

A NEW *Tadarida* OF THE SUBGENUS *CHAEREPHON*  
(CHIROPTERA: MOLOSSIDAE) FROM SÃO TOMÉ ISLAND,  
GULF OF GUINEA (WEST AFRICA)

J. JUSTE AND C. IBÁÑEZ

*Estación Biológica de Doñana, Consejo Superior  
Investigaciones Científicas, 41080 Sevilla, Spain*

We describe a population of the genus *Tadarida* (Molossidae) from São Tomé Island (Gulf of Guinea, West Africa), as a new species based on cranial and interaural-membrane morphology shown in three specimens. These features are shared only with *T.* (*Chaerephon*) *gallagheri* from Zaire and, in part, with *T.* (*C.*) *johorensis* from the Malayan Peninsula, two species that appear to be the closest allies. The families Molossidae (the new species and *T.* (*C.*) *pumila*) and Emballonuridae (*Taphozous mauritanus*) are recorded for the first time for the island of São Tomé.

**Key words:** *Tadarida*, *Chaerephon*, São Tomé Island, West Africa

Among free-tailed bats, *Tadarida* (sensu lato) is considered to be the most complex and diversified genus (Koopman, 1975), containing almost one-half of the known species in the family Molossidae (Corbet and Hill, 1986). The taxa *Mops* and *Chaerephon* have been considered as either separate genera (Freeman, 1981) or included within *Tadarida* as subgenera (Legendre, 1984). *Chaerephon* originally was distinguished on the basis of the complex interaural band of the Oriental species, *T. johorensis*. Lately, its characterization was extended to include the lack of palatal emargination and the presence of an unreduced M3 (revised in Hill, 1961). Freeman (1981) admits that *Tadarida* and *Chaerephon* share characteristics and that taxa like *bivittata* and *ansorgei* seem phylogenetically related to both genera. Patterns of karyotypic morphology are not concordant with Freeman's (1981) classification and have not resolved questions concerning relationships (Smith et al., 1986). Therefore, we consider it appropriate here to retain *Chaerephon* within *Tadarida* as do Legendre (1984) and Hill and Smith (1984).

In a recent survey of the bats of São Tomé Island (Gulf of Guinea, West Africa), we

obtained several specimens identified as *Tadarida* (*C.*) *pumila* and three other specimens whose external, cranial, and dental characters identify them as belonging also to the subgenus *Chaerephon*. They are the first molossids reported on São Tomé Island and all of them are deposited in the Estación Biológica de Doñana collections. These last three specimens cannot be identified with any of the 11 known African species of the subgenus *Chaerephon* (Corbet and Hill, 1986); therefore, we describe them here as representing a new species.

*Tadarida* (*Chaerephon*) *tomensis*  
new species

*Holotype*.—Adult female; skin, skull, and partial skeleton; Estación Biológica de Doñana (EBD) 18256, field number B7085; from Praia das Conchas, 3 km NW Guadalupe, São Tomé Island, Republic of São Tomé and Príncipe (0°24'N, 6°37'E); obtained on 22 April 1988 by Javier Juste and Antonio Ayong.

*Paratypes*.—Two adult females; in alcohol, skulls removed; EBD 17371 and 17734. EBD 17371 is from Agua Izé, São Tomé Island, and was collected by Javier Juste and Carlos Ibañez on 11 April 1988. EBD

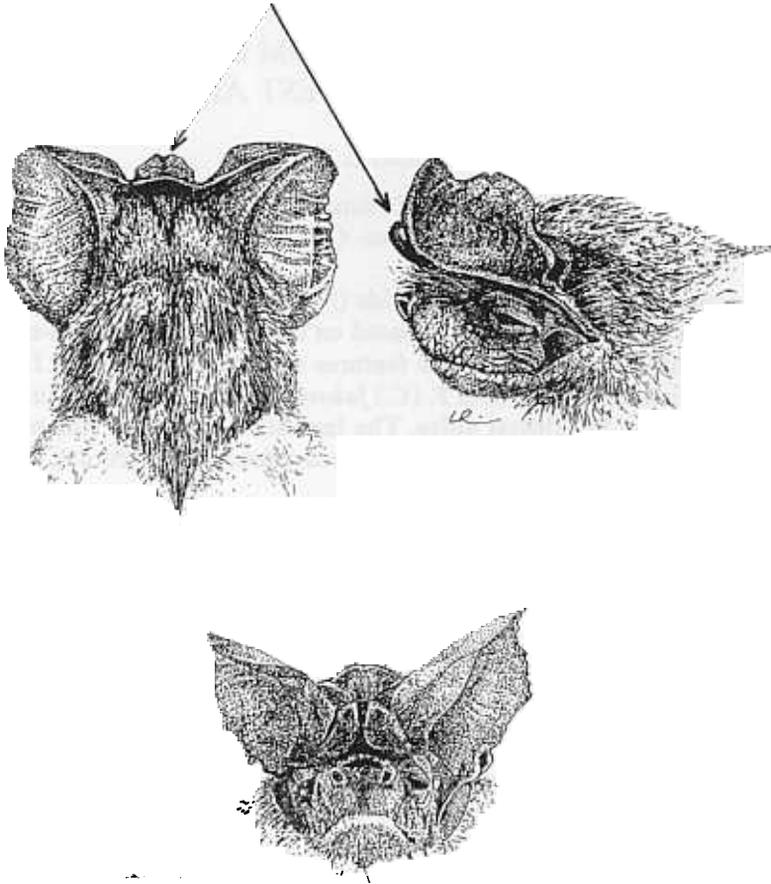


FIG. 1.—The head of *Tadarida (C.) tomensis* in frontal, lateral, and dorsal views, based on EBD 7371 paratype. Arrows point to the characteristic interaural lobe.

17734 is from Praia das Conchas, São Tomé Island, and was collected by Javier Juste and Antonio Ayong on 22 April 1988.

**Distribution.**—Known only from São Tomé Island where it has been collected at two localities.

**Diagnosis.**—Interaural membrane bearing a characteristic globular swelling on the anterior margin, similar to that found only in *T. (Chaerephon) gallagheri* among all African species. In lateral view, the interaural swelling extends slightly forward of the muzzle (Fig. 1). The anterior rostrum is inflated on each side of the anterior nares from (and including) the premaxillae to the lacrimals. The nasal opening is elongated when viewed from above (the nasals appear emarginate) with the posterior margin extending posterior to the lacrimal processes and the

maxillary root of the zygomatic arches (Fig. 2). Also in this dorsal view the nasal orifice is shaped as an elongated bell; not flask-shaped as in *T. gallagheri*.

**Description.**—A small free-tailed bat (length of forearm of holotype, 38.5 mm; other measurements in Table 1) with round-tipped ears wider than long that extend forward slightly ahead of the muzzle. The well-developed antitragal lobe is subrectangular. The tragus is minute, and bears three lobes on its upper margin and a lower basal lobule.

A striking feature is the appearance of the interaural membrane (Fig. 1). The anterior margin of this membrane has the form of a truncated triangle when displayed that is slightly elevated centrally and has a small depression. The anterior margin of the in-

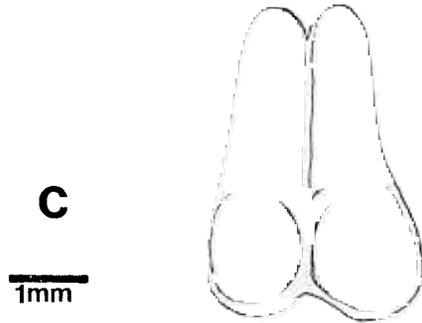
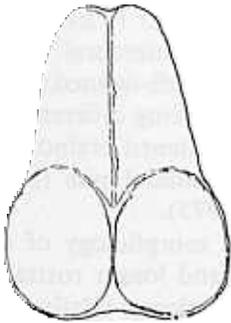
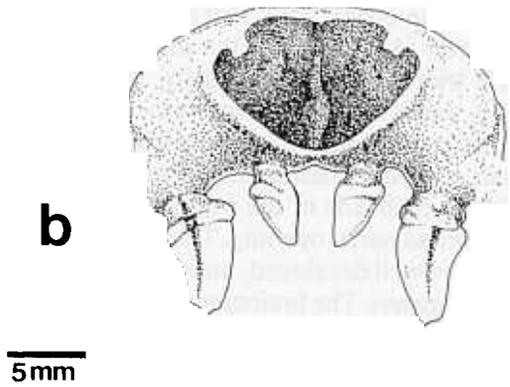
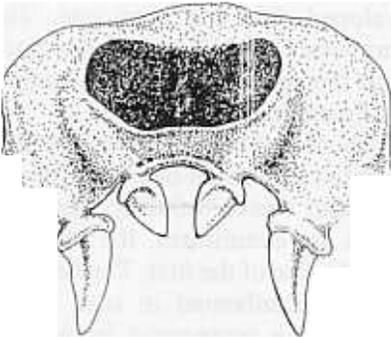
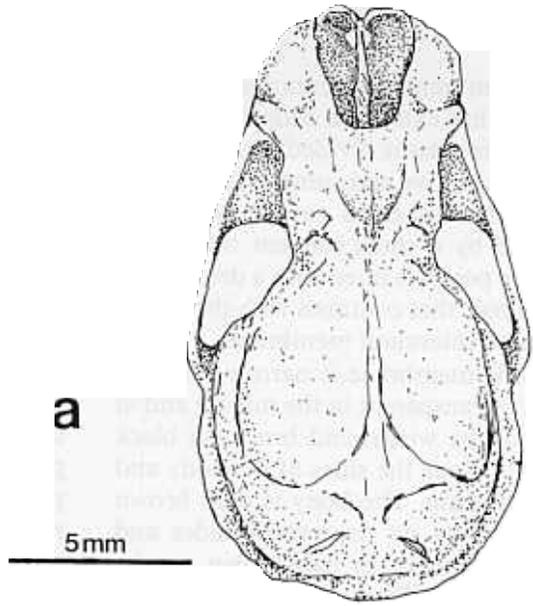
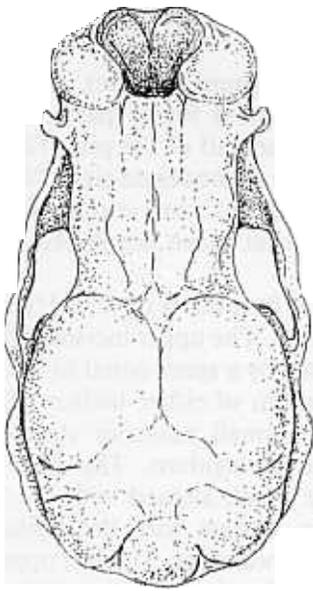


FIG. 2.—Differences in skull and teeth characteristics between *Tadarida (Chaerephon) gallagheri*, male holotype BM 76.207 (left) and *Tadarida (Chaerephon) tomensis*, female holotype EBD 18256 (right): a) dorsal views; b) frontal views of upper incisors and canines; c) basisphenoidal pits (anterior part in the top).

teraural membrane also bears a central globular mass that extends a little beyond the muzzle. This mass is divided longitudinally by a medial groove and surrounds a 3-mm-deep pouch connected to the interaural membrane by a small median ridge. The base of the pouch is lined with a dense layer of brown hair that contrasts with the essentially naked interaural membrane.

The wing membrane is narrow, whitish, and nearly transparent in the middle and at the tips of the wings, and brownish black proximally along the sides of the body and the uropatagium. The body is dark brown dorsally, brown on the ventral sides and flanks, but whitish to pale-brown on the venter medially. The body pelage is dense, relatively long, and extends as a narrow strip along the flanks and uropatagium, where it is most conspicuous on the venter. The dorsal pelage is longest (ca. 7.0 mm) and has a whitish to pale-brown base; that of the venter is shorter (4.0 mm) and the individual hairs are tricolored-whitish basally, brown medially, and with pale-brown tips.

The rostrum is inflated laterally from the lacrimals to and including the premaxillae (Fig. 2a) on each side of the comparatively long and broad narial opening. The lacrimal processes are well developed, but not as long as in *T. gallagheri*. The braincase is rounded and only slightly elevated above the rostrum. In the specimens examined (females), supraorbital ridges and a sagittal crest are lacking; lambdoidal crests are weakly developed. The anterior insertion of zygomatic arches shows a conspicuous flattened space anterior to the orbital fossa. The zygomatic arches are slender and relatively straight when viewed dorsally. The premaxillae are fused; the degree of anterior palatal emargination resembles level 2 of Freeman (1981). The palate is broad, concave medially, and achieves its anterior maximum width at the level of the last premolar. The mesopterygoid fossa becomes wider posteriorly. The basisphenoidal pits are well defined (diameter, 1.2–1.6 mm) and deep (level 4 of Freeman, 1981), separated

by a 0.2-mm septum (Fig. 2c). A line connecting the glenoid fossae passes through the anterior one-half of the pits. The auditory bullae are of moderate size. The mandible is slender, has a low coronoid process and a somewhat more developed angular process.

The dental formula is  $i\ 1/2, c\ 1/1, p\ 2/2, m\ 3/3$ , total 30. The upper incisors are large and separated by a space equal to the width of the cingulum of either incisor. The canines have a small posterior cusp on the posterolingual cingulum. The first upper premolar is small, aligned with the tooth-row, and in contact with the canine and second upper premolar. The last upper premolar is well developed with a high crown and >50% the length of the canine. The first two upper molars are similar in size; labially the metacone is higher than the paracone, and lingually the protocone is much better developed than the hypocone. The third commissure of M3 is well developed and about the same length as the second (stage 2 of Freeman, 1981, scale).

Each of the lower incisors is small and separated from each other, the inner pair is larger and weakly bilobed. The lower premolars are caniniform, the second almost twice the size of the first. The first two lower molars are subequal in size; the third is smaller. The protoconid is the dominant cusp, followed by the hypoconid.

*Comparisons.*—Among African members of the subgenus *Chaerephon* with interaural membranes, only *T. major* shows some similarity to *T. tomensis* and *T. gallagheri* in the interaural structure, but *T. major* lacks a well-defined interaural pocket and shows striking differences in the skull, such as its flattened braincase and its shallow basisphenoidal pits (Freeman, 1981; Harrison, 1975).

Based on morphology of the interaural membrane and longer rostral inflations in the skull, the closest relative to *T. tomensis* among all African molossids is *T. gallagheri*, known only from the holotype, a male, from Kindu (Kivu region, East Zaire) and

TABLE 1.—External and cranial measurements (in g and mm) of the three female specimens of *T. (C.) tomensis* (São Tomé Island) and the *T. (C.) gallagheri* male holotype (Kivu region, Zaire). Measurements follow Freeman (1981) except for lengths of upper and lower toothrow, inter-dental breadths (taken over across the teeth), and rostral breadth that follow Harrison (1975).

Character	<i>T. tomensis</i>			<i>T. gallagheri</i>
	Holotype EBD 18256	Paratype EBD 17374	Paratype EBD 17371	Holotype BM 76.207
Mass	7.2		7.0	
Length of forearm	38.5	35.5	38.0	37.6
Length of ear	20.0	20.0	21.0	19.5
Length of tibia	13.0	13.0	13.0	13.0
Length of hindfoot	8.5	8.9	9.0	8.4
Total length	92.0	77.7	90.0	78.0
Length of tail	33.6	29.0	30.0	30.1
Length of third metacarpal	40.2	36.6	40.4	37.9
Length of first phalanx	14.7	13.9	15.9	14.4
Length of second phalanx	19.0	18.7	20.5	19.1
Length of fourth metacarpal	38.2	35.1	38.7	36.6
Length of first phalanx	11.8	11.3	12.2	12.3
Length of second phalanx	10.5	9.1	9.3	9.4
Length of fifth metacarpal	24.8	21.9	23.6	24.0
Length of first phalanx	10.3	10.0	10.4	11.7
Length of second phalanx	4.2	4.7	5.0	4.3
Greatest length of skull	15.6	15.4	16.1	16.0
Condylolincisive length	14.8	14.1	15.2	14.9
Palatal length	6.3	6.5	6.6	6.9
Mastoid breadth	8.9	8.5	8.6	8.7
Breadth of braincase	7.9	7.8	7.9	7.9
Zygomatic breadth	9.2		9.2	8.9
Postorbital breadth	3.7	3.8	3.8	4.2
Breadth of rostrum	5.1	5.1	5.1	5.3
Length of maxillary toothrow	5.6	5.8	5.5	5.8
Breadth at upper canines	4.0	3.9	4.0	3.8
Breadth at upper molars	6.8	6.9	6.6	6.3
Length of mandible	10.3	10.1	10.5	10.7
Length of lower toothrow	5.9	6.2	5.8	6.1

described by Harrison (1975). Body measurements are similar, but the two female specimens from São Tomé Island are slightly larger; the remaining female from São Tomé Island is noticeably smaller (Table 1). The interaural membrane in *T. tomensis* differs from that of *T. gallagheri* because the globular swelling is less projected over the muzzle. The fold that borders the pouch in *T. gallagheri* (Harrison, 1975) is absent in *T. tomensis*.

The most conspicuous differences between the two species occur in the skull (Figs. 2a and 2b). Specimens from São Tomé Island have a narrow postorbital constriction;

yet a broader zygomatic width, especially as shown by the females from São Tomé Island, when compared with the holotype of *T. gallagheri* (Table 1). The shapes of the anterior insertions of the zygomatic arches are wider and flared in *T. tomensis* (Fig. 2a). While the nasal inflations are much less conspicuous in *T. tomensis* than in *T. gallagheri*, the nasal aperture is longer in *T. tomensis*, and the posterior border lies behind a line across lacrimals. The form of the nasal opening clearly is different for the continental and insular species (Fig. 2a). The palate differs by being narrower posteriorly in *T. tomensis*. Basisphenoidal pits are larger

and deeper, and the septum is narrower in *T. gallagheri* (Fig. 2c). Finally, the occipital is blunter in *T. tomensis* than in *T. gallagheri* when seen laterally, being more similar to that of *T. pumila*. Although the teeth are similar, they all average significantly larger in *T. tomensis*, especially the canines (Fig. 2b) and upper first premolars (minus cule in *T. gallagheri*). Because the usual pattern of sexual dimorphism in *Tadarida* is one in which males typically exhibit greater body size, larger skulls, and more powerful teeth (Peterson, 1969, 1970, 1972), we argue that *T. gallagheri* and *T. tomensis* are not conspecific. *T. tomensis* clearly differs from the other similarly sized molossid on the island, *T. pumila*, because it has a different pattern of color in body pelage and because it has conspicuous differences in the interaural membrane and skull morphology.

*Remarks.*—The specimens from São Tomé Island show the unique interaural membrane that Dobson (1878) used to define the subgenus *Chaerephon*. They also share other features typical of the group such as an unreduced upper last molar, well-developed antitragal lobule, a relationship between the second phalanx and the total length of the fourth digit around 14–17% (17.3% in the holotype, 16.4 and 15.4% in the paratypes of *T. tomensis*); a range assigned to *Chaerephon* by Freeman (1981), and finally, all dental attributes established by Legendre (1984). Indeed, on a supraspecific level, the specimens of São Tomé Island belong to *Tadarida* (*Chaerephon*). Nevertheless, at this level, and supported by the appearance of *T. tomensis*, we could restrict the definition of the subgenus *Chaerephon* to the original character state defined by Dobson (1878). This would reduce the taxon to include only the species *johorensis*, *gallagheri*, and *tomensis*. However, the presence of a variably complex interaural membrane in other related species, as in *T. major*, makes it difficult to establish clear boundaries and therefore the restriction of *Tadarida* (*Chaerephon*) requires

more detailed studies. The similarities of the structure of the interaural membrane clearly indicate a close phylogenetic relationship among *johorensis*, *gallagheri*, and *tomensis*. Such a relationship, however, poses an interesting biogeographic dilemma: how does one reconcile the geographic gap of >2,000 km between the two African species within the same forest block, and between these and *T. johorensis* from Sumatra and the Malayan Peninsula (Hill, 1961, 1974)? This great second gap could be explained by an early/middle Miocene forest corridor connecting these two areas (K. F. Koopman, pers. comm.). Among African species, the simpler structure of the interaural membrane and the less marked inflations in the cranial rostrum suggest the presence of less derived features in the insular *T. tomensis*, in contrast to *T. gallagheri* (D. L. Harrison, pers. comm.).

We expect that males of *T. tomensis* will be larger in size, and will show the same interaural structure described here for females. The ear formation is similar in both sexes of *T. johorensis* (Hill, 1974).

The discovery of this molossid increases to five the number of families of bats known for São Tomé Island; the emballonurid *Taphozous mauritanus* also was captured for the first time on the island. The known bat fauna of São Tomé Island now includes *Eidolon helvum*, *Rousettus aegyptiacus*, *Myonycteris brachycephala*, *Taphozous mauritanus*, *Hipposideros commersoni*, *Hipposideros ruber*, *Miniopterus minor*, *Tadarida pumila*, and *Tadarida tomensis*.

*Comparative specimens examined.*—*Tadarida* (*C.*) *gallagheri* (1), ZAIRE: Kivu region (East Zaire), holotype male (British Museum of Natural History 76.207). *Tadarida* (*C.*) *pumila* (2), EQUATORIAL GUINEA: Corisco Island, Río Muni region (EBD); (10), SÃO TOMÉ AND PRÍNCIPE: Praia Micondó, São Tomé Island (EBD).

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