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Sorex longirostris.

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Sorex longirostris Bachman, 1837

Southeastern Shrew

Sorex longirostris Bachman, 1837:370. Type locality the Hume Plantation on Cat Island in the mouth of the Santee River, South Carolina.

"*Bachmani (longirostris junior* Bachm)" Pomel, 1848:249. Reference from Jackson, 1928.

Sorex wagneri Fitzinger, 1868:512. Reference from Jackson, 1928.

Sorex fisheri Merriam, 1895:86. Type locality Lake Drummond, Great Dismal Swamp, Norfolk County, Virginia.

CONTEXT AND CONTENT. Order Insectivora, Family Soricidae, Subfamily Soricinae. The genus *Sorex* includes approximately 40 living species. Three subspecies of *S. longirostris* are currently recognized:

S. l. longirostris (Bachman, 1837:370), see above (*bachmani* Pomel and *wagneri* Fitzinger are synonyms).

S. l. fisheri Merriam, 1895:86, see above.

S. l. eionis Davis, 1957:3. Type locality Homosassa Springs, Citrus County, Florida.

DIAGNOSIS. Size is small for the genus, tail relatively shorter than in *S. cinereus*. Often differentiated from other eastern *Sorex* by the third upper unicuspid being smaller than the fourth (Fig. 1). This character is shared by some western American *Sorex* but was attributed only to *S. longirostris* in the East (Merriam, 1895; Miller, 1895; Jackson, 1928). Miller (1895) and Kellogg (1939), however, recognized that this character was not always distinctive. In Alabama and Georgia 20%, and in Indiana 12%, of the specimens exhibited equal or nearly equal third and fourth upper unicuspids (French, 1980, in press). Also, *S. cinereus ohionensis* was described as a distinct subspecies, in part because the third upper unicuspid is usually smaller than the fourth (Bole and Moulthrop, 1942). Both upper and lower first incisors are relatively smaller and all teeth are more lightly pigmented than in *S. cinereus*. The skull, when compared to *S. cinereus*, is smaller, shorter, and the rostrum is broader (see below). Miller (1895) noted that the palate was remarkably broad and short (Fig. 1). The inner ridge of the upper unicuspids lacks pigment and the greatest width across the outside of the first large molariform teeth is usually less than 2 times the distance from the posterior end of the palate to the anterior end of the first incisors (Whitaker, 1968). Other differences between *S. longirostris* and *S. cinereus* are discussed by French (1980). Skulls of *S. l. fisheri* are larger and relatively narrower than in *S. l. longirostris* and skulls of *S. l. eionis* are intermediate in size but otherwise similar to *S. l. longirostris* (Davis, 1957).

GENERAL CHARACTERS. Color of dorsum Prout's brown or mummy brown above, cinnamon brown or ochraceous tawny below (Jackson, 1928). *S. l. fisheri* is similar in appearance to *S. l. longirostris* but is usually duller above and more tinged with drab or wood brown below (Jackson, 1928). The colors of *S. l. eionis* are described as very dark chestnut dorsally, becoming lighter and richer on the sides (Davis, 1957).

Measurements, in mm, with means in parentheses, for 270 *S. l. longirostris* trapped in Georgia and Alabama are: total length, 68.0 to 94.0 (81.9); length of tail, 24.0 to 37.0 (30.1); length of hind foot (measured without claw; claw = about 1 mm), 8.0 to 11.0 (9.9); weight, 2.0 to 5.8 gm (3.25); condylobasal length, 13.8 to 15.5 (14.6); palatal length, 5.4 to 6.4 (5.9); cranial breadth, 6.9 to 7.9 (7.5); interorbital breadth, 4.0 to 4.8 (4.4); and length of maxillary tooth row, 5.0 to 5.8 (5.4) (French, in press). External measurements for 91 reproductively mature specimens from the Alabama population are: total length, 77.0 to 92.0 (83.2); length of tail, 27.0 to 33.0 (30.0); length of hind foot, 9.0 to 11.0 (9.9). External measurements for six *S. l. fisheri* are: total length, 92 to 102 (97.7); length of tail, 34 to 40 (37.7); and length of hind foot, 11.5 to 13.0 (12.1) (Jackson, 1928). Cranial measurements of five specimens are: condylobasal length, 15.4 to 16.4 (15.9); palatal length, 5.4 to 5.6 (5.5); cranial breadth, 7.3 to 8.2 (7.7); interorbital breadth, 3.3 to 3.6 (3.5); maxillary breadth, 4.4 to 4.8 (4.5); and length of maxillary tooth row, 5.3 to 5.8 (5.5) (Jackson, 1928). See Davis (1957) for measurements of 10 *S. l. eionis*.

The dental formula is i 3/1, c 1/1, pm 3/1, m 3/3, total 32. Eight of 128 specimens (6.2%) of *S. longisrostris* collected in Indiana displayed tooth anomalies and in Alabama, 1 of 95 specimens (1.1%) had anomalies (French, 1980). All observed abnormalities involve the upper unicuspids, the most common being the lack of one or both upper fifth unicuspids. In a few cases the upper fourth unicuspid was the missing tooth. Unusual reductions in the size of the upper third unicuspid were also noted. One case of an extra tooth was found, resulting in five unicuspids on one side and six on the other.

DISTRIBUTION. Records of occurrence are shown in Fig. 1. It is not known if populations west of the Mississippi River, in Arkansas and Missouri, are disjunct; recent records from Adair and adjacent counties in Missouri (Mock and Kivett, in press) suggest that specimens may eventually be found in the intervening area. One insular record is from a Barn Owl pellet on Hatteras Island, North Carolina (Engels, 1941). In Virginia, *S. longirostris* is found throughout most of the state except the Ridge and Valley

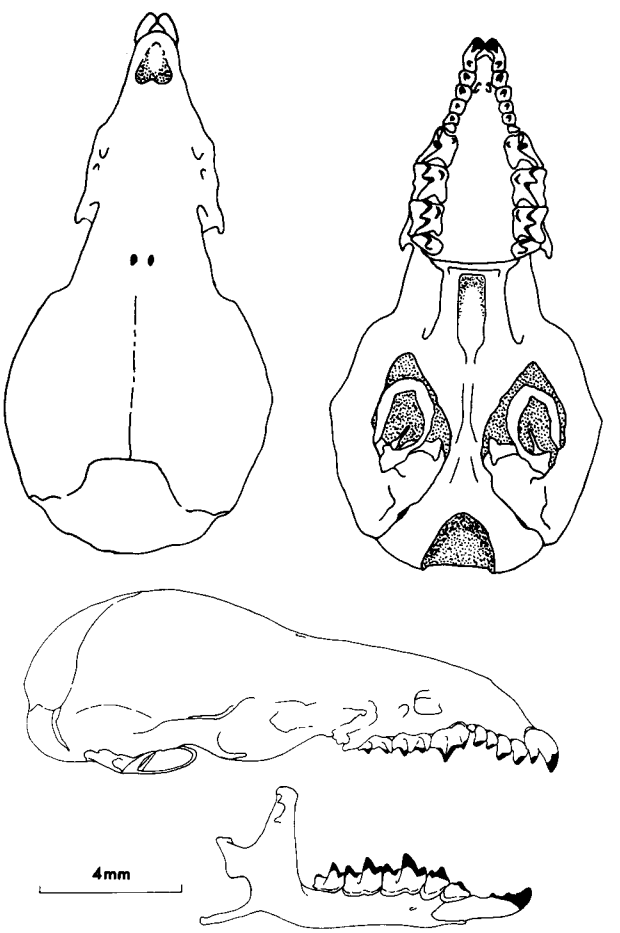

FIGURE 1. Dorsal, ventral and lateral views of cranium, and lateral view of lower jaw of *Sorex longirostris longirostris* from Chambers County, Alabama.

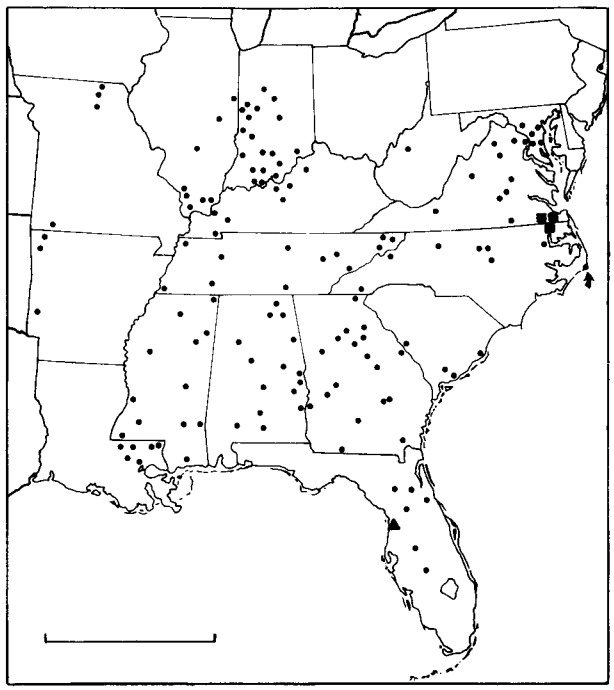

FIGURE 2. Map of the southeastern part of the United States of America, showing geographical distribution of *Sorex l. longirostris* (circles), *S. l. fisheri* (squares), *S. l. eionis* (triangle). Scale represents 500 km.

Province where it is found only at lower elevations (C. Jones and J. Pagels, pers. comm.). In North Carolina, *S. longirostris* has been found up to 760 m in elevation (Gentry et al., 1968). Previous records from McHenry County, Illinois (Wood, 1910) and Giles County, Virginia (Odum, 1944) have proven to be *S. cinereus*. Limits to the range of *S. longirostris* are still poorly known.

FOSSIL RECORD. Parmalee (1967) tentatively identified 51 elements from a minimum of 27 individuals from a fissure-fill deposit in Monroe County, Illinois, as *S. longirostris*. The age of this deposit ranged from 10,000 to 1000 B.C. and is located within the present range of *S. longirostris*. No true fossil records are known.

ONTOGENY AND REPRODUCTION. Pregnant *S. longirostris* have been found from 31 March to 6 October with numbers of embryos ranging from 1 to 6 and averaging 3.9 (French, in press). Pregnant specimens have been reported by Dusi (1959), Sealander (1960) and French (1980, in press). Lactating or recently lactating specimens have also been reported (Lindsay, 1960; Stout, 1967; French, 1980, in press). Although no specific specimens are listed, Bailey (1946) reported that *S. l. fisheri* have 6 to 10 young per litter, with 2 or more litters being born between the first part of June and the last of August. Leaf-lined nests containing young were found under or within decaying logs (Jackson, 1928; Engels, 1941; Negus and Dundee, 1965; French, 1976, in press). Negus and Dundee (1965) described two nests with young in detail. Lowery (1974) reported on a nest in Louisiana which contained several apparently grown *S. longirostris* on 23 November.

Nearly grown nestlings measured 71 and 72 mm in total length, and 24 and 27 mm in length of tail (Engels, 1941; French, in press). Trapped specimens that were apparently already weaned measured as little as 72 mm in total length, and 26 and 27 mm in length of tail (Mumford and Rippy, 1962; Lowery, 1974). One lactating *S. longirostis* in Indiana was trapped with three young that had apparently left the nest but were still dependent on the mother. These young measured 76, 78 and 78 mm in total length and 27, 28 and 29 mm in length of tail. Some females in Alabama and Indiana were found to breed during their first year of life (French, 1980, in press).

ECOLOGY. *Sorex longirostis* was initially thought to inhabit wet land, such as swamps, bogs, and marshes (Bachman, 1837). In North Carolina, Brimley (1919) felt that upland grassy fields were the preferred habitat. The greatest numbers of specimens have, however, come from moist to wet areas, usually bordering swamps, marshes, or rivers (Lewis, 1943; Engels, 1941; Mumford, 1969; Layne, 1978; French, 1980, in press). A substantial number of specimens have also come from old field and planted field habitats (Dusi, 1959; Tuttle, 1964; Mumford, 1969; Rose, 1980). In addition, this shrew has been found in other habitat types such as dry upland hardwoods (Negus and Dundee, 1965; Gentry et al., 1968), hardwood forests near small streams (Cook, 1942; Foreman, 1956; Negus and Dundee, 1965), planted pine plots (Lowery, 1974; French, in press), longleaf pine flatwoods (Florida Game and Fresh Water Fish Commission, 1976), and dry sandy areas (Cook 1942; Goodpaster and Hoffmeister 1952; French, in press). Wolfe and Esher (1979) found this species to be nearly ubiquitous in Mississippi. In all habitats *S. longirostris* has been most often associated with a heavy ground cover of grasses, sedges, rushes, blackberry, Japanese honeysuckle and/or thick mats of decaying leaves.

Because of poor catch with conventional snaptraps, *S. longirostris* has generally been considered rare throughout its range. In favorable habitat, *S. longirostris* may be a fairly common shrew (George, 1977; French, in press). On two Alabama study plots, population densities were estimated at 30 per hectare and 44 per hectare. Relatively few authors, however, have reported capturing ten or more specimens in the same locality (Cook, 1942; Davis, 1957; Tuttle, 1964; Mumford, 1969; Smith et al., 1974; Florida Game and Fresh Water Fish Commission, 1976; Smith, 1976; George, 1977; French, 1980, in press; Rose, 1980; Mock and Kivett, in press). Pitfall trapping seems to be the most successful means of capturing this species (George, 1977; Rose, 1980; French, in press).

Whitaker and Mumford (1972) found the five most important food items from seven specimens to be spiders, Lepidoptera larvae, slugs and snails, vegetation, and centipedes (listed in decreasing order of importance), which together formed 79.3% of the total diet. The five most important food items reported by French (1980) from 102 specimens were spiders, Lepidoptera larvae, Gryllidae, adult Coleoptera, and harvestmen, which formed 72.7% of the total diet.

Few cases of predation on *S. longirostris* are known. The most frequent predators reported are owls, including the barred owl (*Strix varia*) (Howell, 1921) and the barn owl (*Tyto alba*) (Nelson, 1934; Engels, 1941; Dusi, 1957; French and Wharton, 1975). Domestic cats (*Felis catus*) have taken the largest numbers of specimens reported (George, 1977; French, in press). Other reported predators include the hooded merganser (*Lophodytes cucullatus*) (Bachman, 1837), cottonmouth (*Agkistrodon piscivorus*) (S. Chrisman, pers. comm.), domestic dog (*Canis familiaris*) (Bryan, 1979), and opossum (*Didelphis virginiana*) (Bruce, 1937). Dead *S. longirostris* have been found in the woods and mentioned by several authors (Dusi, 1951, 1959; Lindsay, 1960; Klimstra and Roseberry, 1969; Paradiso, 1969; Linzey and Linzey, 1971).

Twenty-five species of mites and one species of tick have been reported from *S. longirostris*. Whitaker and Mumford (1972) examined 12 *S. longirostris* and found the hypopial form of the mite, *Orycteroxenus soricis*. Seven *S. longirostris* from Alabama yielded the mites, *O. soricis*, *Amorphacarus* sp., *Protomyobia* sp., *Haemogamasus liponyssoides* and *Ornithonyssus bursa* (French, in press). In Vigo County, Indiana, French (1980) identified the following mites collected from *S. longirostris*: *O. soricis*, *Protomyobia onoi*, *Amorphacarus hengererorum*, *Cyrtolaelaps* sp., *Androlaelaps fahrenholzi*, *Hypoaspis miles*, *Haemogamasus liponyssoides*, *Proctolaelaps* sp., *Dermacarus hypudaei*, *Xenoryctes nudus*, *X. latiporus*, *Bakerdania* sp., Anoetidae (5 forms), *Pygmephorus brevicaudae*, *P. scalopi*, *P. tamiasi*, *P. whitakeri*, *Ornithonyssus bacoti*, *Parasitus* sp. (near *maschkeae*), and the chigger *Neotrombicula* sp. (near *fitchii*). The tick, *Dermacentor variabilis*, was also found. Although numerous fleas were found on *S. cinereus* during the same study, none could be found on *S. longirostris*. The mite, *Orycteroxenus soricis*, was the most frequent ectoparasite; it was found on 90.2% of the shrews, and constituted 66.1% of the mites found.

Internal parasites have not been adequately studied. Forms that have been noted include: nematodes from the stomach, intestine, and urinary bladder (*Capillaria* sp.), and subcutaneously encysted nematodes (*Porrocaecum* sp.); tapeworms; and the protozoan coccidia, *Eimeria* sp. (French, 1980, in press).

BEHAVIOR. Although several southeastern shrews have been captured alive by hand (Goodpaster and Hoffmeister, 1952; Hoffmeister and Mohr, 1957; Sealander, 1960; Mumford and Rip-

py, 1962; Lowery, 1974; French, in press), only a few have been observed in captivity (Goodpaster and Hoffmeister, 1952; French, in press). In Alabama, a captive shrew burrowed frequently in moist soil and was active both day and night. Droppings were confined to one corner of its terrarium, but no effort was made to store food or to construct an elaborate nest, although cotton and wadded-up grass were used when supplied. Occasionally this shrew was heard to emit a bird-like series of very soft chirps. The echolocation frequency was recorded at 22,000 cycles per second (French, in press).

REMARKS. Both *S. l. fisheri* and *S. l. eionis* appear to have very restricted ranges and almost nothing is known concerning the geographical or systematic relationships between these forms and *S. l. longirostris*. Only a few specimens of *S. l. fisheri* and *S. l. eionis* are available for study.

Nothing is recorded on Form, Function, and Genetics.

From the time of its description in 1837 until 1960 approximately 151 specimens appeared in museums or were reported in the literature. During the subsequent decade this figure increased to about 360 and in the following decade (1970 to 1980) reached at least 1115, although many of these were not preserved.

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