

Nycticeinops schlieffeni. By Dave S. Johnston

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***Nycticeinops* Hill and Harrison, 1987**

Nycticejus: Peters, 1860:223. Part.
Vesperugo Dobson, 1876:118. Part.
Scotophilus: Noack, 1887:280. Part.
Scoteinus: Thomas and Wroughton, 1908:539. Part.
Nycticeius: G. M. Allen, 1911:328. Part.
Scotoecus: Wettstein, 1916:191. Part.
Nycticeinops Hill and Harrison, 1987:254. Type species *Nycticejus schlieffeni* Peters, 1860:223, by original designation.

CONTEXT AND CONTENT. Order Chiroptera, suborder Microchiroptera, superfamily Vespertilionoidea, family Vespertilionidae, subfamily Vespertilioninae, genus *Nycticeinops*. *Nycticeinops* is monotypic.

***Nycticeinops schlieffeni* (Peters, 1860)**

Schlieffen's Bat

Nycticejus schlieffeni Peters, 1860:223. Type locality "Cairo, Egypt."
Vesperugo schlieffeni Dobson, 1876:118. Name combination and incorrect subsequent spelling of *Nycticejus schlieffeni* Peters, 1860:223.
Nycticejus schlieffeni Dobson, 1878:244. Incorrect subsequent spelling of *Nycticejus schlieffeni* Peters, 1860:223.
[*Nycticejus*]. *adovanus* Heuglin, 1877:34. Type locality "Asam River at Adowa, Tigre, Abyssinia" = Ethiopia.
Scotophilus minimus Noack, 1887:280. Type locality "Qua Mpala [= Pala], Marungu," Katanga Province, Democratic Republic of the Congo.
Scoteinus schlieffeni: Thomas and Wroughton, 1908:539. Name combination.
Scoteinus schlieffeni australis Thomas and Wroughton, 1908:539. Type locality "Coguno, Inhambane," Mozambique.
Scoteinus schlieffeni albiventer Thomas and Wroughton, 1908:540. Type locality "Naikhala, Upper Egypt."
Scoteinus schlieffeni bedouin Thomas and Wroughton, 1908:540. Type locality "Lahej, near Aden," Yemen.
Nycticeius africanus G. M. Allen, 1911:328. Type locality "Meru River, Northern Guaso Nyiro, Kenya."
Scotoecus cinnamomeus Wettstein, 1916:191. Type locality "Nub-baka, Kordofan Province, Anglo-Egyptian Sudan" = Sudan.
Scoteinus schlieffeni fitsimonsi Roberts, 1932:17. Type locality "Tsotsoroga Pan, Northern Bechuanaland" = Botswana.
Nycticeinops schlieffeni: Hill and Harrison, 1987:254. First use of current name combination.

CONTEXT AND CONTENT. Content as above. Hayman and Hill (1971) recognized 4 subspecies, *N. s. albiventer* (Thomas and Wroughton 1908), *N. s. australis* (Thomas and Wroughton 1908), *N. s. fitsimonsi* (Roberts 1932), and *N. s. schlieffeni* (Peters 1860). Rosevear (1965) suggested that the white-bellied form, *N. s. albiventer* (Thomas and Wroughton 1908), is found in all areas and may not warrant subspecies status, but Hayman and Hill (1971) used *albiventer* as a subspecific name for the population of Schlieffen's bat occurring in regions from West Africa to Egypt. Allen (1911) listed *N. s. albiventer* in the synonymy of *N. africanus*. Harrison (1964) rejected the status of *bedouin* as a separate Arabian subspecies. Hayman and Hill (1971) suggested *adovanus* Heuglin, 1877 and *minimus* Noack, 1887 are synonyms of the subspecies *N. s. schlieffeni*. Currently, *N. schlieffeni* is considered monotypic (Simmons 2005).

DIAGNOSIS. *Nycticeinops schlieffeni* has a baculum with an expanded base and long fluted shaft that distinguishes it from

Nycticeius humeralis (Hill and Harrison 1987). *N. schlieffeni* has a shorter rostrum and anteriorly, a cranium more narrow than that of *N. humeralis* (Hill and Harrison 1987). Maxillary toothrows of *N. schlieffeni* are more convergent than those of *N. humeralis* (Hill and Harrison 1987). Bacula from *Scoteanax* and *Scotorepens* have modified tips and molars are not as reduced as in *N. schlieffeni* (Hill and Harrison 1987).

GENERAL CHARACTERISTICS. *Nycticeinops schlieffeni* (Fig. 1) is one of the smallest species of bat in Africa. Males average 4.7 g and females 5.1 g (Rautenbach 1982), and length of forearm is 29–34 mm in males and 30–33 mm in females (Koopman 1975). Pelage of *N. schlieffeni* varies in color over geographic range. Dorsal pelage of head and body is brown to light brown and hairs are unicolored. Ventral pelage is paler brown to grayish white to white with hairs bicolored only in darker populations. *N. schlieffeni* has a flattened muzzle that is sparsely haired anteriorly, and nares open obliquely (Rosevear 1965). Ears are rounded with a small, posteriorly oriented basal lobe. Tragus is bluntly pointed with a posterior margin that is strongly convex with prominent basal lobe (Rosevear 1965). Calcar extends just over one-half of uropatagial border and postcalcarial lobe is well developed (Rosevear 1965).

Selected cranial measurements (in mm) for males and females, respectively, are: condylobasal length, 11.6–12.9, 12.1–12.6; width across last molars, 5.2–5.8, 5.5–5.9; length of maxillary toothrow, 4.1–4.7, 4.2–4.6. External measurements (in mm or g) for both sexes combined are: total length, 64–80; length of tail, 28–31; length of head and body, 40–50; length of forearm, 28–31; body mass, 3.7–5.0 (Smithers 1983).

Nycticeinops schlieffeni has a wide flattened braincase without an elevated front (Fig. 2). Schlieffen's bat has almost no cranial crest and only a slight occipital "helmet." Postorbital region is wide, and supraorbital area is somewhat broad. Rostrum is not expanded laterally, but is narrow anteriorly, making cranial profile nearly straight and slightly lower over front of orbits (Hill and Harrison 1987).

DISTRIBUTION. Schlieffen's bat ranges from Mauritania to Egypt, south to Somalia and Namibia and northeastern South Africa (Fig. 3). *N. Schlieffeni* also occurs in southwest Arabia. No fossils are known.



FIG. 1. Photograph of an adult male Schlieffen's bat taken in 1987 along the Luvuvhu River in Kruger National Park, South Africa. Used with permission of the photographer, B. Fenton.

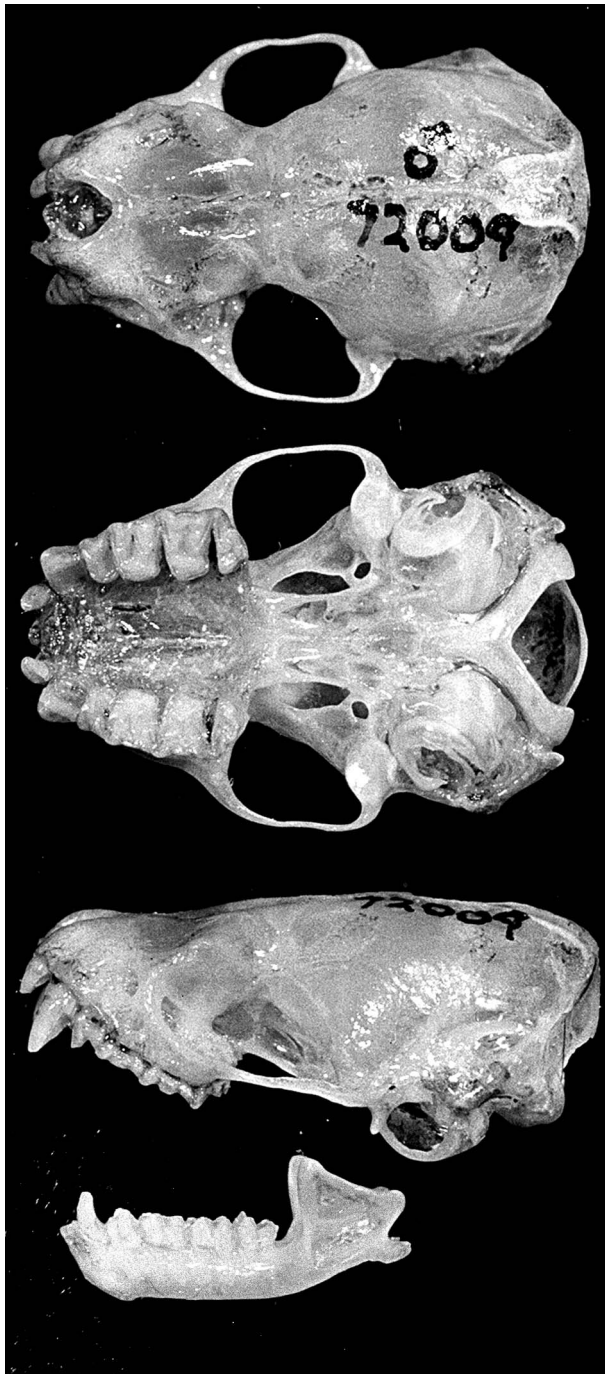


FIG. 2. Dorsal, ventral, and lateral views of cranium and lateral view of mandible of an adult male *Nycticeinops schlieffeni* collected at Melka Ware, Ethiopia (Royal Ontario Museum, Toronto, Canada, museum specimen 72009). Greatest length of skull is 12.5 mm.

FORM AND FUNCTION. *Nycticeinops schlieffeni* has a bicornuate uterus. In parous females, right uterine horn may be as much as one-third longer than the left uterine horn (van der Merwe and Rautenbach 1986).

Dental formula is $i\ 1/3, c\ 1/1, p\ 1/2, m\ 3/3$, total 30. Upper incisor is massive, unicuspid, and usually separated from 1st upper canine by a very short diastema or may contact 1st upper canine (Thomas and Wroughton 1908). Upper premolar has contact with upper canine and has small protocone; lingual shelves of upper molars are widely separated, upper 3rd molar is not reduced, and lower incisors are strongly imbricated to one-half of width (Hill and Harrison 1987). Lower 1st incisor is more clearly tricuspid and

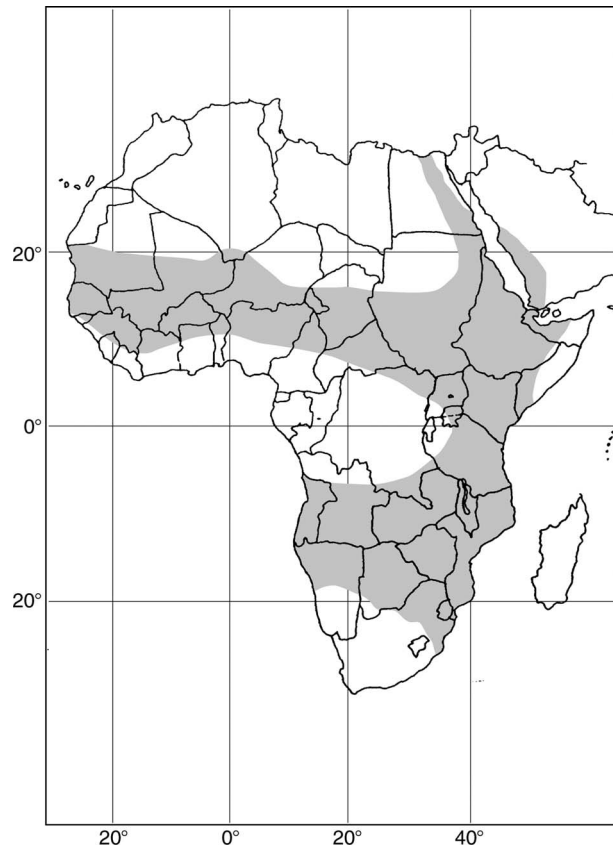


FIG. 3. Geographic distribution of *Nycticeinops schlieffeni* (range modified from Smithers [1983]).

longer than more massive 2nd and 3rd lower incisors (Hill and Harrison 1987). Second lower premolar is much reduced, 3rd lower molar is slightly reduced, and posterior triangle is smaller than anterior triangle (Hill and Harrison 1987).

REPRODUCTION AND ONTOGENY. In the subtropical region of Pafuri in Kruger National Park, South Africa (22°25'S), copulation occurs during June, and females store spermatozoa in uterine horns until late August when ovulation occurs (van der Merwe 1987). Births in southern Africa occur during November (Ansell 1986; Taylor 2000), and Schlieffen's bats are seasonally monoestrous (van der Merwe and Rautenbach 1987).

In southern Africa at the end of September (early spring), 1st signs of spermatogenic activity occur in testes, and by end of December type A and type B spermatogonia are undergoing mitosis while primary spermatocytes are present (van der Merwe and Rautenbach 1990). Near the end of April, primary spermatocytes and spermatids with condensed nuclei are abundant and many spermatozoa are attached to Sertoli cells or have accumulated in seminiferous tubules; large numbers also are present in epididymides (van der Merwe and Rautenbach 1990). Between May and June (beginning of winter), number of primary spermatocytes decreases; spermatids and spermatozoa are abundant and epididymides are crowded with spermatozoa (van der Merwe and Rautenbach 1990). Near the equator in Somalia (1°04'N), a scrotal male was caught between August and September (Varty and Hill 1988).

Nycticeinops schlieffeni has an average number of 3.1 corpora lutea per female, and 5 of 6 females recorded with large fetuses were pregnant with triplets (van der Merwe and Rautenbach 1986). In all cases of triplets, 2 or 3 corpora lutea were in right uterine horn and only 1 or none was in left (van der Merwe and Rautenbach 1986).

ECOLOGY AND BEHAVIOR. *Nycticeinops schlieffeni* forages in riparian forest, floodplain, and above open water during dry season in Zimbabwe (Fenton and Thomas 1980). Schlieffen's bat depends on open water in marshes, streams, or reservoirs (Smithers 1971) and also is associated with open woodland savanna in south-

ern Africa (Smithers 1983). In Zimbabwe, *N. schlieffeni* ($n = 31$) spent the following amounts of foraging time in different habitats: 29% in brachystegia woodland, 26% in short mopane woodland, 16% in tall mopane woodland, 13% over pans (i.e., pools) in pan mopane woodland, 6.4% in riparian forest, 3% in brachystegia vleis, 3% above larger rivers, and 3% above smaller rivers (Fenton 1975). Schlieffen's bat spends the following amounts of time foraging in different zones within habitats: 50.3% in open areas, 38.7% between larger branches and trunks of trees, 10.1% around trees 0.5 m away from canopy, and 0.9% near surface of branches and leaves of trees and bushes (Aldridge and Rautenbach 1987). In northern, western, and southern bioregions of Uganda, Schlieffen's bats were observed only in the zoka forest (a savannah mosaic with riparian forest) in Uganda's northern region (Kityo and Kerbis 1996).

In Miombo woodlands in Zimbabwe, disturbed wooded habitat had a smaller ratio of Schlieffen's and other smaller bat species <10 g and a higher ratio of larger bat species >10 g when compared with adjacent healthy wooded habitat (Fenton et al. 1998).

Little or no partitioning of niches of *N. schlieffeni* and *Pipistrellus (Eptesicus) capensis* occurs because both species are equally abundant at many of the same sites and show no evidence of food, habitat, or time partitioning (Fenton and Thomas 1980). The only reported difference was that *P. capensis* spent no time within the woodland between larger branches and trunks of trees, the 2nd most common habitat zone for *N. schlieffeni* (Aldridge and Rautenbach 1987). Two species of *Tadarida* are sometimes found in association with *N. schlieffeni* (Kingdon 1974). In the Zoka forests of northwestern Uganda, *N. schlieffeni* was caught in association with *Epomophorus labiatus*, *E. minimus*, *Eptesicus capensis*, *E. somalicus*, *E. tenuipinnis*, *Hipposideros abae*, *H. caffer*, *H. ruber*, *Miniopterus schreibersi*, *Nycteris hispida*, *N. macrotis*, *N. thebaica*, *Pipistrellus nanus*, *Scotoecus albofuscus*, and *Scotophilus leucogaster* (Kityo and Kerbis 1996). In the Miombo forests of Mana Pools area in northern Zimbabwe, *N. schlieffeni* was caught in a similar association: *Epomophorus minimus*, *E. wahlbergi*, *Eptesicus capensis*, *E. somalicus* (formerly by *E. zuluensis*), *E. tenuipinnis*, *Hipposideros abae*, *H. caffer*, *H. ruber*, *Miniopterus schreibersi*, *Nycteris hispida*, *N. macrotis*, *N. thebaica*, *Pipistrellus nanus*, *P. rusticus*, *Scotoecus albofuscus*, and *Scotophilus leucogaster* (Fenton et al. 1998).

Bat hawks (*Macheiramphus alcinus*) capture and eat Schlieffen's bats (Fenton et al. 1977). Schlieffen's bat emerges relatively early in the evening, at ca. 1730 h, and actively forages until ca. 1900 h (Fenton and Thomas 1980). During a dry season in Zimbabwe, *N. schlieffeni* ($n = 5$) fed on beetles (50%), caddisflies (41%), and moths (6%); in a wet season, its diet ($n = 30$) included beetles (72%), flies (19%), moths (5%), and true bugs (4%)—Fenton and Thomas 1980). Some beetles in the genera *Bolboceras* and *Geotrupes* were not eaten by a captive animal (Kingdon 1974). Healthy captives have been known to survive without food for 5 days (Kock 1969).

Wing measurements (mean, *SD*) for Schlieffen's bat averaging 5 g are: wing loading (Nm^{-2}), 6.7, 1.0; aspect ratio, 6.9, 0.4; wingtip shape index, 1.6, 0.4 (Aldridge and Rautenbach 1987). Echolocation calls are narrow band (39–47 kHz) and steep frequency modulated (FM) with a dominant frequency of 41 kHz in Swaziland (Taylor 2000). In Kruger National Park and Zimbabwe, multiharmonic calls sweep from 100 to 40 kHz with a duration of 2–10 ms (Fenton and Thomas 1980).

Day roosts for Schlieffen's bats include rock crevices (Pienaar et al. 1987); hollows and crevices in trees (Verschuren 1957); and huts, houses, and cellars (Rosevear 1965). Although *N. schlieffeni* has been considered a solitary species (Rosevear 1965; Verschuren 1957), individuals also have been reported to live in small groups evenly distributed throughout appropriate habitat (Fenton 1975). Based on museum specimens, a group of 3 individuals was roosting together in a tree in Zambia (Taylor 2000). Schlieffen's bat does not migrate seasonally (van der Merwe and Rautenbach 1990).

GENETICS. *Nycticeinops schlieffeni* has a diploid number of 34 and a fundamental number of 52 (Ruedas et al. 1990). Karyotype consists of 10 pairs of metacentric and 6 pairs of acrocentric autosomes; largest pair of acrocentric autosomes possesses a secondary constriction near centromere. X chromosome is medium sized and metacentric; Y chromosome is small and acrocentric (Ruedas et al. 1990).

REMARKS. *Nycticeinops* is Greek for night aspect, and *schlieffeni* refers to the collector, Count Wilhelm von Schlieffen-Schlieffenburg. Hill and Harrison (1987) placed this species in a new genus based on a taxonomic review of Vespertilioninae using bacula. Elevation of this species to generic status is supported by Ruedas et al. (1990), who reported the karyotype.

The type species has undergone many generic changes in taxonomy since Peters (1860) 1st described it as *Nycticejus*. Dobson (1876) placed it in *Scotozous* with the impression that this genus lacked an upper 3rd incisor, and Dobson (1878) later considered *Scotozous* to be a subgenus of *Vesperugo*. Thomas (1890) placed it in *Scotophilus* with the understanding from Dobson that *schlieffeni* has only 1 pair of upper incisors. Miller (1907) placed this species in *Scoteinus* with Australian species, and Allen (1911) placed it in *Nycticeius* because it appeared similar to the American *N. humeralis*.

Confusion in the literature exists between *N. schlieffeni* and several other species. A specimen (Allen 1914) was recorded as *Scoteinus schlieffeni* from Blue Nile Province, but is actually *Scotoecus hirundo* (Koopman 1975). Material described by Wettstein (1916) as *Scotoecus cinnamomeus* is actually *Nycticeius schlieffeni* (Koopman 1975).

Agreement about the range of *N. s. albiventer* and *N. s. schlieffeni* is lacking. Thomas and Wroughton (1908) described the type specimen for *N. s. albiventer* from Naikhala, Egypt (upper Nile River in Egypt), and the type specimen for *N. s. schlieffeni* (from Peters 1860) as Cairo, Egypt (lower Nile River). Hayman and Hill (1971) described the range of *N. s. schlieffeni* as Egypt, eastern and northeastern Africa, the Sinai, and extraliminally southwestern Arabia and that of *N. s. albiventer* as West Africa locations from Mauritana east to northern Sudan and Kenya. Several poorly defined subspecies are frequently recognized (Koopman 1994).

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