified), *Giardia*, and *Tritrichomonas*. Of the nematodes, *Strongyloides* and *Trichuris* were found.

Duikers are game animals but are not highly sought by sportsmen because their heads do not make interesting trophies (Walker et al., 1975), although some reports (Hillman, in litt.) suggest that they may be prized trophies in the Sudan. Local inhabitants kill duikers for food by capturing them in live traps or with nets. Among some indigenous groups the meat is taboo because of the belief that duikers eat carrion (Ansell, 1950; Christie, 1924; Malbrant and Maclatchey, 1949), but in others, duiker meat is especially prized (Jeffrey, 1974; Machado, 1969). In one region of the Ivory Coast, skulls of yellow-backed duikers are used as "gri-gri" (fetishes) (Rahm, 1961). Duikers are captured by imitating their calls (Ansell, 1950) and by stalking around fallen logs and other common resting sites (Ionides, 1946). Duikers are hunted at night by shining a carbide light into their eyes. This temporarily blinds and confuses them, allowing them to be shot between the eyes by the hunter (Jeffrey, 1974). Duikers also may be driven into nets with the aid of numerous beaters; this method of capture is most successful if the net is not set in a straight line (Golley and Buechner, 1968).

Cephalophus sylvicultor was protected at various times in some of the countries within its range. It is now listed on Appendix II of CITES, but its actual status in the wild is uncertain. Yellow-backed duikers breed well in zoos (Farst et al., 1980; Kranz and Lumpkin, 1982) and young were hand-reared successfully and even kept as pets (Ansell, 1950; Kranz and Lumpkin, 1982).

BEHAVIOR. Little is known about the behavior of yellow-backed duikers in the wild because of the density of their habitat and their secretive nature. Duikers move through thick vegetation with head and neck held low, giving them a hunched look; they are capable of quick bursts of running, and advance at a jerky trot or by heavy and clumsy leaps, often progressing in zig-zags (Dekeyser and Villiers, 1955; Jeffrey, 1974; Maberly, 1962; Malbrant and Maclatchey, 1949). In captivity, duikers occasionally run about erratically and wildly, even climbing up along walls (Farst et al., 1980).

Cephalophus sylvicultor was described as living solitary, in couples, and rarely in small groups (Ansell, 1960b; Dekeyser and Villiers, 1955; Malbrant and Maclatchey, 1949), but other observations (Bally, 1946) suggest that monogamous pairs and their young live together or that only one pair occupies a specific area (Maberly, 1962). Forest duikers generally are assumed to be monogamous (Estes, 1974); monogamy was confirmed in the wild for the blue duiker *C. monticola* (Dubost, 1980). Family groups of blue duikers consisting of a breeding pair and up to two immature offspring, live in small, permanent territories which adults of both sexes defend from conspecific intruders. In this species, breeding pairs seem to be permanent for life and are the only stable groups. Young blue duikers leave their parents during the second year of life to establish territories. Interactions between neighboring family groups or pairs are rare in blue duikers, but, within a family, social interactions, especially heterosexual contacts, are frequent and intense. Studies of captive *C. maxwelli* suggest a similar social structure (Aeschlimann, 1963; Ralls, 1973). In captivity, yellow-backed duikers are kept as pairs with their immature offspring; the relationships between these individuals are generally amicable (Kranz and Lumpkin, 1982).

Cephalophus sylvicultor is not strictly nocturnal but diurnal activity is limited generally to the early morning, late afternoon, and early evening (Ansell, 1950, 1960b; Dekeyser and Villiers, 1955; Dubost, 1980; Gautier-Hion et al., 1980; Maberly, 1962; Malbrant and Maclatchey, 1949). Yellow-backed duikers tend to stay in dense forest during the day and rest in a "nest" under a fallen tree or other thick cover to which they return regularly (Bally, 1946; Ionides, 1946; Maberly, 1962). They emerge into more open areas only at night (Maberly, 1962). Malbrant and Maclatchey (1949) reported that duikers sometimes leave their cover at night to feed on groundnuts and other crop plants growing in abandoned villages.

Duikers usually take cover and hide in response to danger. In captivity, when one is startled, it freezes immediately, often with one foreleg off the ground. The animal then remains motionless, stares in the direction of the disturbance, and waits for recurrence of the disturbance before taking cover (Kranz and Lumpkin, 1982). Disturbing events also elicit immediate erection of the hairs of the yellow rump patch (Ansell, 1960; Dekeyser, 1956; Kranz and Lumpkin, 1982; Machado, 1969). Piloerection of this highly visible patch is the most prominent visual display and may signal alarm or threat to conspecifics (Kranz and Lumpkin, 1982). Fights between *C. sylvicultor* conspecifics have not been observed, but Ralls (1975) described agonistic behavior in *C. maxwelli*.

All forest duikers rely on olfactory and, to a lesser extent, acoustic communication, but *C. sylvicultor* uses fewer visual signals than the diurnal *C. monticola* and more than the strictly nocturnal *C. dorsalis* (Dubost, 1980). In captivity, both sexes of *C. sylvicultor* frequently mark objects in their environment with products of their maxillary glands and often rub their noses over the marked area as if to spread the secretion (Kranz and Lumpkin, 1982). In *C. maxwelli*, maxillary secretions are deposited along paths that connect resting places, and conspecifics also mark each other (Aeschlimann, 1963). Vocalizations of *C. sylvicultor* include a "squealing bark" (Maberly, 1962), soft, pig-like grunts, and bleating (Kranz and Lumpkin, 1982); the "squealing bark" described by Maberly (1962) may be the same as bleating.

Daily interactions in captivity between paired males and females differ little from those seen when the female is in estrus (Kranz and Lumpkin, 1982). Mutual licking and sniffing, especially of the face and genitals, are common, and the male constantly investigates his mate to detect estrus. When the females urinates, the male may sample the urine and exhibit Flehmen (lip-curl; Schneider, 1930), a response that may allow him to determine her sexual state (Estes, 1972; Ladewig and Hart, 1980). The male may "drive" the female, licking her vulva, and nudging, butting, and even biting her anogenital region. The vulva becomes red and swollen from this treatment and wounds sometimes are inflicted on her anogenital region from bites by the male. When following, the male also may emit soft, pig-like grunts. When not in estrus, the female attempts to discourage the male by dropping to her knees, running away (sometimes with a bleating vocalization), or by hiding in a corner or other secluded spot where the male cannot reach her rump. The male then may bite, lick, nudge, or horn the female in an effort to get her to stand up.

When the female is in estrus she is more tolerant of sniffing and licking of her vulva by her mate, although sometimes her

anogenital region is licked and nudged with such force that her hindfeet are lifted off the ground. When the female no longer runs from the male, he begins to mount her. The male may Laufschiag (stiff foreleg kick between the hindlegs of the female; Walther, 1958) before mounting. The female often moves from under the male then stops; the male then approaches her, sniffs her vulva, and again attempts to mount. Mounts without intromission frequently result in ejaculation. Copulation itself is brief, consisting of one pelvic thrust before dismounting. While copulating, a male duiker leans over the female, somewhat posterior to her neck, and holds his head so that his nose is from one to three hand-widths above the female's withers (Walther, 1979). The posture resembles that of *Tragelaphus*, except that males of this species rest their chin on the female's back (Ralls, 1978). No postcopulatory behavior has been observed. The sexual behavior of the yellow-backed duiker is much like that of Maxwell's duiker (Ralls, 1973) and broadly similar to that of other primitive antelopes (Walther, 1979).

Parturition has not been observed in yellow-backed duikers, but movements of the foetus can be seen and the vulva of the female becomes swollen about 5 days before birth. Females also may become restless just before parturition. There may be a tendency for births to occur in the early morning: of six parturitions of one captive female, four occurred between 0700 and 0900 h (Kranz and Lumpkin, 1982). Two duiker calves observed in captivity received little maternal care (Kranz and Lumpkin, 1982). *C. sylvicultor* seems to be typical of species in which young hide (Walther, 1979). The calves spent most of their time lying alone, seemingly more often in protected spots at the bases of vertical objects such as trees or clumps of grass. Nursing is infrequent, but individual bouts of nursing may be lengthy; nursing bouts of 7 and 15 min were observed immediately after birth and at 2 days of age, respectively, in one mother-calf pair, and one bout of 12-min duration was seen in another pair when the calf was 5 weeks old. Mothers also lick and groom their young. In captivity, males generally are indifferent to calves, but they occasionally become intolerant of the young and must be removed to prevent possible injuries.

GENETICS. In the five species of *Cephalophus* examined the diploid number was 60 (NF = 62); with the exception of *C. maxwelli*, all females of the genus had 58 acrocentric autosomes and two metacentric sex chromosomes (Hard, 1969; Hsu and Bernschke, 1971). In *C. sylvicultor*, the X-chromosomes were submetacentric, with relatively short arms. The Y-chromosome of *C. sylvicultor* has not been positively identified, but Hard (1969) assumed it to be a small acrocentric.

REMARKS. *Cephalophus sylvicultor* is the type species of the genus (Ansell, 1971). *Cephalophus* is from the Greek *kephale* (=head) and *lophus* (=crest), referring to the tuft of hairs on top of the head. *Sylvicultor* is from the Latin *silva* (=wood) and *cultus* (past participle of *colere* = to cultivate), referring to its habitat. Duiker is from the Dutch for "diver" that describes its habit of diving into dense vegetation for cover. Machado (1969) reported that Angolan natives believed yellow-backed duikers were fond of the meat of Bell's hinge-back tortoise (*Kinixys belliana*) that the animals obtained by blowing the body out of its shell. Apparently, empty shells often are found in areas frequented by duikers.

Groves and Grubb (1981) recently revised the Cephalophini on the basis of horn-core insertion, sexual dimorphism, and juvenile pelage; this revision is mentioned here because only an abstract of the work has been published. They recognize three genera: *Sylvicapra* (one species, *S. grimmia*); *Philantomba* (two species, *P. maxwelli* and *P. monticola* forming a superspecies); and *Cephalophus* (12 species). *Cephalophus* was divided further into three subgenera: *C. (Cephalophula)*, *C. (Cephalpia)*, and *C. (Cephalopus)*. *C. sylvicultor* was placed in the subgenus *Cephalopus* with *C. spadix* (with which it forms a superspecies), *C. dorsalis*, and *C. jentinki*. The subgenus *Cephalopus* was characterized by thin horns, little sexual dimorphism in horn and skull form, and speckled juvenile pelage. *C. (Cephalophula)* included only *C. zebra*, and *C. (Cephalopia)* included seven of the eight remaining species of Cephalophini. The affinities of *C. adersi* are uncertain.

Because of the similarity among the various species of the Cephalophinae and the limited information about *C. sylvicultor*, some aspects of the biology of other *Cephalophus* species were included in the present account where data on *sylvicultor* were lacking.

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