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Variation in the southern short-tailed shrew, Blarina Carolensis

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VARIATION IN THE SOUTHERN SHORT-TAILED SHREW,

BLARINA CAROLINENSIS

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ABSTRACT

The southern short-tailed shrew (*Blarina carolinensis*) inhabits the Mississippi Alluvial Plain, the Gulf Coastal Plain, Florida, and the Atlantic Coastal Plain as far north as Virginia. Since its description by Bachman in 1837, this species has been widely studied and has a long and convoluted taxonomic history. Many of the morphometric studies were performed in different geographic locations and used different methodologies. These differences have made it difficult to make broad statements about the relationships within this species. Recently, a study of cranial measurements of specimens from the three subspecies of *B. carolinensis* found in Florida, identified a small population whose measurements were significantly different from other populations of *Blarina* in the state, which resulted in the recognition of another species, *B. shermani*. Thus, I examined the species as a whole and described how cranial morphology varied geographically. My study examined *B. carolinensis* in North Carolina and Virginia; compared the three subspecies to determine the amount of difference between them; and also tested for the presence of populations that exhibited noticeably different morphology from the bulk of the species. Specimens were borrowed from 28 museums. The following cranial measurements were recorded for each specimen: occipito-premaxillary length, cranial breadth, maxillary breadth, interorbital breadth, height of mandible, breadth of the condyloid process, and length of molariform toothrow. Principle Componensts Analysis, Discriminant Function Analysis, and Multivariate Analysis of Variance showed that *B. c. peninsulae* was often more different than not from *B. c. carolinensis* and *B. c. minima*; and there were mixed results for the type and amount of difference between *B. c. carolinensis* and *B. c. minima*. These results

indicate the existence of two subspecies rather than three. One subspecies, *B. c. peninsulae*, is retained and is located in peninsular Florida. *Blarina carolinensis minima* is synonomized under *B. c. carolinensis* and is located throughout the rest of the species' range.

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PREFACE

My thesis was written in the style suitable for publication in the Journal of Mammalogy.

Key words: *Blarina carolinensis*, cranial morphology, mammalian distributions, shrew, Soricidae.

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INTRODUCTION

The northern short-tailed shrew (*Blarina brevicauda*) originally was named *Sorex brevicaudus* by Say (1823) based on materials from Washington County, Nebraska. He recorded the following information from this shrew: length from the nose to the root of the tail, length of the tail, and length from the upper teeth to the tip of the nose. He described this shrew as blackish plumbeous above and lighter below. The ears and eyes are small and concealed by fur. The teeth are glossy brownish black at the tip. The feet are white and are sparsely furred with the 1st toe being the smallest; the 2nd, 3rd and 4th are sub-equal; the 5th toe was shorter than the 2nd, 3rd, and 4th, but longer than the 1st. The tail was sparsely furred, nearly as long as the hind foot. Other than being slightly thicker in the middle, the tail was almost equal in diameter along its length. Lastly, Say (1823) mentioned that there were 12 incisors in the superior jaw.

The southern short-tailed shrew (*Blarina carolinensis*) originally was named *Sorex carolinensis* by Bachman (1837) based on materials from South Carolina. He described the species' external appearance using techniques that were standard for the time. He recorded the following measurements: length of body, tail, head, palm to the end of the nails, and hind foot. Say (1823) also recorded length of body and length of tail when he was describing *S. brevicaudus*. In regard to these 2 measurements, the shrew described by Bachman (1837) was smaller than the shrew Say (1823) described. Externally, Bachman described the muzzle and lip, the whiskers, the ears, and size of the forefeet and hind feet. He provided a dental formula (intermediary incisors 2/2, lateral incisors 5-5/2-2, grinders 5-5/3-3), a description of the pigmentation on the teeth and its pattern, the extra lobes on the upper and lower incisors, the various sizes of the lateral incisors, and the shape of the molars.

Bachman (1837) knew that *Sorex carolinensis* could be found in the upper and maritime districts of South Carolina. Other than that, nothing was known of this species' distribution. He discussed his find with a colleague, Dr. Pickering, who confirmed that this species had not yet been described and stated that this species "…had been observed as far north as Philadelphia." (Bachman 1837) We now think that Dr. Pickering was referring to *S. brevicaudus*. This illustrates a continuing problem with this genus. Because the external appearance, disregarding size, is so similar, it would be easy to confuse what we now think to be 2 species. *Sorex brevicaudus* was described 14 years prior to Bachman (1837) describing *S. carolinensis*; did Bachman consider his shrew to be sufficiently different from *S. brevicaudus* to be considered a different species? Or, was Bachman unaware of *S. brevicaudus*?

After examining all specimens classified as *Sorex* in the British Museum, Gray (1838) observed that there was a subset of shrews collected in North America, which all possess short tails and strong forefeet. Using a *Sorex talpoides* specimen for his type, Gray designated this group as *Blarina*.

The name *Blarina carolinensis* was 1st used by Baird (1857). He acknowledged Gray's new genus, *Blarina*, and included some additional characters that differentiated *Blarina* from other genera, such as *Sorex*. He noted that, because of their small external ears and their short tails, this grouping "…made a very natural genus…" When Baird discussed *B. carolinensis* specifically, he started with an external description including notes on color, foot size, and tail length. He went on to describe the skull as being short and thick with the 1st premolar as being slightly smaller than the 2nd, the 3rd and 4th are noticeably smaller, and the 5th is wedged between the 4th premolar and the 1st molar. Also, he corrected the tooth formula given by Bachman to: incisors 1-1/1-1, premolars 5-5/2-2, molars 4-4/3-3. Baird (1857) stated that *B. carolinensis* is very similar in color to *B. brevicauda*, but the forefeet of *B. carolinensis* are noticeably smaller, as well as overall size, except that the tail is longer.

Merriam (1895) reviewed the species of *Blarina* and *Notiosorex*. In addition to studying museum specimens, additional specimens were collected from type localities. He examined the holotype or neotype for each of the species in question. In regard to *B. carolinensis*, Merriam (1895) described the pelage color as "…uniform dark sooty plumbeous, more or less tinged with brownish, especially in the summer; indistinctly paler below." When compared to *B. brevicauda*, he described *B. carolinensis* as having a less massive cranium and mandible, and that the ramus of the mandible had a slight trace of an angle, whereas the ramus of the mandible of *B. brevicauda* was described as angular and being bent abruptly upward. The lateral incisors are nearly vertical in *B. carolinensis* and somewhat broader at the base. The incisors of *B. brevicauda* are narrower at the base and slope forward. Merriam (1895) determined that the difference in overall size of *B. brevicauda* and *B. carolinensis* (larger and smaller, respectively) were examples of geographic variation and they should not be considered separate species. Based on this conclusion, Merriam (1895) relegated *B. carolinensis* to a subspecies of *B. brevicauda*. In this same publication Merriam (1895), though he had just stated that *B. carolinensis* should be a subspecies of *B. brevicauda*, inexplicably named a new subspecies of shrew from Dade County, Florida under the name *B. carolinensis peninsulae*. In this publication, Merriam (1895) also provided the first description of the distribution of this subspecies. He stated that *Blarina brevicauda carolinensis* could be found in the Austroriparian area of the United States, from the Chesapeake Bay to Arkansas.

Elliot (1899) trapped two shrews in Murray County, Oklahoma which he described as being "Similar to *Blarina brevicauda carolinensis*, but lighter in color, and differing in the character of the teeth, and with an extremely short tail." He described the color as being iridescent silver grey/light brown, but lighter on the underside. He also noted that the tail is bi-colored with brown dorsally and lighter brown ventrally. The occipital plane is similar to *B. brevicauda*. Though the skull is smaller, the pterygoid fossa is similar in size to *B. brevicauda*. The 1st and 2nd unicuspids are more than twice as big as the 3rd, 4th, and 5th and they project forward. The 5th unicuspid is not visible when the skull is viewed from the side. To Elliot (1899), this shrew seemed to be the western equivalent of *B. b. carolinensis*, but he felt it was sufficiently different to classify it as its own subspecies. He named it *B. b. hulophaga*, and later corrected the name to *B. b. hylophaga*.

As part of a study on the ecology and distributions of mammals in Oklahoma, Blair (1939) noted that the *Blarina* Elliot (1899) observed differed from *B. brevicauda carolinensis* in color only. Cranially they are very similar. This being the case, and because very few specimens were examined to describe the subspecies, Blair (1939) decided that *B. b. hylophaga* should be a junior synonym of *B. b. carolinensis*.

Until 1954, it was thought that the distribution of *Blarina brevicauda carolinensis* in the Midwest went only as far north as southeastern Kansas. Work by Jones and Findley (1954) found that there was a significant step in the size of the *Blarina* in southern Nebraska. Specimens captured in the southeastern and southwestern corners of Nebraska were more similar to *B. b. carolinensis* than *B. b. brevicauda*. Additionally, specimens they examined from across Kansas and northeastern Colorado had measurements more consistent with *B. b. carolinensis*. Using cranial and external measurements, they found that specimens could be assigned to the appropriate subspecies without regard to where they were captured. These results provided physical evidence suggesting *B. b. brevicauda* and *B. b. carolinensis* were more different than previously thought.

In Florida, Hamilton (1955) described and named *Blarina brevicauda shermani* with the type locality in Lee County. That taxon has been referred to as a subspecies of *B. brevicauda* and *B. carolinensis* by various authors. Not much is known of this subspecies. Samples come from only Lee and Collier counties of southwestern Florida. Hamilton (1955) described *B. b. shermani* as being more similar to *B. brevicauda* than *B. carolinensis* because of its larger body size and cranial measurements. It can be differentiated from *B. c. peninsulae* not only by its large size, but also by its darker pelage.

Genoways and Choate (1972) sought to add to the research done by Jones and Findley (1954) by determining whether intergradation or hybridization was occurring at the *Blarina* contact zone in Nebraska. They used external and cranial measurements to elucidate the systematic relationships between *B. b. carolinensis* and *B. b. brevicauda* in Nebraska.

Genoways and Choate (1972) found that only 1, possibly 2, specimens they examined were of intermediate size and might be a hybrid or an intergrade. Otherwise the sample split into 2 distinct groups. They determined that the *Blarina* in southern Nebraska "…behave as good biological species…" (Fig. 1) Given the results of their study, they elevated *B. b. carolinensis* to *B. carolinensis*.

After examining the karyology of North American shrews, Genoways et al. (1977) found support for the conclusions made by Genoways and Choate (1972). Genoways et al. (1977) reported that the karyotypes of *Blarina* from Kansas and southern Nebraska are the same. However, karyotypes of *Blarina* from Otoe County Nebraska and Cass and Sarpy counties (the latter counties being only 15 miles north of the former) showed different karyotypes (2n = 52, fn = 62; 2n = 49 or 50, fn = 48 respectively).

A morphometric comparison of the *Blarina* in the southern midwest made by George et al. (1981) revealed 2 groups, with no mensural overlap, occurred west of the Mississippi River. They determined that these shrews are sufficiently different to warrant specific status. *Blarina carolinensis* is in the south and they reinstated the name *B. hylophaga* for the population in the north. The following year, George et al. (1982) collected karyotypic data for *Blarina* from several locations across the range of the genus.

These karyotypes supported their findings from their previous study, that *B. carolinensis* and *B. hylophaga* were distinctly different.

In regard to the genus *Blarina*, Benedict et al. (2006) remarked that, the "…geographic ranges now are relatively well understood, the details of these relationships require additional study in several regions." They chose to examine the *Blarina* from Florida and its adjacent areas because there were differing opinions on how many species of *Blarina*, or subspecies of *B. carolinensis* were present in that area. Cranial measurements for *B. c. carolinensis*, *B. c. peninsulae*, and *B. c. shermani* were recorded and examined. They found that there was a significant difference between the measurements of *B. c. shermani* and *B. c. peninsulae* (*B. c. shermani* averaged 7.8% larger than *B. c. peninsulae*) and also between *B. c. shermani* and *B. c. carolinensis* (*B. c. shermani* averaged 9.5% larger than *B. c. carolinensis*). No significant difference was found between *B. c. peninsulae* and *B. c. carolinensis* (*B. c. peninsulae* averaged 1.7% larger than *B. c. carolinensis*). Given the results of the study by Benedict et al. (2006), *Blarina carolinensis shermani* was elevated to species status as *B. shermani*.

Several glacial and interglacial events during the Pleistocene probably played an integral part in the differentiation and distribution of *Blarina* (Brant and Ortí 2001; Jones et al. 1984). The Wisconsin glacial event in particular seems to have had a large effect on shaping the current distribution. Handley's (1971) publication on the post-glacial movements of fauna from the southern Appalachians illustrates the distribution of *B. carolinensis* and *B. brevicauda* , as it was know at the time, and the proposed movements of these species after the Wisconsin glaciation (Fig. 2). He suggested that after deglaciation *B. brevicauda* moved northward because of their preference for boreal habitats and ultimately were limited by excessive soil moisture in the north, soil aridity in the west, and warm temperatures in the south.

According to Handley (1971), *Blarina carolinensis* followed *B. brevicauda*'s northward shift and their distributions have remained contiguous but allopatric. He suggested that *B. carolinensis* had advanced as far as the Potomac River, and then retreated to southern North Carolina. In this process, fragmentation occurred and some isolated populations were left in northeastern North Carolina and southeastern Virginia, but remained allopatric.

Fossil evidence presented by Graham and Semken (1976) show 2 to 3 distinct phena of *Blarina* were living in some of the same areas across the eastern half of the United States at the same time during the Pleistocene without any evidence of interbreeding. They suggested that the reason for this coexistence is because the climate was more uniform during the Pleistocene, and the post-glacial changes in climate are the reason for the distributions of *Blarina* we observe today.

Jones et al. (1984) examined Pleistocene and Holocene *Blarina* to assess the phylogeny and paleobiogeography of the genus. This study supported the findings of Graham and Semken (1976), in that Jones et al. (1984) agreed that post-glacial climate change is most likely the catalyst for species within this genus becoming allopatric. Additionally, they suggested that *B. brevicauda* or an ancestral species arose in the middle to late Pliocene. They thought that this species split during the Irvingtonian

(1.8-0.3 million years ago) into *B. brevicauda* and *B. carolinensis*. *Blarina carolinensis* later divided into an eastern and western population during the late Pleistocene, after the Wisconsinan glaciation, resulting in *B. hylophaga* in the west.

Brant and Ortí (2001) used mitochondrial DNA sequences of 16s rRNA and cytochrome *b* to infer the phylogenetic relationships among *Blarina carolinensis*, *B. brevicauda*, and *B. hylophaga*. Using a molecular clock, they found that speciation in *Blarina* began earlier than previous studies on fossils suggested, prior to the Pleistocene glaciations. The data show *B. hylophaga* as a sister group of *B. carolinensis*/*B. brevicauda*. Brant and Ortí (2001) found strong support for the *B. carolinensis*/*B. brevicauda* group (86%). Morphometric studies had found that *B. carolinensis* to be more similar to *B. hylophaga* than either were to *B. brevicauda* (George et al. 1981; Jones et al. 1984). However, the study by Brant and Ortí (2001) showed that divergence had occurred between these 2 groups (*B. hylophaga* and *B. carolinensis*/*B. brevicauda*) 4.6 million years ago (mya), and between *B. carolinensis* and *B. brevicauda* 3.7 mya.

Currently, 4 species are recognized in the genus *Blarina* (Fig. 3). They occur through the eastern and central United States and southern Canada. The northern short-tailed shrew (*Blarina brevicauda*) occupies the northern half of this region and is the most extensively studied of the 4 species. At the other extreme, Sherman's short-tailed shrew (*Blarina shermani*) is confined to a small portion of the southwestern coast of Florida and is poorly known. Elliot's short-tailed shrew (*Blarina hylophaga*) inhabits the westcentral part of the range of the genus in parts of Nebraska, Kansas, Oklahoma, Texas, Missouri, and Arkansas. Finally, the southern short-tailed shrew (*Blarina* *carolinensis*) dwells on the Mississippi Alluvial Plain, the Gulf Coastal Plain, throughout Florida, and on the Atlantic Coastal Plain as far north as Virginia.

Within *Blarina carolinensis*, there are 3 recognized subspecies: *B. c. carolinensis*, *B. c. minima*, and *B. c. peninsulae* (Fig. 4). *Blarina carolinensis carolinensis* is the northern most of the 3 subspecies. The type locality for this subspecies is in Charleston County, South Carolina. *Blarina carolinensis carolinensis* can be found from southern Illinois, south across Arkansas to northeastern Texas, skipping much of the Mississippi Alluvial Plain but continues eastward across the western 1/2 of Mississippi, Alabama, the northern 3rd of Florida, southern Georgia, most of eastern South Carolina, the southeastern 3/4 of North Carolina, and a small amount of southeastern Virginia. Aside from Bachman's (1837) original description of the species, there are no additional physical descriptions for this subspecies.

As noted earlier, Merriam (1895) described and named *Blarina carolinensis peninsulae*, with type locality in Dade County, Florida. This subspecies inhabits much of the body of peninsular Florida (Fig. 4). He described it as having a skull that is somewhat larger and heavier than others within the species. Among other features that set this subspecies apart, the molariform teeth are described as being "decidedly larger, heavier, and less emarginate posteriorly." Merriam (1895) also noted that the pelage lacks the sepia-brown tint of the neighboring *B. c. carolinensis*.

Lowery (1943) described and named *Blarina brevicauda minima* with type locality in East Baton Rouge Parish, Louisiana. Most subsequent authors (summarized by Genoways and Choate 1998) referred to that taxon as *Blarina carolinensis minima.*

This subspecies occupies the southeastern portion of Texas, much of Louisiana, the western half of Mississippi, small portions of westernmost Tennessee and Kentucky, and a small portion of southeastern most Missouri (Fig. 4). Of their physical appearance, Lowery (1974) stated, "Specimens in Louisiana, southeastern Texas, and western Mississippi are smaller than those found elsewhere in the southeastern United States, and they are decidedly smaller than representatives of any northern population." More specifically, Schmidly and Brown (1979) documented that there was a significant step in the cranial measurements of the *B. carolinensis* between Nacogdoches and Newton counties in Texas. They used univariate and multivariate techniques to show that specimens from Newton County and south represented the smaller *B. c. minima* and the specimens from Nacogdoches County and north represented the larger *B. c. carolinensis*.

Data from Benedict et al. (2006) suggest that possibly there are populations elsewhere within the distribution of *Blarina carolinensis* that are sufficiently distinct from existing populations to warrant subspecific designation. Although previous studies of this species and its subspecies have been very valuable and informative, each investigator used slightly different tests from one another and/or used different cranial measurements in their studies. The objective of my study was to conduct a comprehensive review of *B. carolinensis* by comparing the subspecies to one another and also by examining specific areas of interest by using the same cranial measurements across analyses and the same statistical analyses across comparisons to assess the validity of the subspecies and test for the presence of populations which exhibit noticeably different morphology from the bulk of the species.

METHODS

Specimens were borrowed from the following collections: American Museum of Natural History (AMNH); Arkansas State University (ASU); Carnegie Museum of Natural History (CM); Bob and Betsey Campbell Museum of Natural History, Clemson University (CUSC); Dallas Museum of Natural History (DMNH); The Field Museum (FMNH); University of Kansas, Museum of Natural History (KU); Museum of Natural Science, Louisiana State University (LSUMZ); Museum of Comparative Zoology, Harvard University (MCZ); Sternberg Museum of Natural History, Fort Hays State University (MHP); Mississippi Museum of Natural Science (MMNS); Museum of Vertebrate Zoology, University of California (MVZ); University of Oklahoma, Sam Noble Oklahoma Museum of Natural History (OMNH); Royal Ontario Museum (ROM); Santa Barbara Museum of Natural History (SBMNH); Vertebrate Natural History Collection, Sam Houston State University (SHSU); Southern Illinois University (SIUCM); Texas Cooperative Wildlife Collection, Texas A&M University (TCWC); Museum of Texas Tech University (TTU); University of Arkansas, Museum Zoological Collections (UAMZC); University of Central Florida (UCF); University of Florida, Florida Museum of Natural History (UF); University of Georgia, Museum of Natural History (UGAMNH); Utah Museum of Natural History, University of Utah (UMNH); University of North Carolina at Wilmington (UNCW); United States National Museum of Natural History (USNM); Thomas Burke Memorial Washington State Museum, University of Washington (UWBM); and Virginia Museum of Natural History (VMNH). A total of 1,573 museum specimens were examined from Alabama, Arkansas, Florida, Georgia, Illinois, Kentucky, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia (Appendices I and II).

The following measurements (Choate 1972) were collected by using digital calipers: occipito-premaxillary length (OPLEN), cranial breadth (CRNBR), maxillary breadth (MAXBR), interorbital breadth (INOBR), and height of mandible (HEMAN). The measurements recorded with the digital calipers were relayed directly to the computer by a cable connection. These measurements were recorded to the nearest 0.01mm. Measurements for breadth of the condyloid process (COPBR) and length of molariform toothrow (P4-M3) were taken using an ocular micrometer in a binocular microscope (Fig. 5). These measurements were also recorded to the nearest 0.01mm, but were later multiplied by a 0.96 correction to correct for a bias in the micrometer (R. J. Packauskas, pers. comm.). Only specimens with a complete set of measurements were used in statistical analyses (Appendix III shows the measurements of specimens which were used in analyses, Appendix IV shows the measurements of specimens which were not used in analyses). Of the 1,573 specimens examined, 1,184 had a complete set of measurements and were used in analyses. When available, total length, tail length, hind foot length, ear length, and mass were recorded from skin tags but were not used in statistical analyses. Noticeable color differences were also noted, but not analyzed. All age and sex groups were pooled because little variation has been found that can be attributed to age or sex in the trappable population of this genus (Benedict 1999; Choate 1972; Moncrief et al. 1982; Schmidly and Brown 1979).

Specimen locations were mapped by using Geographic Information Systems (GIS) ArcGIS 9.2 (Environmental Research Institute, Redlands, California) and split into 28 groups (Fig. 6). Type localities and major rivers were considered when making these groups. I also attempted to keep the number of specimens within each group as uniform as possible. However, a few groups were much larger or much smaller than others. Some statistical comparisons were made by using these groups, other comparisons were made by using nominal subspecies.

Early on in the analysis stage of this project it was determined, by visual inspection, that CUSC 2210 (from group U) and MVZ 81255 (from group W) were outliers. They were excluded from all analyses.

I used Microsoft Excel 2003 (Microsoft Corporation, Redmond, Washington) to calculate descriptive statistics for each type of cranial measurement for each of the 28 groups and for each of the three subspecies (Appendix V). I used Statistical Package for the Social Sciences (version 12.1; SPSS Inc., Chicago, Illinois), to perform all statistical comparisons.

Using Principal Components Analysis (PCA) with a Varimax rotation, Discriminant Function Analysis (DFA), and Multivariate Analysis of Variance (MANOVA), I compared *Blarina carolinensis carolinensis* and *B. c. minima*. The PCA was used to reduce the dimensionality of the data to make the variability present within the data the more apparent. The DFA was used to maximize the variation between these two subspecies and minimize the amount of variation within the subspecies. This showed me whether or not it would be possible to identify individuals not included in the original analysis to one of the two subspecies based on their measurements alone. The intent of the MANOVA was to support the findings of the DFA to confirm which measurements differed between the subspecies. To compare *B. c. carolinensis*, *B. c. minima*, and *B. c. peninsulae* I used the same tests used previously for the *B. c. carolinensis* and *B. c. minima* comparison.

Schmidly and Brown (1979) documented that there was a significant "step" between the cranial measurements of *Blarina carolinensis carolinensis* and *B. c. minima* in Texas. This observation was based on 44 museum specimens and used external measurements and cranial measurements for their analyses. I took a closer look at this area by gathering more specimens and using additional tests. I used 103 specimens for PCA, DFA, and MANOVA to compare the subspecies of *Blarina* from Texas. According to McCay (2001) both *B. c. carolinensis* and *B. c. minima* also occur in Louisiana, Mississippi, Arkansas, Tennessee, Missouri, and Kentucky (Fig. 4). Because I had acceptable sample sizes for both subspecies in Mississippi and Arkansas, I used the same tests for these states as well. I wanted to determine whether I had support or opposition for the findings from the previous analysis of *B. c. carolinensis* and *B. c. minima* which did not incorporate locality into the calculations.

Handley (1971) noted that isolated populations of *Blarina brevicauda* remained in northeastern North Carolina and southeastern Virginia that are surrounded by *B. carolinensis*. Though we now show the distribution to be continuous through this area, I was interested in examining the *B. carolinensis* from this area to see how they compared to other nearby populations of *B. carolinensis*. I compared 4 groups of *B. carolinensis* from Virginia and North Carolina (groups V, W, X, and Y; Fig. 6) by using MANOVA, PCA, and DFA.

To conclude my review of *Blarina carolinensis*, I also compared the groups from Florida and adjacent areas (groups P, Q, R, S, and T; Fig. 6). These groups were analyzed by using MANOVA, PCA, and DFA. Later I excluded group T from the DFA because it had a small sample size (n = 5) and re-ran the tests.

RESULTS

Blarnia carolinensis carolinensis and Blarina carolinensis minima.—The sample sizes of *Blarina carolinensis carolinensis* and *B. c. minima* were very uneven (*B. c. carolinensis* n = 794, *B. c. minima* n = 354). Because the sample sizes were so unequal, the covariances between the samples were unequal. To compensate for this, I randomly selected 354 specimens from *B. c. carolinensis* and used a MANOVA to determine whether these selected individuals were a good representative of the whole sample of the subspecies. The Wilks' λ value indicated that there was not a significant difference between the randomly selected *B. c. carolinensis* and the remainder of the sample ($F = 1.381$; df = 7, 786; $p = 0.210$). Therefore I continued my analyses using the reduced sample size of *B. c. carolinensis*.

The PCA of *Blarina carolinensis carolinensis* and *B. c. minima* extracted 1 component which had an eigenvalue of 3.915. This component was most strongly influenced by OPLEN and MAXBR measurements (Table 1). The results of this comparison are summarized in Figures 7 and 8. Figure 7 shows the principle component loadings along the Y-axis and latitude along the X-axis. Figure 8 shows longitude along the X-axis instead of latitude. There did not appear to be any separation between subspecies in either of these graphs when considering the Y-axis.

The DFA of *Blarina carolinensis carolinensis* and *B. c. minima* extracted 1 axis which had a weak eigenvalue (eigenvalue = 0.07). However, the axis that was extracted did a significantly better job explaining the variation in the data than expected by chance (Wilks' $\lambda = 0.935$; df = 7; $p < 0.001$). Based on the standardized coefficients, the most discriminating cranial measurement for separating these two subspecies were MAXBR (-0.780) and HEMAN (0.768) (Table 2). The discriminant scores were plotted against latitude and again against longitude to visualize the results (Figs. 9 and 10). Neither of these graphs revealed any apparent patterns. There was no apparent separation between groups when considering the Y-axis.

The MANOVA showed that there was a significant difference between *Blarina carolinensis carolinensis* and *B. c. minima* ($F = 6.953$; df = 7, 700; $p < 0.001$). Between these 2 subspecies, ANOVAs showed that there was a significant difference between the OPLEN ($F = 18.790$; df = 1; $p < 0.001$), P4-M3 ($F = 4.221$; df = 1; $p = 0.04$), CRNBR ($F = 17.142$; df = 1; $p<0.001$), HEMAN ($F = 29.367$; df = 1; $p < 0.001$), and COPBR ($F = 12.419$; df = 1; $p < 0.001$).

Blarina carolinensis carolinensis, Blarina carolinensis minima, and Blarina carolinensis peninsulae.—Similar to the comparison of *Blarina carolinensis carolinensis* and *B. c. minima*, the sample size of *B. c. peninsulae* was much smaller than both *B. c. carolinensis* and *B. c. minima* (*B. c. peninsulae* n = 34). I randomly selected 34 individuals from *B. c. minima* and used a MANOVA to determine that there was no significant difference between the randomly selected individuals and the rest of the samples of that subspecies (Wilks' λ: $F = 0.855$; df = 7, 346; $p = 0.542$). To eliminate problems with unequal covariances, I also randomly selected 34 individuals from *B. c. carolinensis*. This new sample was selected randomly from the random sample taken for the *B. c. carolinensis* and *B. c. minima* comparison.

The PCA of *Blarina carolinensis carolinensis*, *B. c. minima*, and *B. c. peninsulae* extracted 2 components. Component 1 had an eigenvalue of 3.606 and was most strongly influenced by INOBR (0.854) and MAXBR (0.814). Component 2 had an eigenvalue of 1.048 and was most strongly influenced by COPBR (0.838) and OPLEN (0.734) (Table 3). A bivariate plot of the 1st and 2nd principal components (Fig. 11) showed overlap of all 3 subspecies. Additionally, the graphs depicting the scores from principal component 1 plotted against latitude (Fig. 12) and longitude (Fig. 13) did not show any patterns when considering the Y-axis

The DFA of *Blarina carolinensis carolinensis*, *B. c. minima*, and *B. c. peninsulae* had a strong eigenvalue for the 1st function (eigenvalue for function 1 = 2.011) and the 2nd function was not informative (eigenvalue for function 2 = 0.107). The Wilks' λ showed that function 1 explained the variation within the data better than expected by chance (Wilks' $\lambda = 0.3$; df = 14; $p < 0.001$), and function 2 did not (Wilks' $\lambda = 0.903$; df = 6; $p = 0.136$). The standardized coefficients showed that the most discriminating cranial measurements for separating these 3 subspecies in the 1st function were OPLEN (1.75) and P4-M3 (-1.085) (Table 4). A visual assessment of the biplot of the discriminant scores for each function (Fig. 14) show a mixing of *B. c. carolinensis* and *B. c. minima* along left half of the X-axis (depicting the scores from function 1), and *B. c. peninsulae* is the dominant subspecies on the right half of the X-axis. This pattern was repeated, with respect to the Y-axis, when the scores from function 1 were graphed against latitude (Fig. 15) and longitude (Fig. 16). These results suggest that measurements for OPLEN and P4-M3 could be used to differentiate *B. c. peninsulae* from *B. c. carolinensis* and *B. c. minima*.

The MANOVA indicated that there was a significant difference in the comparison of *Blarina carolinensis carolinensis*, *B. c. minima*, and *B. c. peninsulae* ($F = 10.969$; df = 14, 186; $p < 0.001$). Between the subspecies, ANOVAs indicated a significant difference in OPLEN ($F = 28.321$; df = 2; $p < 0.001$), CRNBR ($F = 6.007$; df = 2; $p = 0.003$), HEMAN ($F = 5.430$; df = 2; $p = 0.006$), and COPBR ($F = 5.607$; df = 2; $p = 0.005$). I used a Tamhane's post-hoc test to determine how the subspecies differed from one another in regard to the aforementioned cranial measurements. The OPLEN measurement of *B. c. peninsulae* was significantly different from both *B. c. carolinensis* (mean difference = 0.7844; $p < 0.001$) and *B. c. minima* (mean difference = 0.9062; $p < 0.001$), but not between *B. c. carolinensis* and *B. c. minima* (mean difference = 0.1218; $p = 0.754$). The CRNBR measurement for *B. c. minima* was significantly different from both *B. c. carolinensis* (mean difference = -0.1818; $p = 0.007$) and *B. c. peninsulae* (mean difference = -0.1900; $p = 0.004$), but not between *B. c. carolinensis* and *B. c. peninsulae* (mean difference = -0.0082; $p = 0.999$). The HEMAN measurement of *B. c. carolinensis* was not significantly different from either *B. c. minima* (mean difference = 0.0721; $p = 0.483$) or *B. c. peninsulae* (mean difference = -0.1244; $p = 0.213$), but *B. c. minima* was significantly different from *B. c. peninsulae* (mean difference = -0.1965; $p = 0.003$). The COPBR measurement showed that *B. c. peninsulae* was significantly different from both *B. c. carolinensis* (mean difference = 0.05082; $p = 0.04$) and *B. c. minima* (mean difference = 0.05619; $p = 0.007$), but *B. c. carolinensis* and *B. c. minima* were not significantly different from one another (mean difference = 0.00536; p = 0.987).

Blarina carolinensis carolinensis and Blarina carolinensis minima of Texas.—The PCA comparison of the *Blarina carolinensis* subspecies from Texas extracted only 1 component (eigenvalue = 4.240). Loaded most heavily on this axis were OPLEN 0.921), MAXBR (0.861), and CRNBR (0.821) (Table 5). The results of this comparison are summarized in the biplots that show component 1 along the Y-axis and latitude along the X-axis (Fig. 17) and another graph that shows longitude along the X-axis (Fig. 18). These graphs show no separation, with respect to the Y-axis, between the PCA values given for *B. c. carolinensis* and *B. c. minima* in Texas.

The DFA of the *Blarina carolinensis* in Texas extracted 1 axis which had an eigenvalue of 0.284. The axis extracted did a better job explaining the variation than expected by chance (Wilks' $\lambda = 0.779$; df = 7; p = 0.001). The standardized coefficients show the most discriminating cranial measurements for separating these subspecies in Texas are COPBR (0.869) and OPLEN (-0.720) (Table 6). The discriminant scores from this test were plotted against latitude (Fig. 19) and again against longitude (Fig. 20) to better visualize the results. When viewed against latitude, the scores produced by the DFA for *B. c. carolinensis* tended to be higher than the scores of *B. c. minima*.

The MANOVA showed that there was a significant difference between *Blarina carolinensis* subspecies in Texas (F = 3.861; df = 7, 95; p = 0.001). Between these two subspecies there was a significant difference between the COPBR measurements (F = 23.285; df = 1; $p < 0.001$) HEMAN measurements (F = 8.649; df = 1; p = 0.004), CRNBR (F = 4.203; df = 1; p = 0.043) and MAXBR measurements (F = 5.358; df = 1; p = 0.023).

Blarina carolinensis carolinensis and Blarina carolinensis minima of Arkansas.—The PCA comparison of the *Blarina carolinensis* subspecies in Arkansas extracted two components. Component 1 had an eigenvalue of 3.518 and component 2 had an eigenvalue of 1.023. Loaded most heavily on axis 1 were OPLEN (0.861), MAXBR (0.792), and HEMAN (0.780) (Table 7). Most heavily loaded on the 2nd axis was COPBR (0.911). The results of this comparison are summarized in Figure 21 which shows the loadings from the 1st component plotted against the loadings from the 2nd component. Also graphed were the loadings from the 1st component against latitude (Fig. 22) and longitude (Fig. 23). When considering the Y-axis, these graphs do not show any separation between the loadings given for *B. c. carolinensis* and *B. c. minima*.

The DFA for the *Blarina carolinensis* from Arkansas extracted 1 axis that had an eigenvalue of 0.039. The axis extracted did not explain the variation better than expected by chance (Wilks' $\lambda = 0.962$; df = 7; p = 0.539).

The MANOVA showed that there was not a significant difference between *Blarina carolinensis carolinensis* and *B. c. minima* in Arkansas (F = 0.861; df = 7, 153; p = 0.539). This being the case, no additional tests were performed.

Blarina carolinensis carolinensis and Blarina carolinensis minima of Mississippi.—The PCA comparison of the *Blarina carolinensis* subspecies from Mississippi extracted 2 components. Component 1 had an eigenvalue of 3.459, and component 2 had an eigenvalue of 1.040. Loaded most heavily on component 1 were

P4-M3 (0.844), INOBR (0.725), and OPLEN (0.715) (Table 8). Loaded most heavily on the 2nd component was COPBR (0.813). When the scores from component 1 and 2 were graphed against each other (Fig. 24) there was no apparent separation between the subspecies. Similarly, when the scores were graphed against latitude (Fig. 25) and longitude (Fig. 26), no patterns were apparent when considering the Y-axis.

The DFA of the *Blarina carolinensis* subspecies in Mississippi extracted 1 axis that had an eigenvalue of 0.195. The axis extracted was marginally significant (Wilks' $\lambda = 0.837$; df = 7; $p = 0.074$). The standardized coefficients show that the most discriminating cranial measurement for potentially separating subspecies in Mississippi was P4-M3 (-1.124) (Table 9). The discriminant scores from this test were plotted against latitude and again against longitude to better visualize the results (Figs. 27 and 28). No patterns were apparent on either of these graphs when considering the Y-axis.

The MANOVA showed that there was no significant difference between *Blarina carolinensis carolinensis* and *B. c. minima* in Mississippi ($F = 1.952$; df = 7, 70; $p = 0.074$). This being the case, no additional tests were performed.

Examination of Blarina carolinensis carolinensis in Virginia and North Carolina.—For these analyses, I chose to include groups V (from southeastern North Carolina), W (from northeastern North Carolina and southeastern Virginia), X (located just west of group W), and Y (located just west and slightly south of group X) (Fig. 6). The PCA comparison of group V and group W extracted 1 component (eigenvalue = 3.942). Measurements that loaded most heavily on this axis were MAXBR (0.880), OPLEN (0.825), and CRNBR (0.819) (Table 10). The results of this comparison were graphed against latitude (Fig. 29) and again against longitude (Fig. 30) to visualize the data. There was no apparent separation in either of these biplots when considering the Y-axis.

The PCA comparison of group W and group X extracted 1 component (eigenvalue = 3.462). The most heavily weighted measurements on this axis were MAXBR (0.839), OPLEN (0.835), and CRNBR (0.784) (Table 11). The results of this comparison were graphed against latitude (Fig. 31) and again against longitude (Fig. 32) to visualize the data. There was no apparent separation in either of these graphs when considering the Y-axis.

The PCA comparison of group W and group Y extracted 1 component (eigenvalue = 3.853). The measurements that weighed most heavily on this axis were OPLEN (0.848), CRNBR (0.835), and MAXBR (0.826) (Table 12). The results of this comparison were graphed against latitude (Fig. 33) and again against longitude (Fig. 34) to visualize the data. There was no apparent separation in either of these graphs when considering the Y-axis.

The DFA extracted 3 axes (eigenvalue for function 1 = 0.746; function 2 = 0.159; function 3 = 0.064). Function 1 explained the variation between the groups better than expected by chance (Wilks' $\lambda = 0.465$; df = 21; $p < 0.001$). Functions 2 and 3 were not significant (function 2: Wilks' $\lambda = 0.811$; df = 12; $p = 0.1$; function 3: Wilks' $\lambda = 0.94$; df = 5; $p = 0.363$). The standardized coefficients showed that the 1st function was defined predominantly by MAXBR (Table 13). Discriminant scores from the 1st and 2nd functions were plotted against each other (X-axis and Y-axis, respectively) to be assessed visually (Fig. 35). The graph showed that there is separation along the X-axis (which depicts the discriminant scores for function 1). Though there was some mixing, the 2 groups that were western, inland groups, X and Y (Fig. 6), separate from the eastern and coastal groups, W and V. These results indicated that groups X and Y were generally larger than groups V and W in regard to the MAXBR measurement. Axis-Y, which depicts the discriminant scores for function 2, did not show any separation between the groups. When the scores from function 1 were graphed against latitude, groups V and W had discriminant scores more similar to each other than to groups X and Y (Fig. 36). Groups X and Y also had discriminant scores similar to one another. When the scores from function 1 were graphed against longitude, there was a gradually decreasing shift in the discriminant scores from west to east (Fig. 37), indicating a possible clinal relationship.

The MANOVA showed that there was a significant difference between the groups I selected to examine from North Carolina and Virginia (Wilks' λ: $F = 3.565$; $df = 21, 244$; $p < 0.001$). The cranial measurements where significant differences were noted were P4-M3 ($F = 3.897$; $df = 3$; $p = 0.011$) and MAXBR ($F = 8.641$; $df = 3$; $p < 0.001$). A Tamhane's post-hoc test was used to determine how the groups differed from one another in regard to P4-M3 and MAXBR. The post-hoc test was unable to detect which groups were different from which in regard to the length of P4-M3. This is probably because of the reduced power of the post-hoc test. The MAXBR comparison showed that group W was significantly different from group X (mean difference = -0.2150; $p < 0.001$) and group Y (mean difference = -0.3396; $p = 0.002$). Group Y was found to be only marginally different from group V (mean difference = 0.2409; p = 0.066). Otherwise there were no additional significant differences found.

Examination of Blarina carolinensis in Florida and surrounding area.—I used a PCA to 1st examine Florida *Blarina carolinensis carolinensis* and *B. c. peninsulae*. Two components were extracted. The eigenvalue of the 1st component was 4.047. The measurements that loaded most heavily on this axis were INOBR (0.879), MAXBR (0.802), and CRNBR (0.795) (Table 14). The eigenvalue of the 2nd component was 1.019. The measurements which loaded most heavily on the 2nd axis were COPBR (0.867), and OPLEN (0.784). When graphed together (Fig. 38), with component 1 along the X-axis and component 2 along the Y-axis, there are no apparent patterns. I also graphed principal component 1 against latitude (Fig. 39) and longitude (Fig. 40). These graphs do not show any separation between the PCA values given for *B. c. carolinensis* and *B. c. peninsulae* when considering the Y-axis.

Principle Component Analysis was then used to make various comparisons between the groups Q, R, S, and T (Fig. 6). Groups Q, R, S, and T are listed from north to south in Florida. Group Q includes a few specimens from southern Georgia.

The PCA comparison of group Q and group R extracted 2 components. Component 1 had an eigenvalue of 4.172. The measurements that loaded most heavily on this axis were MAXBR (0.886), INOBR (0.865), and CRNBR (0.819) (Table 15). Component 2 had an eigenvalue of 1.191. The measurements that loaded most heavily on this axis were COPBR (0.893), and OPLEN (0.886). Principal components 1 and 2 were graphed against each other to better visualize any patterns that might be present within the data (Fig. 41). Also, the scores from the PCA were graphed against latitude (Fig. 42) and again against longitude (Fig. 43). These graphs did not show any separation between group Q and group R in relation to the Y-axis.

The PCA comparison of group S and group T extracted 2 components. Component 1 had an eigenvalue of 3.774. The measurements with the highest loadings on this axis were INOBR (0.919), CRNBR (0.763), and MAXBR (0.712) (Table 16). Component 2 had an eigenvalue of 1.050. The measurements with the highest loadings on this axis were P4-M3 (0.772), OPLEN (0.749), and COPBR (0.706). Principal components 1 and 2 were graphed against each other to better visualize any possible patterns (Fig. 44). Also, the PCA scores were graphed against latitude (Fig. 45) and again against longitude (Fig. 46). These graphs did not show any separation between group S and group T when considering the Y-axis.

The PCA comparison of group R and group T extracted 2 components. Component 1 had an eigenvalue of 3.785. The measurements with the highest loadings for axis 1 were HEMAN (0.931), and CRNBR (0.861) (Table 17). Component 2 had an eigenvalue of 1.107. The measurements that had the highest loadings on axis 2 were COPBR (0.815), and MAXBR (0.754). Principal components 1 and 2 were graphed against each other to better visualize any possible patterns (Fig. 47). Also, the scores produced by the PCA were graphed against latitude (Fig. 48) and again against longitude (Fig. 49). The graphs of the PCA scores show group T grouped on the high end of the PC values (Y-axis). Going back to the data, when I sort the data by scores from component 1, specimens with a larger score generally have larger measurements in regard to the heavily weighed measurement types (HEMAN and CRNBR). This might have been because group T had so few samples. The sample I had might not have been a good representation of animals from that area.

The PCA comparison of group R and group S extracted 1 component (eigenvalue = 4.258). The measurements that loaded most heavily on this axis were OPLEN (0.904), CRNBR (0.853), and MAXBR (0.846) (Table 18). The scores were graphed against latitude (Fig. 50) and again against longitude (Fig. 51) to visualize the data. These graphs did not show any separation between group R and group S when considering the Y-axis.

The PCA comparison of group Q and groups S extracted 2 components. Component 1 had an eigenvalue of 4.298. Measurements that loaded most heavily on this axis were MAXBR (0.883), INOBR (0.866), and CRNBR (0.828) (Table 19). Component 2 had an eigenvalue of 1.007. The heaviest loadings on this axis were COPBR (0.914) and OPLEN (0.759). Principal components 1 and 2 were graphed against each other to better visualize any patterns that might be present within the data (Fig. 52). Also, the scores produced by the PCA were graphed against latitude (Fig. 53) and again against longitude (Fig. 54). These graphs did not show any separation between group Q and group S when considering the Y-axis.

The PCA comparison of group Q and group T extracted 2 components. Component 1 had an eigenvalue of 4.028. The measurements with the highest loadings for axis 1 were INOBR (0.864), CRNBR (0.836), MAXBR (0.729) (Table 20). Component 2 had an eigenvalue of 1.036. The measurements that had the highest loadings on axis 2 were COPBR (0.904) and OPLEN (0.822). Principal components 1 and 2 were graphed against each other to better visualize any patterns that might be present within the data (Fig. 55). Also, the scores produced by the PCA were graphed against latitude (Fig. 56) and again against longitude (Fig.57). These graphs did not show any separation between group Q and group T when considering the Y-axis.

I added group P to groups Q, R, S, and T for the DFA comparisons. Group P is located in southeastern Georgia with a few specimens from southern South Carolina (Fig. 6). Using the data from these groups, the DFA extracted 4 axes (eigenvalue for function 1 = 1.490; function 2 = 0.269; function 3 = 0.065; function 4 = 0.022). Function 1 and 2 explained the variation within the data better than expected by chance (function 1: Wilks' $\lambda = 0.291$; df = 28; $p < 0.001$; function 2: Wilks' $\lambda = 0.724$; df = 18; $p = 0.037$). Functions 3 and 4 were not significant (function 3: Wilks' $\lambda = 0.919$; df = 10; $p = 0.645$; function 4: Wilks' $\lambda = 0.978$; df = 4; $p = 0.731$). The standardized coefficients showed that the 1st function was influenced most strongly by OPLEN (1.507), and the 2nd function by HEMAN (0.740) (Table 21). Discriminant scores from the 1st and 2nd functions were plotted against each other (X-axis and Y-axis, respectively) to be assessed visually (Fig. 58). A visual assessment of the biplot for the discriminant scores from function 1 (axis-X) and function 2 (axis-Y) show some structure along the X-axis. Though the data formed a continuous group, groups P and Q occupied the left side of the graph, where as groups R, S, and T occupied the right with minimal mixing in the middle. The results indicated that, in general, the measurements for OPLEN were larger in groups R, S, and T. When the values from function 1 were graphed against latitude (Fig. 59), there appeared to be a gradual shift in the discriminant scores (Y-axis) from low to high along the peninsula. Group P had the lowest discriminant score and the northern-most latitude, followed by group Q, then group R, S, and finally group T, which had the highest discriminant score and the most southern latitude. There is some overlap of the discriminant scores, but at the same time there appeared to be some order too. The graph of the discriminant scores with longitude (Fig. 60) show groups P and Q as having similar scores (Y-axis) as one another, .and groups R, S, and T having higher scores that are similar to one another.

Because of the small size of group T ($n = 5$), I excluded it and ran the DFA again. The DFA extracted 3 axes (eigenvalue for function 1 = 1.563; function 2 = 0.1; function 3 = 0.028). Function 1 explained the variation within the data better than expected by chance (Wilks' $\lambda = 0.345$; df = 21; $p < 0.001$). Function 2 and 3 were not significant (function 2: Wilks' $\lambda = 0.884$; df = 12; $p = 0.540$; function 3: Wilks' $\lambda = 0.973$; df = 5; $p = 0.787$). The standardized coefficient value for function 1 was most strongly influenced by OPLEN (1.571) (Table 22). Discriminant scores for function 1 and 2 were plotted against each other (X-axis and Y-axis, respectively) to be assessed visually (Fig. 61). The graph of these results was similar to the DFA with group T. The data points formed a continuous group with some mixing, however, groups P and Q were predominantly on the left side of the X-axis, and groups R and S were predominantly on the right side. There was no separation along the Y-axis, which was expected given that function 2 was not significant. Like the previous comparison, which included group T, it appeared that the OPLEN measurements were larger for groups R and S than they are in groups P and Q. The graphs of function 1 against latitude (Fig. 62) also looked similar to the previous test with a gradual shift in discriminant scores from low to high as you move southward along the peninsula. I also graphed the discriminant scores from function 1 against longitude (Fig. 63), which showed groups P and Q having lower scores than groups R, S, and T..

The MANOVA showed that there was a significant difference between the groups I selected from Florida and the surrounding area ($F = 0.291$; $df = 28, 322$; $p < 0.001$). As a note, group T was included in the MANOVA calculation. Significant differences were found in OPLEN ($F = 15.798$; $df = 4$; $p < 0.001$) and HEMAN ($F = 5.404$; $df = 4$, $p = 0.001$). Marginally significant differences were found in INOBR ($F = 2.453$; $df = 4$, $p = 0.051$) and COPBR ($F = 2.256$; $df = 4$; $p = 0.069$). A Tamhane's post-hoc test was used to determine how the groups differed from one another in regard to OPLEN and HEMAN. The OPLEN comparison showed that group P was significantly different from group R (mean difference = -0.6542; $p < 0.001$), group S (mean difference = -0.9274; $p < 0.001$), and group T (mean difference = -1.0726; $p = 0.009$) but not significantly different from group Q (mean difference = -0.2428; $p = 0.883$) which is a neighboring group to the south. Group Q was significantly different from group S (mean difference = -0.6846; $p = 0.023$) and group T (mean difference = -0.8297; $p = 0.027$) but not significantly different from group R (mean difference = -0.4114; $p = 0.38$) which is a neighboring group to the south. Otherwise the post-hoc tests found no additional significant differences.

DISCUSSION

Blarina carolinensis was originally named and described 173 years ago (Bachman 1837) and has since been very well studied. Many of the taxonomic and morphometric studies are restricted to geographic regions across the range and use different methods, which has makes it difficult to make broad general statements about the species, the subspecies, and geographic variation.

Blarina carolinensis carolinensis and Blarina carolinensis minima.—Named by Lowery (1943), *Blarina carolinensis minima* was given its subspecific epithet because it appeared to be the smallest of all of the *Blarina carolinensis* subspecies. Lowery's observations were based on *B. carolinensis* from Louisiana, but other studies/observations of this subspecies have been carried out in Missouri and Arkansas (Easterla 1968), Texas (Schmidly and Brown 1979), Mississippi (Jones and Carter 1989), and more. All of the previously mentioned studies comment on the small physical size of this subspecies.

When I compared specimens of the two subspecies from across the range of *Blarina carolinensis*, I determined that there was a statistical difference between their cranial measurements. However, accurate identification would be difficult.

When discussing *Blarina carolinensis minima*, Genoways and Choate (1998) could not find a reference for a precise distribution for the subspecies. I used the map (Fig. 4) provided by McCay (2001) in the *B. carolinensis* species account to identify to subspecies the specimens I measured. Possibly, some of the specimens I called *B. c. minima* were actually *B. c. carolinensis* specimens.

Blarina carolinensis carolinensis, Blarina carolinensis minima, and Blarina carolinensis peninsulae.—When I compared all three subspecies, *B. c. carolinensis* and *B. c. minima* were shown, more often than not, to be more similar to one another than either subspecies was to *B. c. peninsulae*. The DFA showed that the skulls of *B. c. peninsulae* were significantly longer than the other 2 subspecies. The MANOVA supported the results of the DFA in that there was a significant difference between these subspecies. The post-hoc comparisons also showed that skull length was a measurement of interest, but went a step further by illustrating that the measurements of *B. c. carolinensis* and *B. c. minima* were not significantly different from one another, but they were both significantly different from *B. c. peninsulae*. However, contrary to the idea that any differences between the subspecies would show that *B. c. peninsulae* would be larger than the other 2 subspecies, the post-hoc test showed that the braincase width of *B. c. carolinensis* and *B. c. peninsulae* were not significantly different from one another, but they were both significantly different from *B. c. minima*. The post-hoc test also added breadth of the condyloid process as being a measurement which could potentially be used to differentiate *B. c. peninsulae* from either *B. c. minima* or *B. c. carolinensis*.

Benedict et al. (2006) found that, in regard to *Blarina carolinensis carolinensis* and *B. c. peninsulae*, shrews from the southern part of the Florida peninsula were slightly larger than shrews from the northern part of the peninsula, but it appeared to be a clinal difference with no step along the cline. When I compared all three *Blarina carolinensis* subspecies, I found that there was a small shift in the discriminant scores near 30º latitude (Fig. 15), with *Blarina* south of 30º having higher scores than the *Blarina* in the north.

This might be correlated with the sharp change in annual precipitation at 30º latitude. The shift in discriminant scores was repeated later when I examined groups of *B. carolinensis* from Florida and adjacent area (Figs. 59 and 62).

Blarina carolinensis carolinensis and Blarina carolinensis minima of Texas.— My results support the findings of Schmidly and Brown (1979), in that there is a statistical difference between the subspecies of *Blarina carolinensis* in Texas. There was some disagreement between the tests I used as to which measurement(s) would be most useful for identification purposes, but the data showed that it might be possible to predict *Blarina carolinensis* subspecies in Texas by using the condyloid process breadth measurement; *B. c. minima* was typically smaller (breadth of condyloid process often ≤ 1.3mm) than *B. c. carolinensis* (breadth of condyloid often ≥ 1.3mm).

There was some overlap in the discriminant scores (Fig. 19) of *Blarina* subspecies of Texas. This might be reduced by using equal samples from each subspecies, that were unavailable to me for this project (*B. carolinensis carolinensis*: n = 10; *B. c. minima*: n = 93). I think that a larger and more balanced sample might identify those measurements that would be most useful for reliable identification. Of the 3 states I was able to analyze that had both *B. c. carolinensis* and *B. c. minima*, (Arkansas, Mississippi, and Texas) Texas was the only state that showed a significant difference between the subspecies.

Examination of Blarina carolinensis carolinensis in Virginia and North Carolina.—This area interested me because of Handley's (1971) comments on the post glacial movements of *Blarina brevicauda* and *B. carolinensis*. He suggested that, in

North Carolina and Virginia, the distribution of *Blarina carolinensis* consists of 5 or more isolated populations that are surrounded by *B. brevicauda*. Hall (1981) and McCay (2001) showed *B. carolinensis* as having a continuous distribution into southeastern Virginia and North Carolina (Figs.1 and 4, respectively), Handley's statement about fragmented populations led me to wonder if there were any considerable differences between the *B. carolinensis* of this area.

When I examined the Virginia and North Carolina samples by using the groups I made a priori (Fig. 6), there was a significant difference between the two western inland groups (groups X and Y) and the eastern coastal groups (groups V and W). However, when the DFA scores were visualized against longitude (Fig. 37), the size difference appeared to be clinal.

Examination of Blarina carolinensis in Florida.—Unlike the comparison of all three subspecies of *Blarina carolinensis*, this section examined exclusively Florida and the areas immediately adjacent. The results of the PCA of *Blarina carolinensis carolinensis* and *B. c. peninsulae* did not show any separation (Figs. 38-40). Additionally, the PCAs, which compared each of the groups I constructed a priori (Fig. 6), did not show any strong separation between groups (Figs. 41-57). The DFA, however, showed that the shrews from the peninsular Florida groups R, S, and T (Fig. 6) generally had longer skulls than shrews from northern Florida (group Q), eastern Georgia, and southwestern South Carolina (group P). The graphs of function 1 against latitude (Figs. 59 and 62) show a fairly well-structured cline with skull length decreasing as you move north along the peninsula. Similar to the comparison of all 3 subspecies, there is a little step in the discriminant scores near 30º latitude (Fig. 15), with groups south of 30º receiving higher scores than the groups in the northern part of the sample area. In the graph of discriminant scores and latitude (Fig. 62), there are 2 individuals from group Q that had scores more similar to those from group R, and 3 individuals from group R that had scores more similar to those from group Q. This is probably a result of how I drew the lines separating the groups.

The Tamhane post-hoc test for the MANOVA showed a difference between the *Blarina* from northern Florida and southeastern Georgia and the *Blarina* from southern Florida. I think that my results are showing the line between the 2 subspecies of *Blarina* in Florida occurs within the area of group R (Fig. 6). The northern-most group (group P) was significantly different from the 3 southern-most groups (groups R, S, and T), but not from its neighboring group (group Q). Additionally, group Q was significantly different from the 2 southern-most groups (groups S and T), but not from its neighboring group (group R). If this were a cline, I would expect a similar trend to continue along the peninsula. But the 3 southern-most groups were never found to be significantly different from one another in this analysis, similar to the 2 northern-most groups.

Conclusions.—When considering all of the comparisons which included *Blarina carolinensis carolinensis* and *B. c. minima*, there seems to be little support for the existence of two subspecies. When comparing the two subspecies directly, the MANOVA was the only test that showed statistical support for two subspecies. There were no apparent patterns in the graphs of the results of the PCA and DFA.

The comparisons of *Blarina carolinensis carolinensis* and *B. c. minima* in Texas, Arkansas, and Mississippi (separate comparisons) did not clarify the results of the aforementioned MANOVA. The only state that showed a significant difference between subspecies was Texas. A visual assessment of the PCA and DFA for the Texas (Figs. 17-20) show *B. c. carolinensis* having slightly higher component and discriminant scores than *B. c. minima*, but there is a fair amount of overlap in the scores. These graphs might not be a good representation of the situation because the sample size for the *B. c. carolinensis* Texas is small (n = 10). If I had had a larger sample size for this subspecies, I think that results for Texas would look more like the results from the Arkansas (Figs. 21-23) and Mississippi (Figs. 24-28). A larger sample size would probably make the distribution of the measurements of *B. c. carolinensis* more normal and not emphasize the individuals with unusual measurements.

Sample size and the types of measurements used in analyses might explain why Schmidly and Brown (1979) arrived at the conclusion they did for their study of the *Blarina carolinensis* in Texas. Their sample size was 44 and they included external measurements in their analyses.

When *Blarina carolinensis carolinensis*, *B. c. minima*, and *B. c. peninsulae* were compared to each other, I again found little support for *B. c. carolinensis* and *B. c. minima* being 2 different subspecies. However, the MANOVA detected that the cranial breadth of *B. c. minima* was significantly different from *B. c. carolinensis* and *B. c. peninsulae*. Otherwise *B. c. minima* grouped together with *B. c. carolinensis* in regard to significant measurements, where as *B. c. peninsulae* was found to be significantly different.

The examination of Florida, and areas immediately adjacent, supported the findings from the comparison of all 3 subspecies, that the *Blarina carolinensis* south of 30º latitude were distinctly different, especially in regard to the length of their skulls. Generally, *B. c. peninsulae* had an occipital-premaxillary length that is greater than 19 mm, where *B. c. carolinensis* was less than 19 mm. Two specimens from group Q (Fig. 6) had discriminant scores more like members of group R (Fig. 59). These individuals were from Clinch and Charlton counties, Georgia; in the southeastern/southcentral part of the state that abuts Florida, right next to group R. These data might be an indication that the subspecific boundary should extend into that part of Georgia.

Given the results of my study, I recommend that *Blarina carolinensis carolinensis* and *B. c. minima* be combined into 1 subspecies as *B. c. carolinensis*. The differences I found between these 2 subspecies are not enough to make reliable differentiation very probable.

The differences between *Blarina carolinensis carolinensis* and *B. c. peninsulae* are, I think, acceptable for the subspecies level (Fig. 64). Though the measurements I have suggested for differentiation are not infallible, I think that they will be correct much more often than not. Future genetic studies might or might not confirm my findings.

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Table 1 – Component loadings from the PCA comparison of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima*.

Component scores	
	PC_1
OPLEN	0.865
P4-M3	0.703
CRNBR	0.799
MAXBR	0.826
INOBR	0.706
HEMAN	0.776
COPBR	0.501

Table 2 – Standardized coefficients from the DFA comparison of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima*.

Standardized coefficients	
	fxn 1
OPLEN	0.274
P4-M3	-0.062
CRNBR	0.443
MAXBR	-0.780
INOBR	-0.002
HEMAN	0.768
COPBR	0.260

Table 3 – Rotated component loadings from the PCA comparison of *Blarina carolinensis carolinensis*, *Blarina carolinensis minima*, and *Blarina carolinensis peninsulae*.

Component scores		
	PC_1	PC_2
OPLEN	0.479	0.734
P4-M3	0.656	0.302
CRNBR	0.584	0.541
MAXBR	0.814	0.183
INOBR	0.854	0.041
HEMAN	0.403	0.660
COPBR	-0.068	0.838

Table 4 – Standardized coefficients from the DFA comparison of *Blarina carolinensis carolinensis*, *Blarina carolinensis minima*, and *Blarina carolinensis peninsulae*.

Standardized coefficients		
	fxn 1	**fxn 2**
OPLEN	1.750	-0.241
P4-M3	-1.085	0.116
CRNBR	-0.313	1.287
MAXBR	-0.547	-0.293
INOBR	0.272	-0.097
HEMAN	-0.019	-0.075
COPBR	0.022	-0.087

Table 5 – Component loadings from the PCA comparison of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Texas.

Component scores	
	PC_1
OPLEN	0.921
P4-M3	0.783
CRNBR	0.821
MAXBR	0.861
INOBR	0.749
HEMAN	0.768
COPBR	0.459

Table 6 – Standardized coefficients from the DFA comparison of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Texas.

Standardized coefficients	
	fxn 1
OPLEN	-0.720
P4-M3	0.272
CRNBR	0.059
MAXBR	0.232
INOBR	0.176
HEMAN	0.337
COPBR	0.869

Table 7 – Rotated component loadings from the PCA comparison of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Arkansas.

Component scores		
	PC_1	PC_2
OPLEN	0.861	0.066
P4-M3	0.746	-0.321
CRNBR	0.715	0.347
MAXBR	0.792	0.165
INOBR	0.584	0.194
HEMAN	0.780	0.134
COPBR	0.126	0.911

Table 8 – Rotated component loadings from the PCA comparison of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Mississippi.

Component scores		
	PC_1	PC_2
OPLEN	0.715	0.448
P4-M3	0.844	-0.064
CRNBR	0.424	0.661
MAXBR	0.672	0.387
INOBR	0.725	0.225
HEMAN	0.362	0.693
COPBR	-0.05	0.813

Table 9 – Standardized coefficients from the DFA comparison of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Mississippi.

Standardized coefficients	
	fxn 1
OPLEN	0.642
P4-M3	-1.124
CRNBR	-0.042
MAXBR	-0.035
INOBR	0.515
HEMAN	0.071
COPBR	0.238

Table 10 – Component loadings from the PCA comparison of groups V and W (Fig. 6).

Component scores	
	PC_1
OPLEN	0.825
P4-M3	0.727
CRNBR	0.819
MAXBR	0.880
INOBR	0.699
HEMAN	0.761
COPBR	0.471

Table 11 – Component loadings from the PCA comparison of groups W and X (Fig. 6)

Component scores	
	PC_1
OPLEN	0.835
P4-M3	0.697
CRNBR	0.784
MAXBR	0.839
INOBR	0.603
HEMAN	0.661
COPBR	0.402

Table 12 – Component loadings from the PCA comparison of groups W and Y (Fig. 6).

Component scores	
	PC_1
OPLEN	0.848
P4-M3	0.780
CRNBR	0.835
MAXBR	0.826
INOBR	0.674
HEMAN	0.630
COPBR	0.330

Table 13 – Standardized coefficients from the DFA comparison of groups V, W, X, and Y (Fig. 6).

Standardized coefficients			
	fxn 1	**fxn 2**	**fxn 3**
OPLEN	-0.981	-1.366	-0.200
P4-M3	0.657	0.454	-0.014
CRNBR	-0.485	-0.039	0.362
MAXBR	1.397	-0.299	-0.430
INOBR	0.007	0.635	0.224
HEMAN	-0.100	0.332	1.044
COPBR	-0.185	0.541	-0.751

Table 14 – Rotated component loadings from the PCA comparison of *Blarina carolinensis carolinensis* and *Blarina carolinensis peninsulae* from Florida.

Component scores		
	PC_1	PC_2
OPLEN	0.449	0.784
P4-M3	0.500	0.630
CRNBR	0.795	0.384
MAXBR	0.802	0.248
INOBR	0.879	0.057
HEMAN	0.511	0.575
COPBR	-0.022	0.867

Table 15 – Rotated component loadings from the PCA comparison of groups Q and R (Fig. 6).

Component scores		
	PC_1	PC_2
OPLEN	0.268	0.886
P4-M3	0.578	0.573
CRNBR	0.819	0.374
MAXBR	0.886	0.191
INOBR	0.865	0.017
HEMAN	0.694	0.420
COPBR	0.090	0.893

Table 16 – Rotated component loadings from the PCA comparison of groups S and T (Fig. 6).

Component scores		
	PC_1	PC_2
OPLEN	0.565	0.749
P4-M3	0.350	0.772
CRNBR	0.763	0.400
MAXBR	0.712	0.328
INOBR	0.919	-0.023
HEMAN	0.252	0.679
COPBR	-0.03	0.706

Table 17 – Rotated component loadings from the PCA comparison of groups R and T (Fig. 6).

Component scores		
	PC_1	PC_2
OPLEN	0.663	0.602
P4-M3	0.539	0.610
CRNBR	0.861	0.290
MAXBR	0.174	0.754
INOBR	0.557	0.394
HEMAN	0.931	-0.059
COPBR	0.055	0.815

Table 18 – Component loadings from the PCA comparison of groups R and S (Fig. 6).

Component scores	
	PC_1
OPLEN	0.904
P4-M3	0.765
CRNBR	0.853
MAXBR	0.846
INOBR	0.690
HEMAN	0.765
COPBR	0.592

Table 19 – Rotated component loadings from the PCA comparison of groups Q and S (Fig. 6).

Component scores		
	PC_1	PC_2
OPLEN	0.458	0.759
P4-M3	0.599	0.531
CRNBR	0.828	0.349
MAXBR	0.883	0.295
INOBR	0.866	0.027
HEMAN	0.583	0.524
COPBR	0.034	0.914

Table 20 – Rotated component loadings from the PCA comparison of groups Q and T (Fig. 6).

Component scores		
	PC_1	PC_2
OPLEN	0.439	0.822
P4-M3	0.654	0.543
CRNBR	0.836	0.357
MAXBR	0.729	0.173
INOBR	0.864	0.016
HEMAN	0.620	0.368
COPBR	0.048	0.904

Table 21 – Standardized coefficients from the DFA comparison of groups P, Q, R, S, and T which are in and adjacent to Florida (Fig. 6).

Standardized coefficients				
	fxn 1	**fxn 2**	**fxn 3**	**fxn 4**
OPLEN	1.507	-0.146	0.207	0.017
P4-M3	-0.710	0.373	-0.352	0.380
CRNBR	-0.756	0.464	0.052	-0.311
MAXBR	-0.104	-0.649	0.913	-0.764
INOBR	0.243	0.397	0.289	1.089
HEMAN	0.016	0.740	-0.403	-0.493
COPBR	0.086	-0.502	-0.401	0.106

Table 22 – Standardized coefficients from the DFA comparison of groups P, Q, R, and S (Fig. 6), which are in and adjacent to Florida.

Standardized coefficients			
	fxn 1	**fxn 2**	**fxn 3**
OPLEN	1.571	0.126	-0.080
P4-M3	-0.765	-0.056	0.483
CRNBR	-0.899	0.278	-0.076
MAXBR	0.147	0.296	-1.246
INOBR	0.202	0.499	1.108
HEMAN	-0.175	0.128	-0.088
COPBR	0.164	-0.626	0.096

Fig. 1 – Recreated and modified map from Hall (1981). This map illustrates what was known about the distribution of these *Blarina* as they were thought to be in the late 1970s and early 1980s. The basemap is from ESRI. 2006 ArcGIS 9, Media Kit: ESRI Data & Maps. ESRI, Redlands, CA.

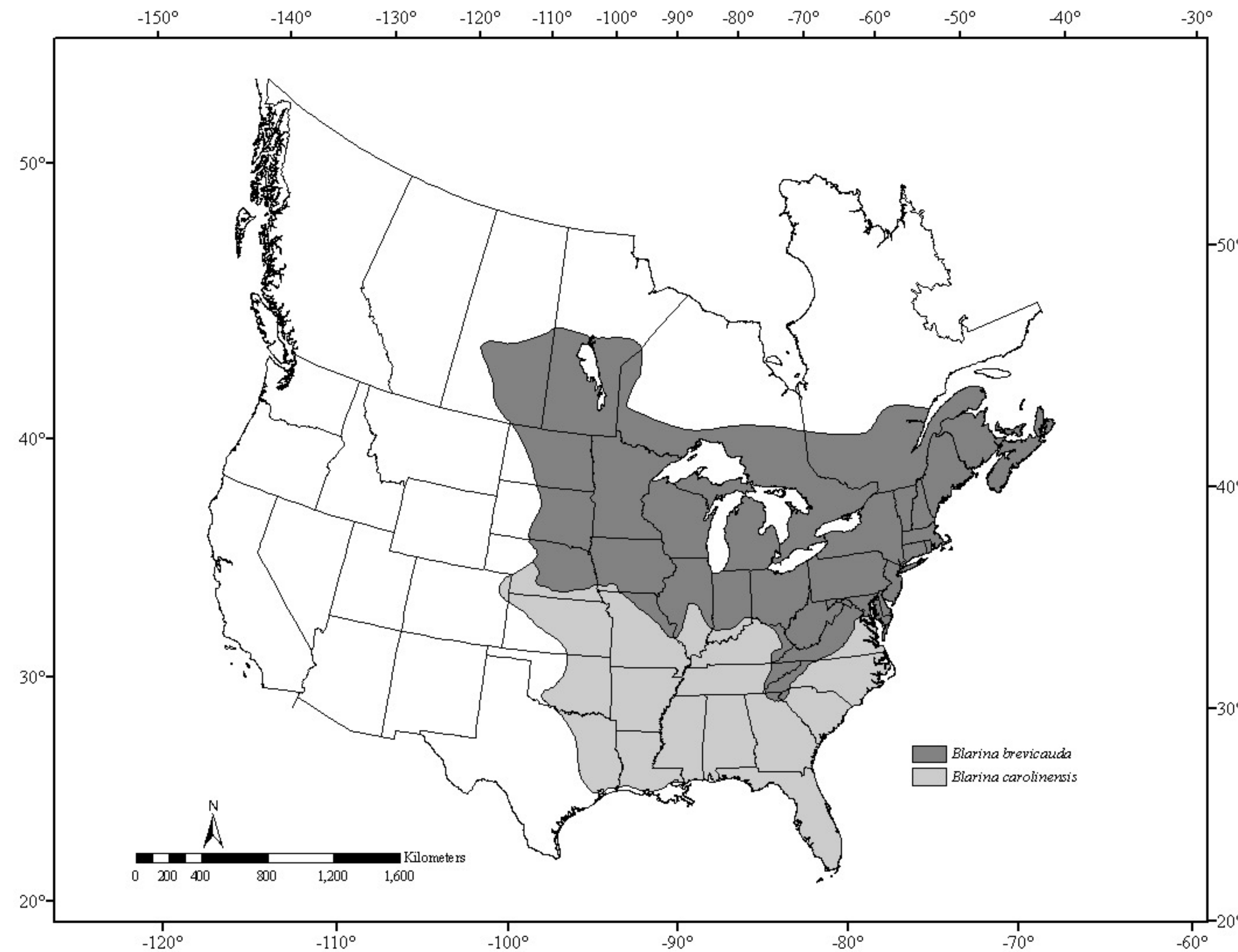
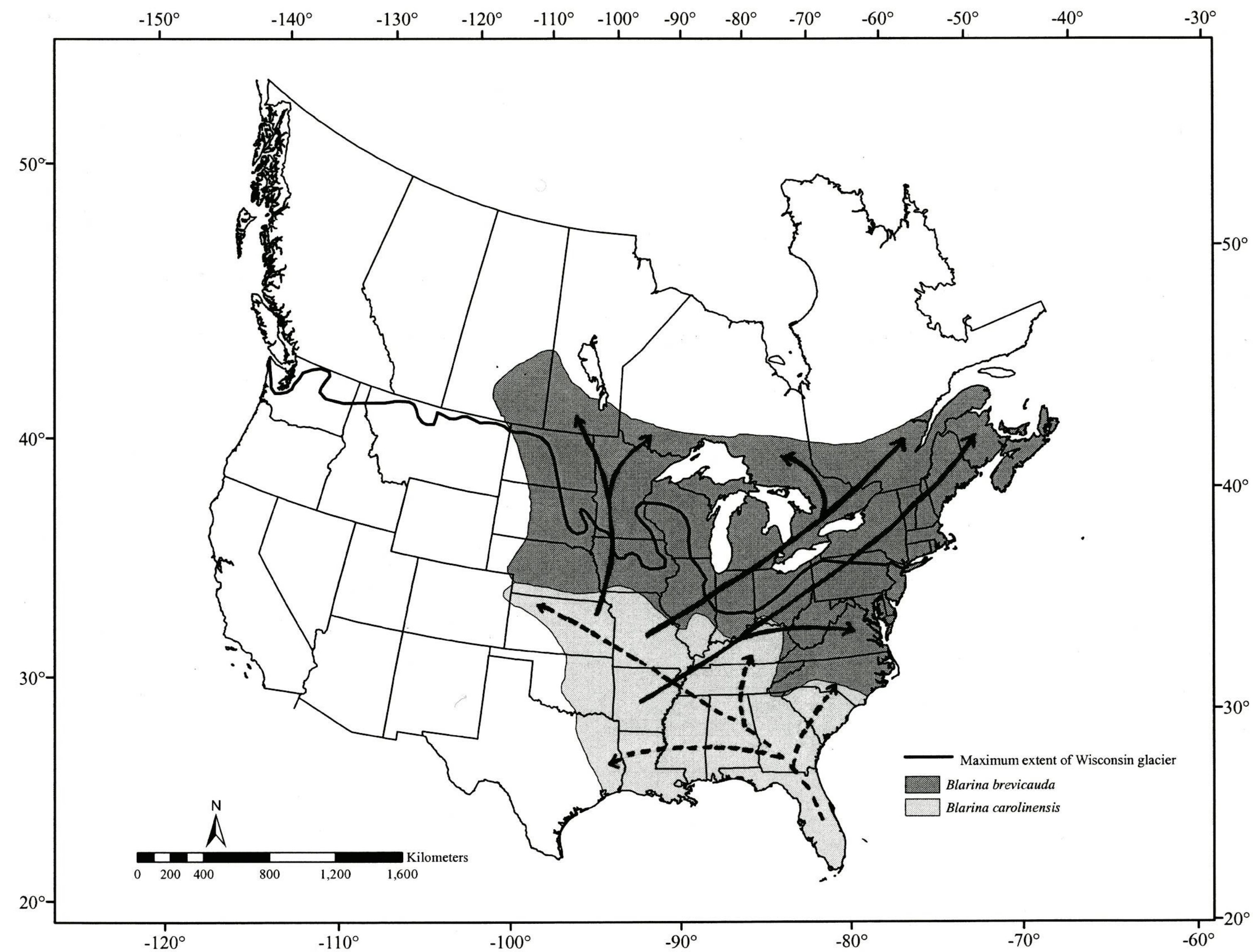

Blarina brevicauda
Blarina carolinensis
N
0 200 400 800 1,200 1,600 Kilometers

Fig. 2 – Geographic distribution and post-glacial movement of *Blarina carolinensis* and *B. brevicauda* recreated from Handley (1971). The basemap is from ESRI. 2006 ArcGIS 9, Media Kit: ESRI Data & Maps. ESRI, Redlands, CA.



-150° -140° -130° -120° -110° -100° -90° -80° -70° -60° -50° -40° -30°
50° 40° 30° 20°
50° 40° 30° 20°
-120° -110° -100° -90° -80° -70° -60°
Maximum extent of Wisconsin glacier
Blarina brevicauda
Blarina carolinensis
N
Kilometers
0 200 400 800 1,200 1,600

Fig. 3 – Map of the distributions of the species of *Blarina*. This map was created by combining information from Benedict et al. (2006), Genoways and Choate (1972), Hall (1981), and McCay (2001). The basemap is from ESRI. 2006 ArcGIS 9, Media Kit: ESRI Data & Maps. ESRI, Redlands, CA.

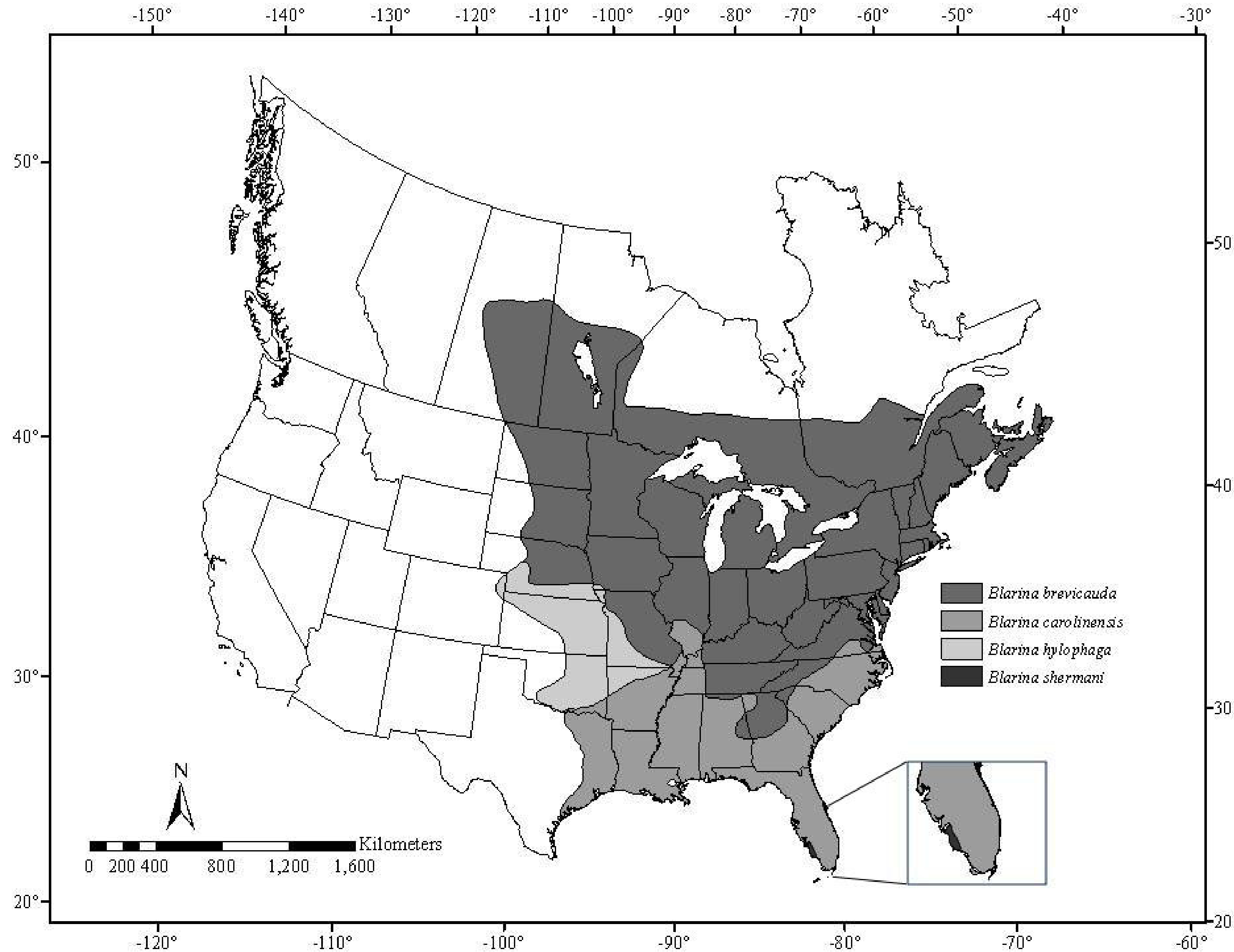

Blarina brevicauda
Blarina carolinensis
Blarina hylophaga
Blarina shermani
N
Kilometers
0 200 400 800 1,200 1,600
-150° -140° -130° -120° -110° -100° -90° -80° -70° -60° -50° -40° -30°
-120° -110° -100° -90° -80° -70° -60°
50° 40° 30° 20°

Fig. 4 – Map of the distribution of *Blarina carolinensis*, with subspecies, redrawn from McCay (2001). Modified by removing *Blarina carolinensis shermani*. The basemap is from ESRI. 2006 ArcGIS 9, Media Kit: ESRI Data & Maps. ESRI, Redlands, CA.

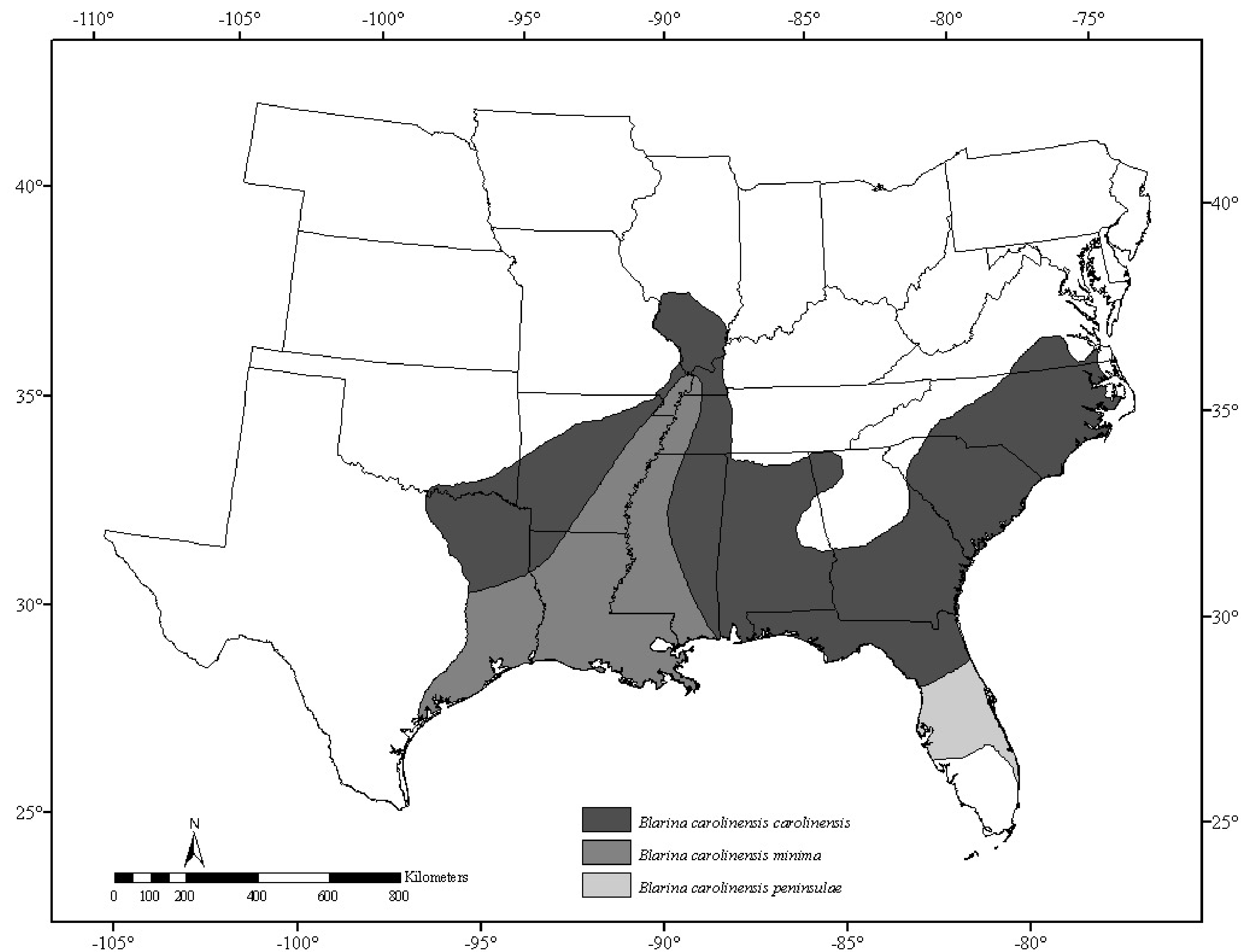
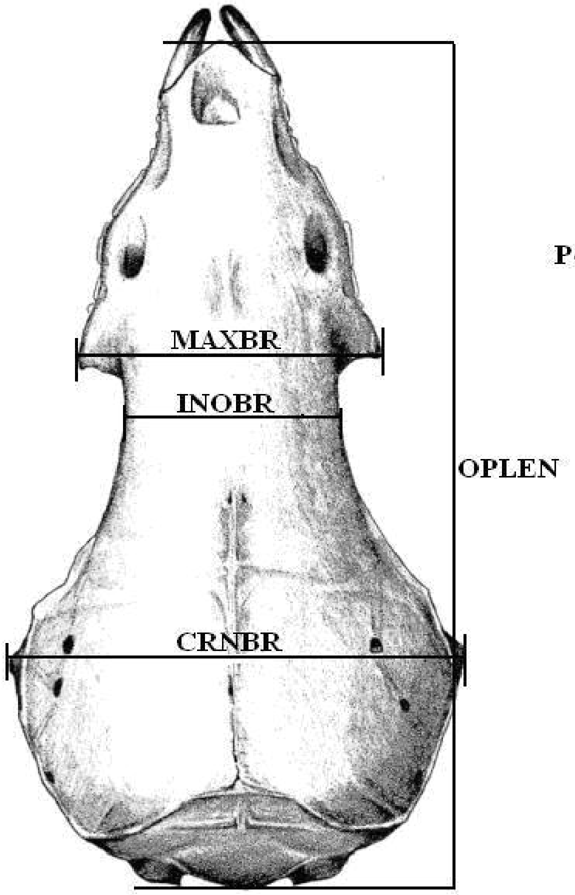
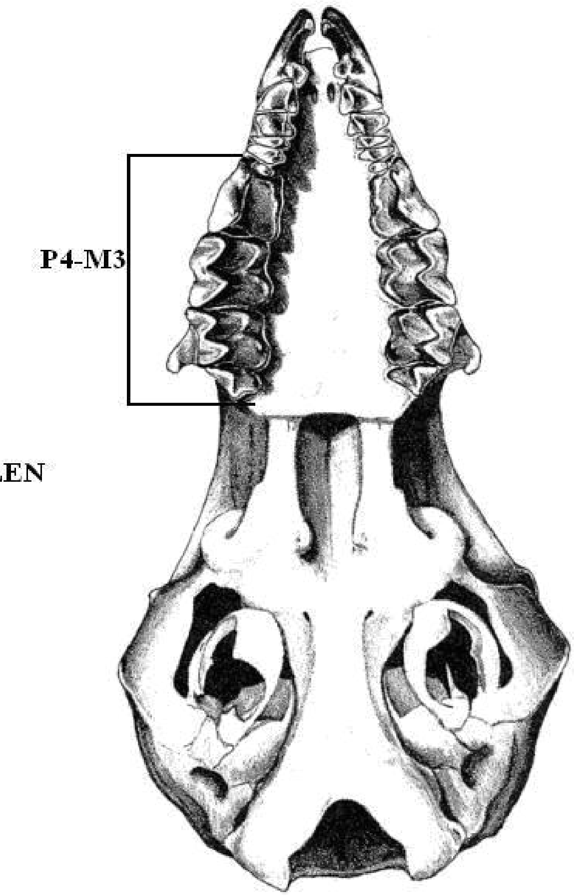

-110°
-105°
-100°
-95°
-90°
-85°
-80°
-75°
40°
35°
30°
25°
N
Kilometers
0
100
200
400
600
800
Blarina carolinensis carolinensis
Blarina carolinensis minima
Blarina carolinensis peninsulae

Fig. 5 - Cranium (upper and left dentary) of *Blarina carolinensis* to show measurements used in this study. Dorsal view (left), ventral view (right) and left dentary (bottom). Abbreviations are as follows: OPLEN = occipito-premaxillary length; MAXBR = maxillary breadth; INOBR = interorbital breadth; CRNBR = cranial breadth; P4-M3 = length of molariform toothrow; HEMAN = height of mandible; COPBR = breadth of condyloid process. Illustration from Genoways and Choate 1998


MAXBR
INOBR
OPLEN
CRNBR


P4-M3

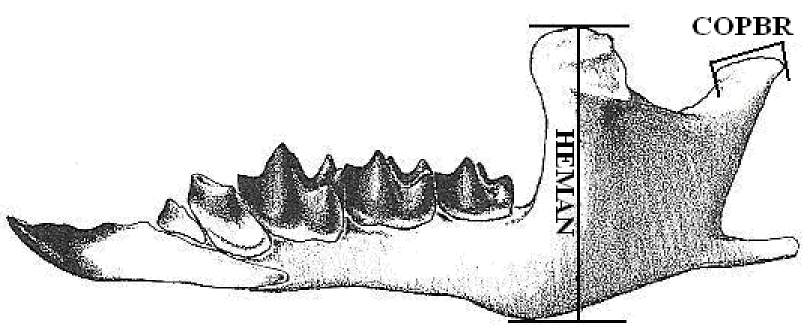

COPBR
HEMAN

Fig. 6 – Distribution of the groups which were used in analyses to make comparisons in specific areas. These groups were formed by considering type localities, subspecies boundaries, areas of interest, and whenever possible the equality of sample sizes. The base map is from ESRI. 2006 ArcGIS 9, Media Kit: ESRI Data & Maps. ESRI, Redlands, CA.

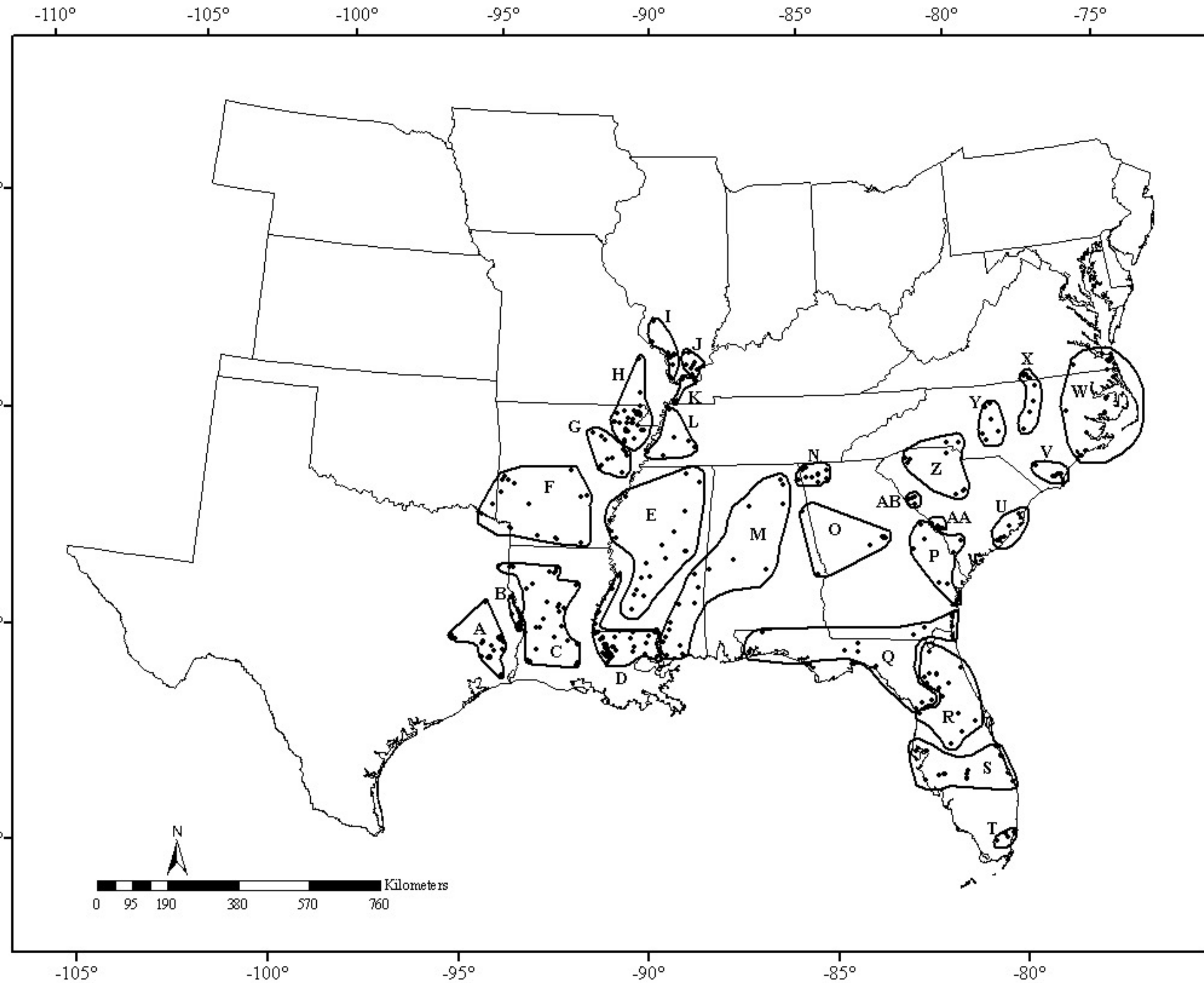

-110° -105° -100° -95° -90° -85° -80° -75°
40° 35° 30° 25°
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z AA AB
N
0 95 190 380 570 760 Kilometers
-105° -100° -95° -90° -85° -80°

Fig. 7 – Latitude and the scores from the 1st principal component of the PCA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima*.

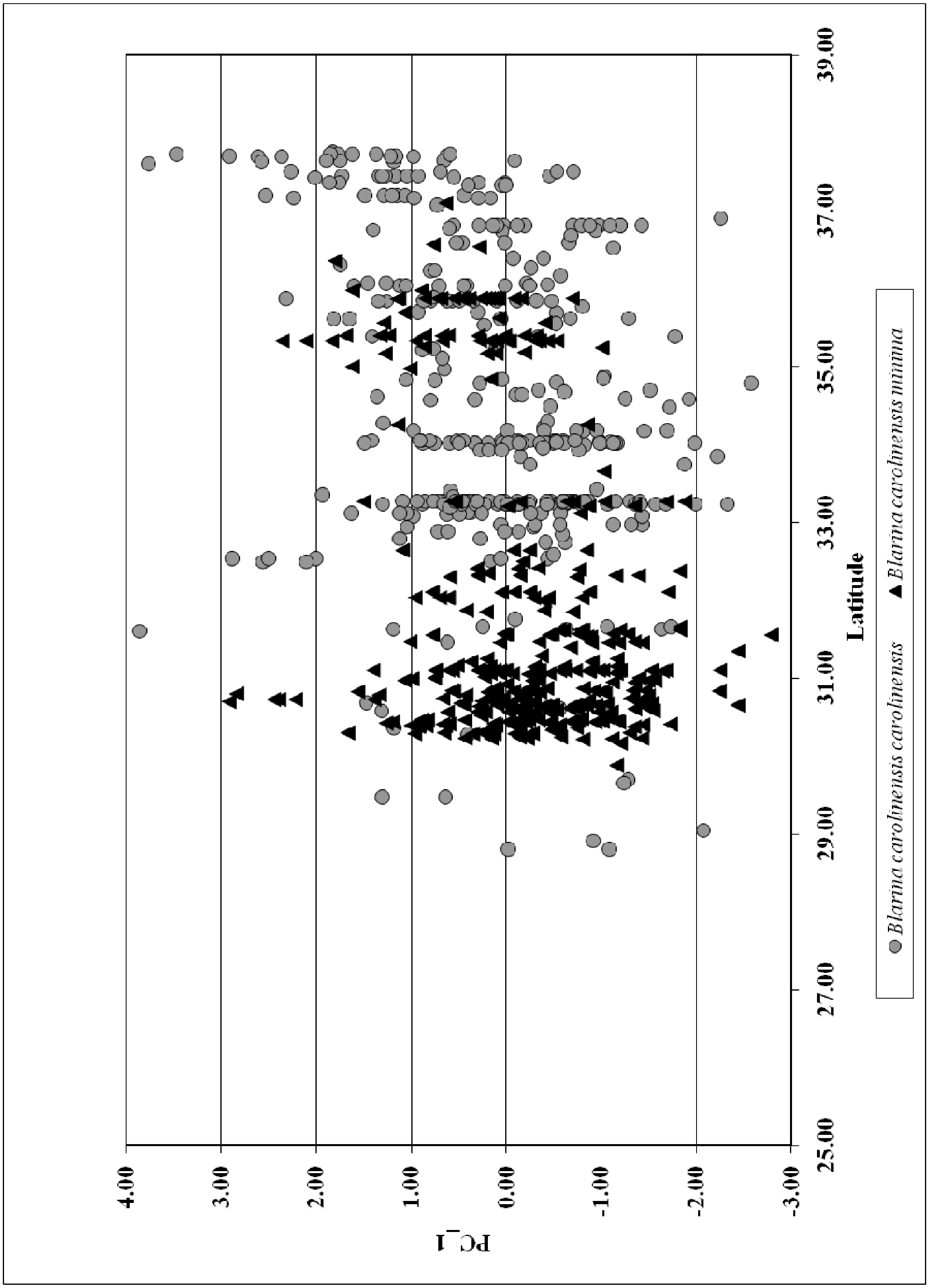

PC_1
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
25.00
27.00
29.00
31.00
33.00
35.00
37.00
39.00
Latitude
Blarina carolinensis carolinensis
Blarina carolinensis minima

Fig. 8 – Longitude and the scores from the 1st principal component of the PCA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima*.

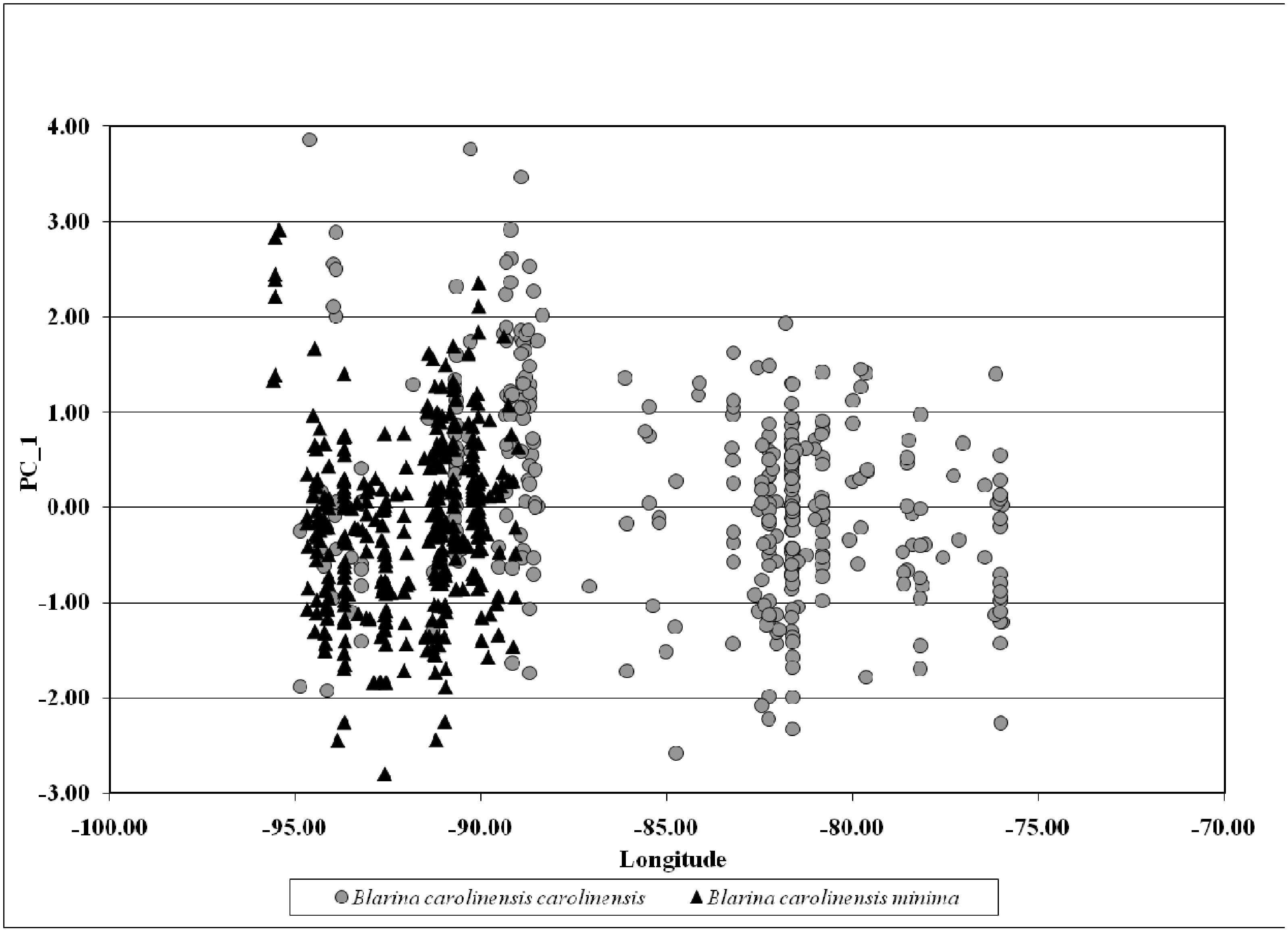

4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
PC_1
-100.00
-95.00
-90.00
-85.00
-80.00
-75.00
-70.00
Longitude
Blarina carolinensis carolinensis
Blarina carolinensis minima

Fig. 9 – Latitude and the discriminant scores of function 1 from the DFA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima*.

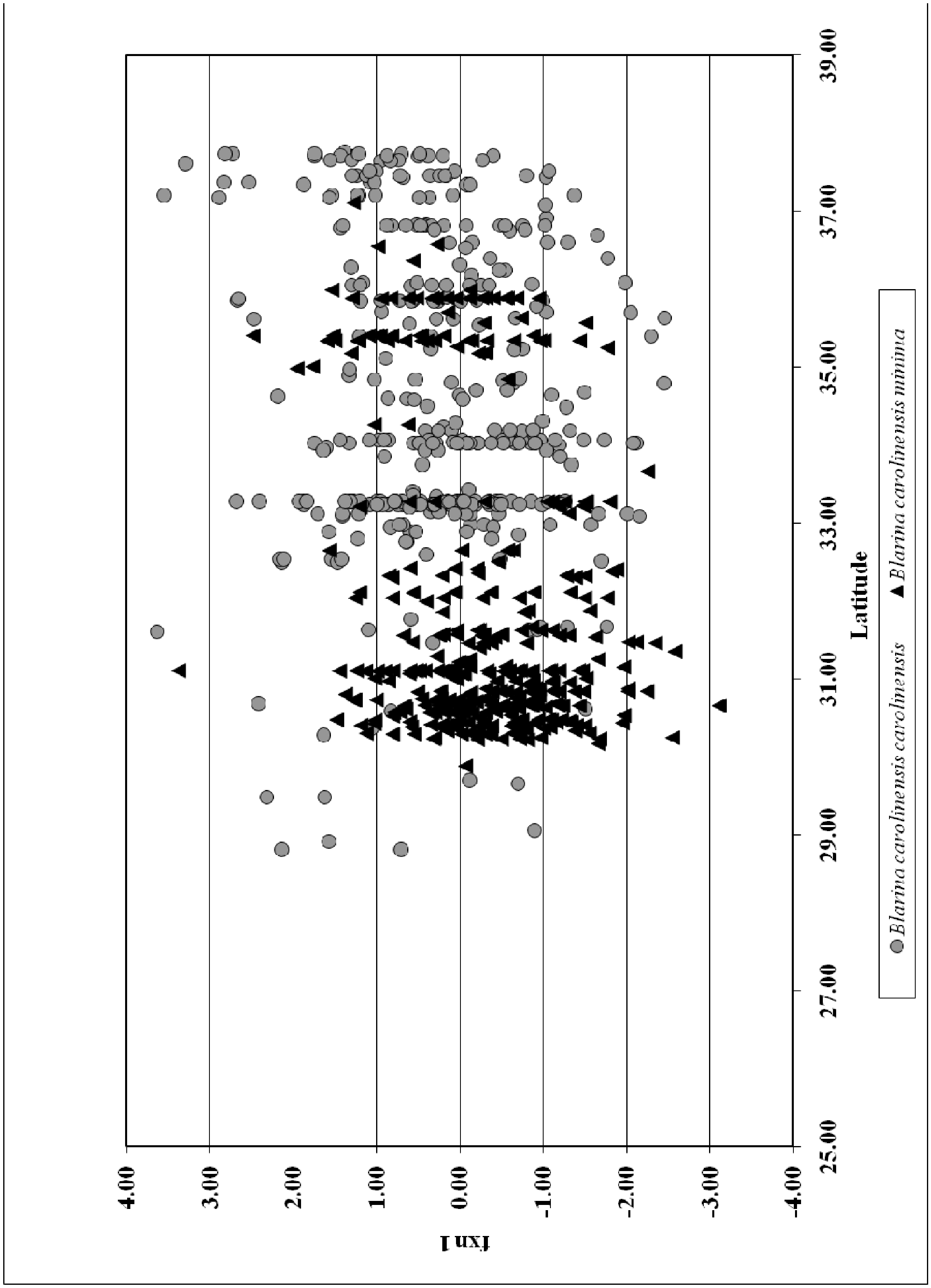
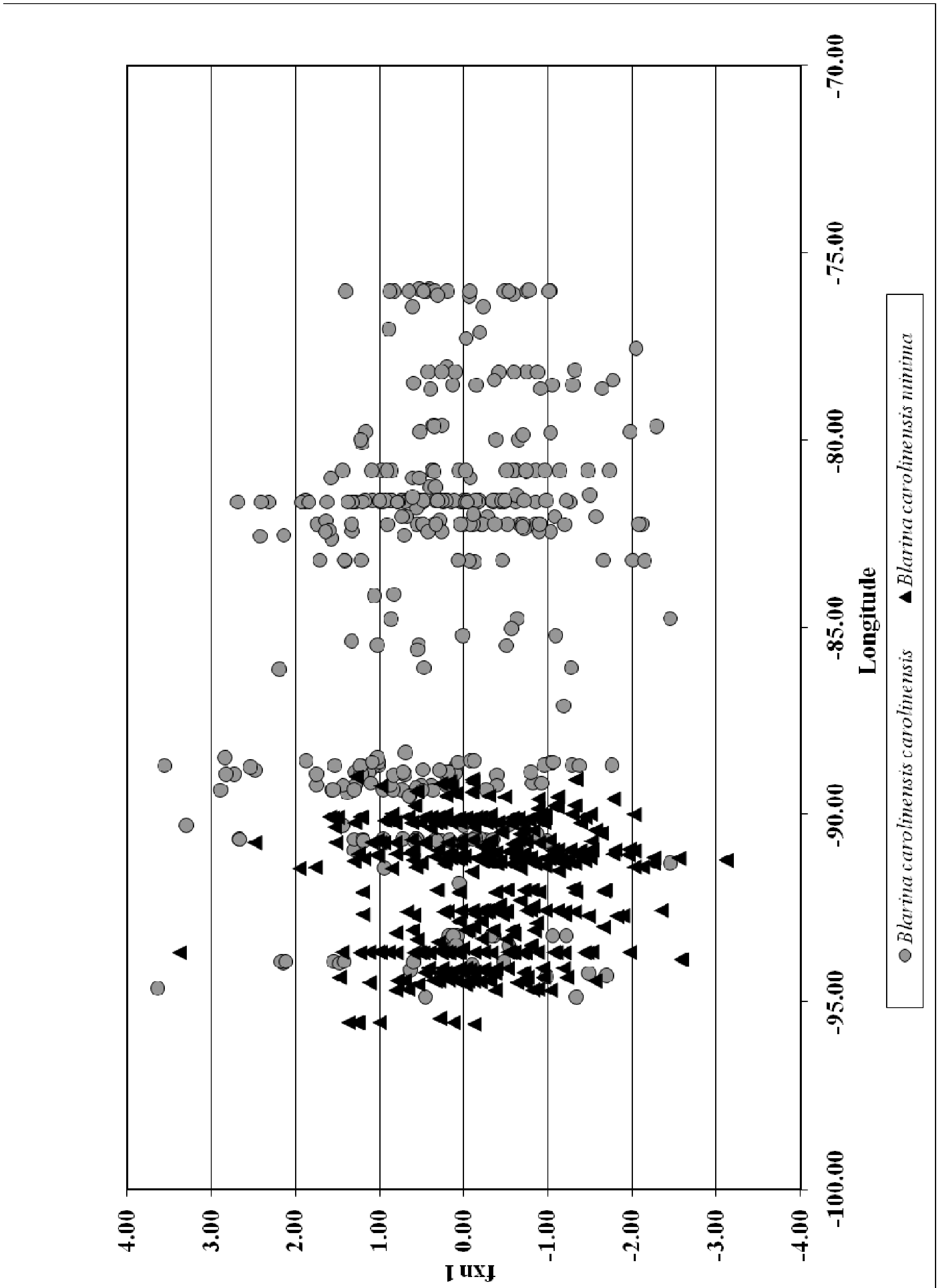

4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
fxn 1
25.00
27.00
29.00
31.00
33.00
35.00
37.00
39.00
Latitude
Blarina carolinensis carolinensis
Blarina carolinensis minima

Fig. 10 - Longitude and the discriminant scores of function 1 from the DFA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima*.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4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
-100.00
-95.00
-90.00
-85.00
-80.00
-75.00
-70.00
Longitude
Blarina carolinensis carolinensis
Blarina carolinensis minima

Fig. 11 – Scores from the 1st and 2nd principal components of the PCA based on the measurements of *Blarina carolinensis carolinensis*, *Blarina carolinensis minima*, and *Blarina carolinensis peninsulae*.

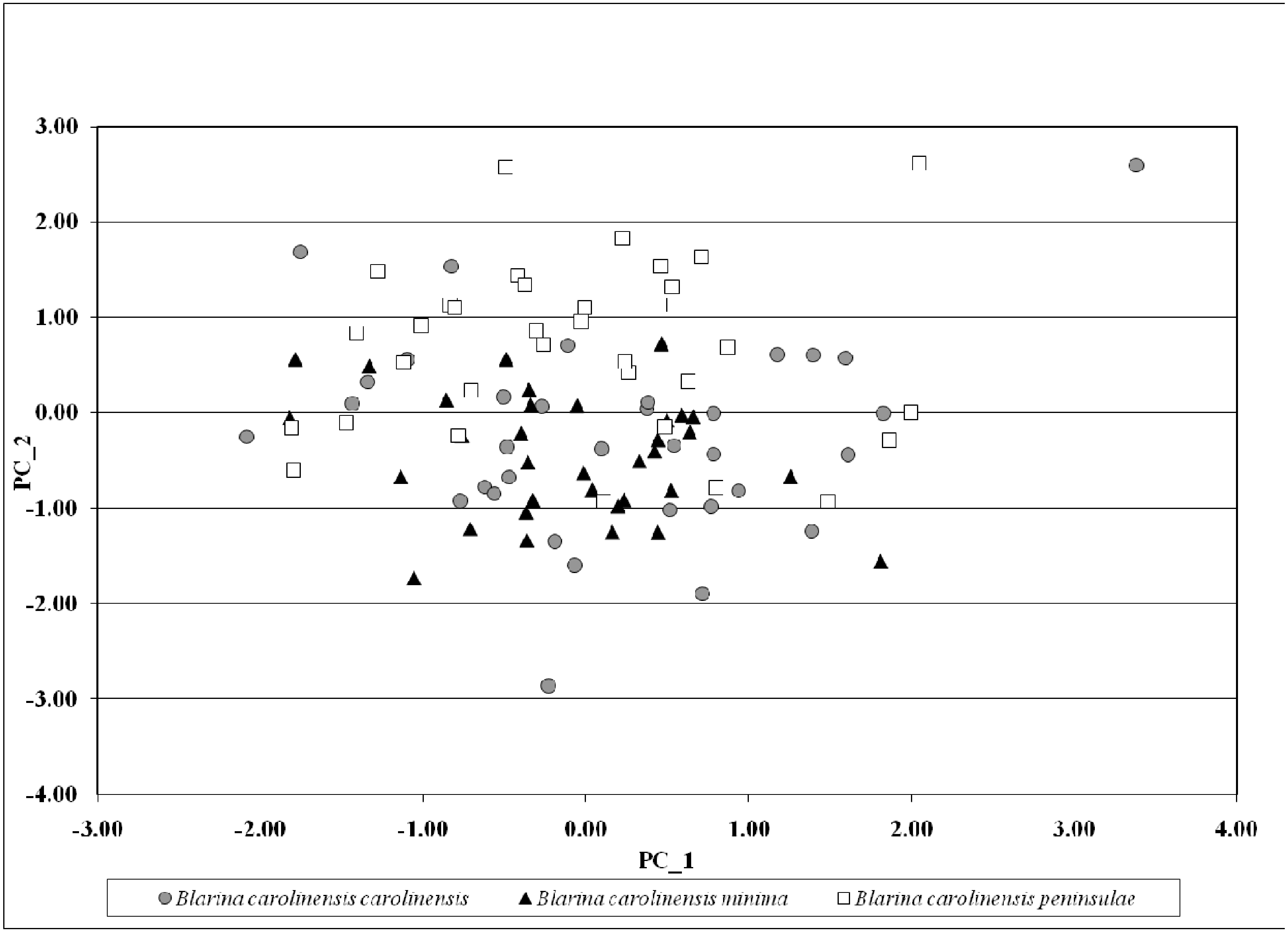

3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
PC_2
-3.00
-2.00
-1.00
0.00
1.00
2.00
3.00
4.00
PC_1
Blarina carolinensis carolinensis
Blarina carolinensis minima
Blarina carolinensis peninsulae

Fig. 12 - Latitude and the scores from the 1st principal component of the PCA, based on the measurements of *Blarina carolinensis carolinensis*, *Blarina carolinensis minima*, and *Blarina carolinensis peninsulae*.

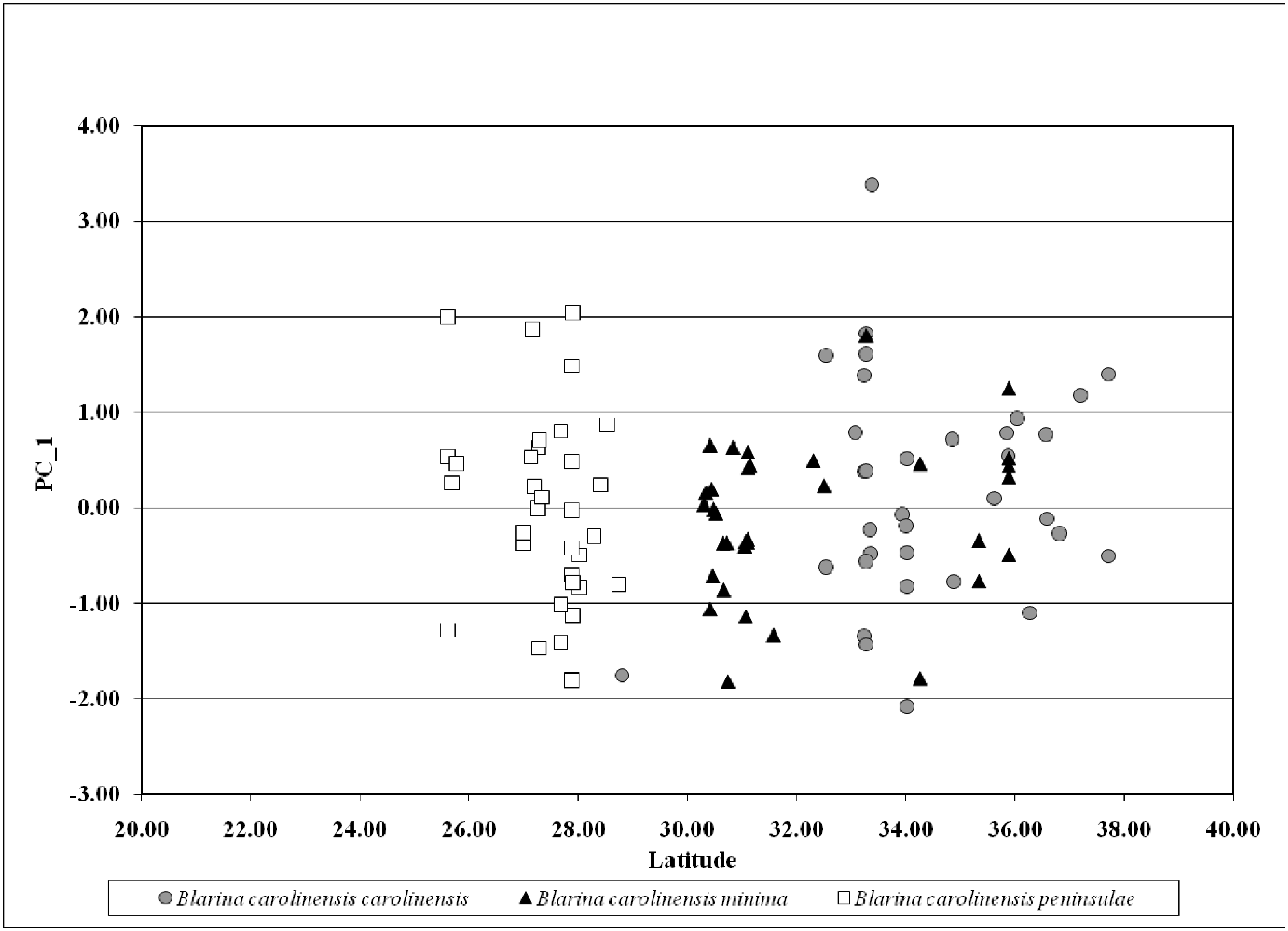

PC_1
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
20.00
22.00
24.00
26.00
28.00
30.00
32.00
34.00
36.00
38.00
40.00
Latitude
Blarina carolinensis carolinensis
Blarina carolinensis minima
Blarina carolinensis peninsulae

Fig. 13 - Longitude and the scores from the 1st principal component of the PCA, based on the measurements of *Blarina carolinensis carolinensis*, *Blarina carolinensis minima*, and *Blarina carolinensis peninsulae*.

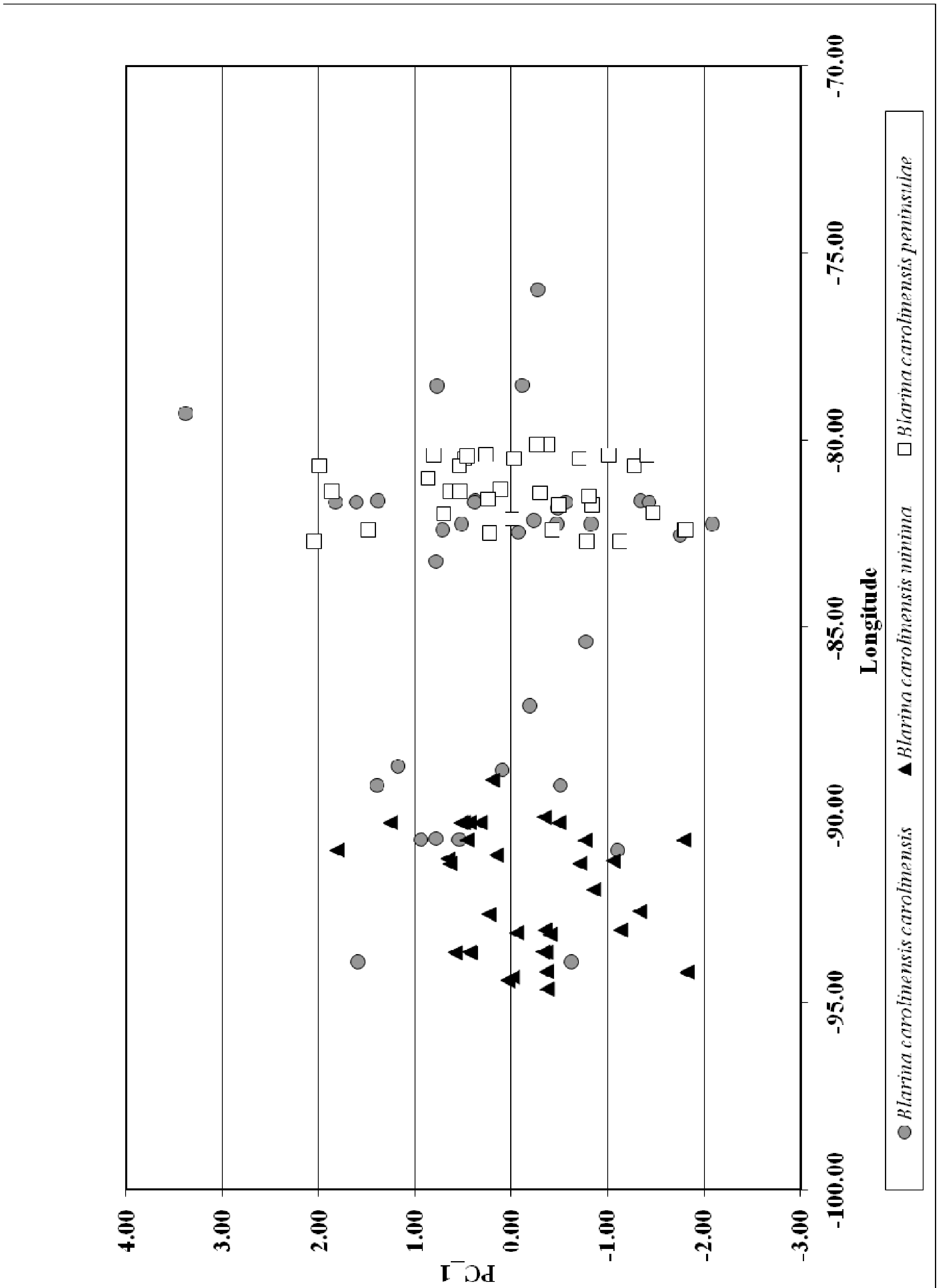

PC_1
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-100.00
-95.00
-90.00
-85.00
-80.00
-75.00
-70.00
Longitude
Blarina carolinensis carolinensis
Blarina carolinensis minima
Blarina carolinensis peninsulae

Fig. 14 - Discriminant scores of function 1 and 2 from the DFA, based on the measurements of *Blarina carolinensis carolinensis*, *Blarina carolinensis minima*, and *Blarina carolinensis peninsulae*.

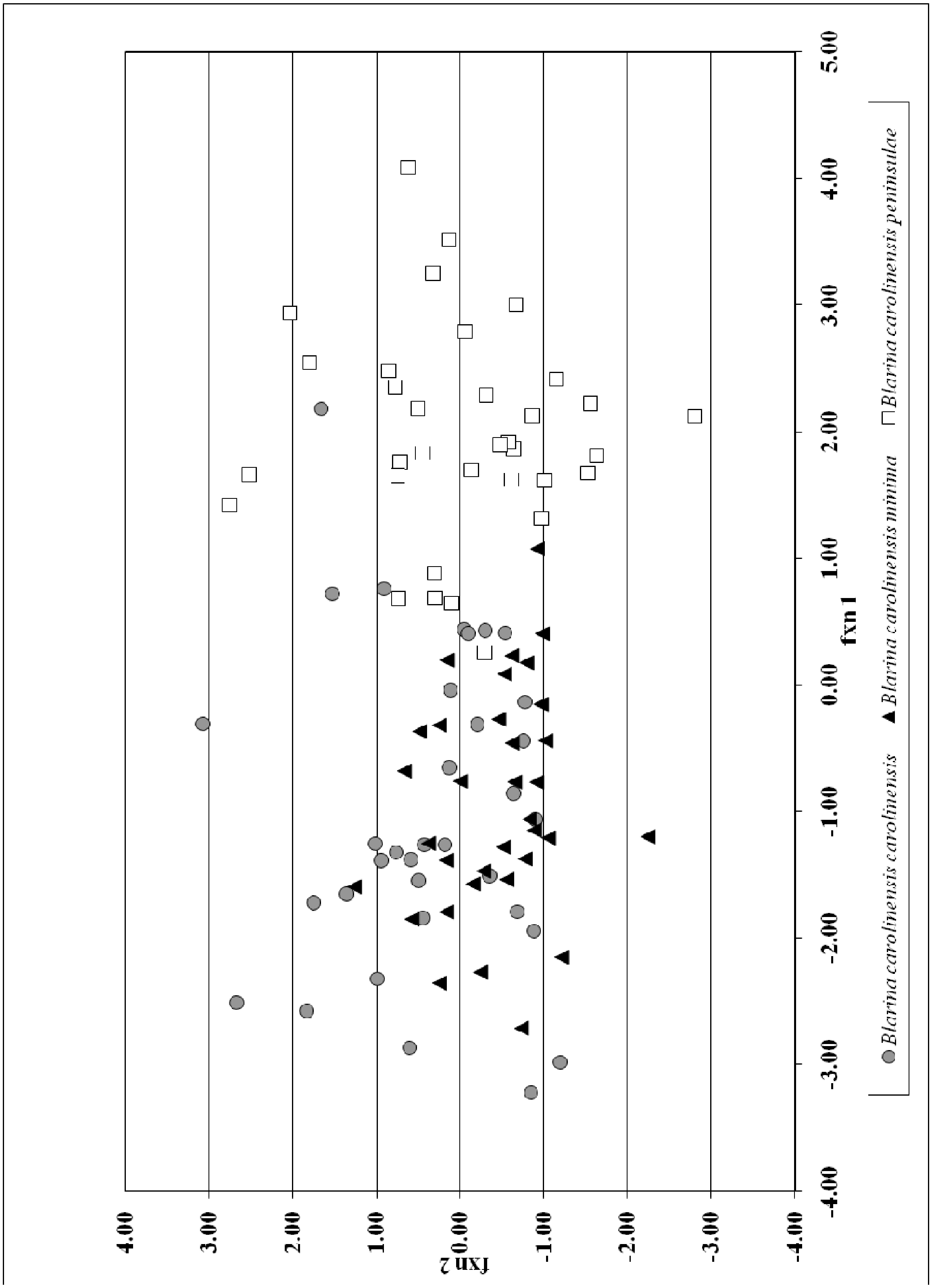

fxn 1
fxn 2
-4.00
-3.00
-2.00
-1.00
0.00
1.00
2.00
3.00
4.00
5.00
Blarina carolinensis carolinensis
Blarina carolinensis minima
Blarina carolinensis peninsulae

Fig. 15 - Latitude and the discriminant scores of function 1 from the DFA, based on the measurements of *Blarina carolinensis carolinensis*, *Blarina carolinensis minima*, and *Blarina carolinensis peninsulae*.

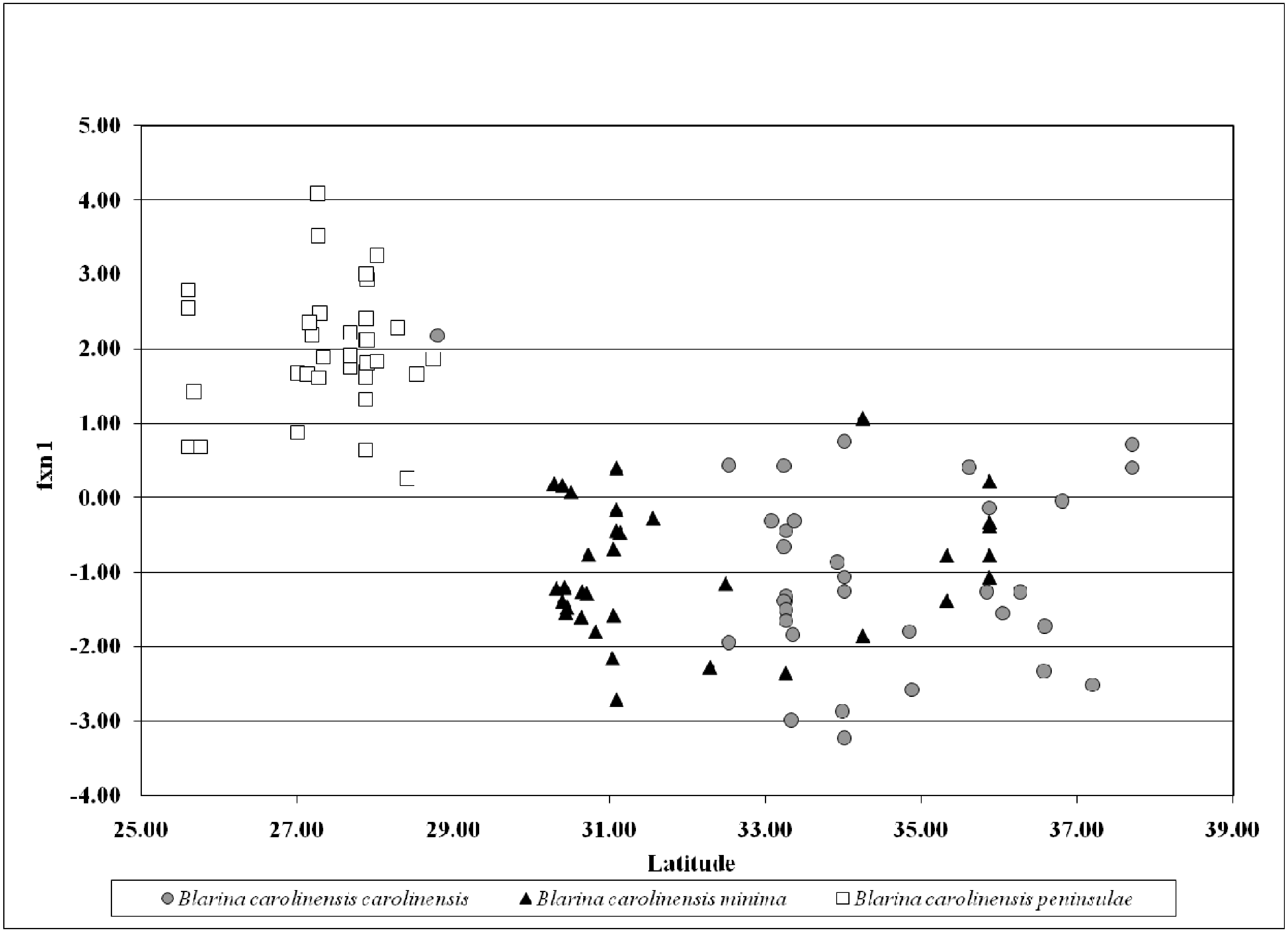

5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
fxn 1
25.00
27.00
29.00
31.00
33.00
35.00
37.00
39.00
Latitude
Blarina carolinensis carolinensis
Blarina carolinensis minima
Blarina carolinensis peninsulae

Fig. 16 - Longitude and the discriminant scores of function 1 from the DFA, based on the measurements of *Blarina carolinensis carolinensis*, *Blarina carolinensis minima*, and *Blarina carolinensis peninsulae*.

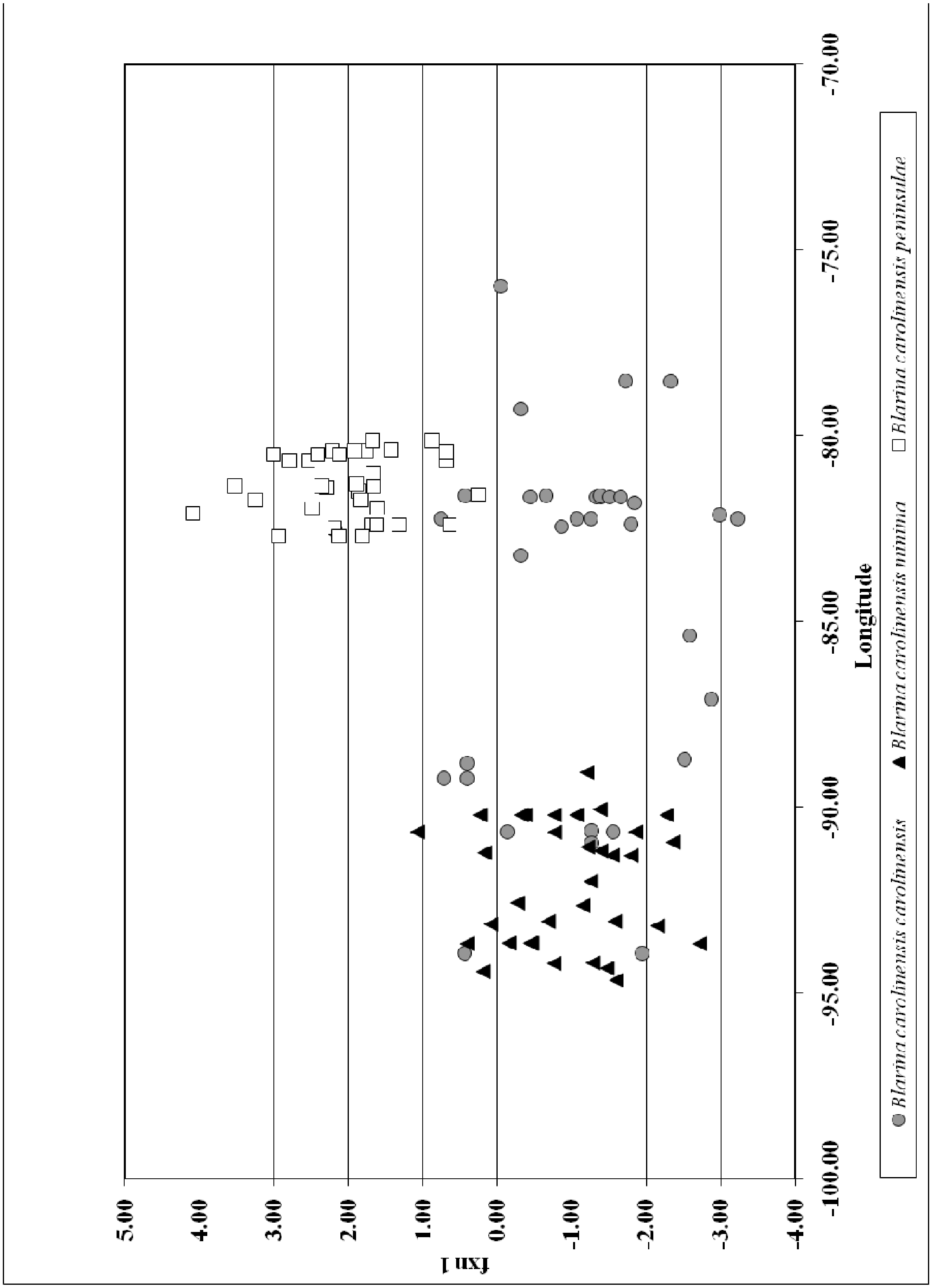

fxn 1
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
-100.00
-95.00
-90.00
-85.00
-80.00
-75.00
-70.00
Longitude
Blarina carolinensis carolinensis
Blarina carolinensis minima
Blarina carolinensis peninsulae

Fig. 17 - Latitude and the scores from the 1st principal component of the PCA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Texas.

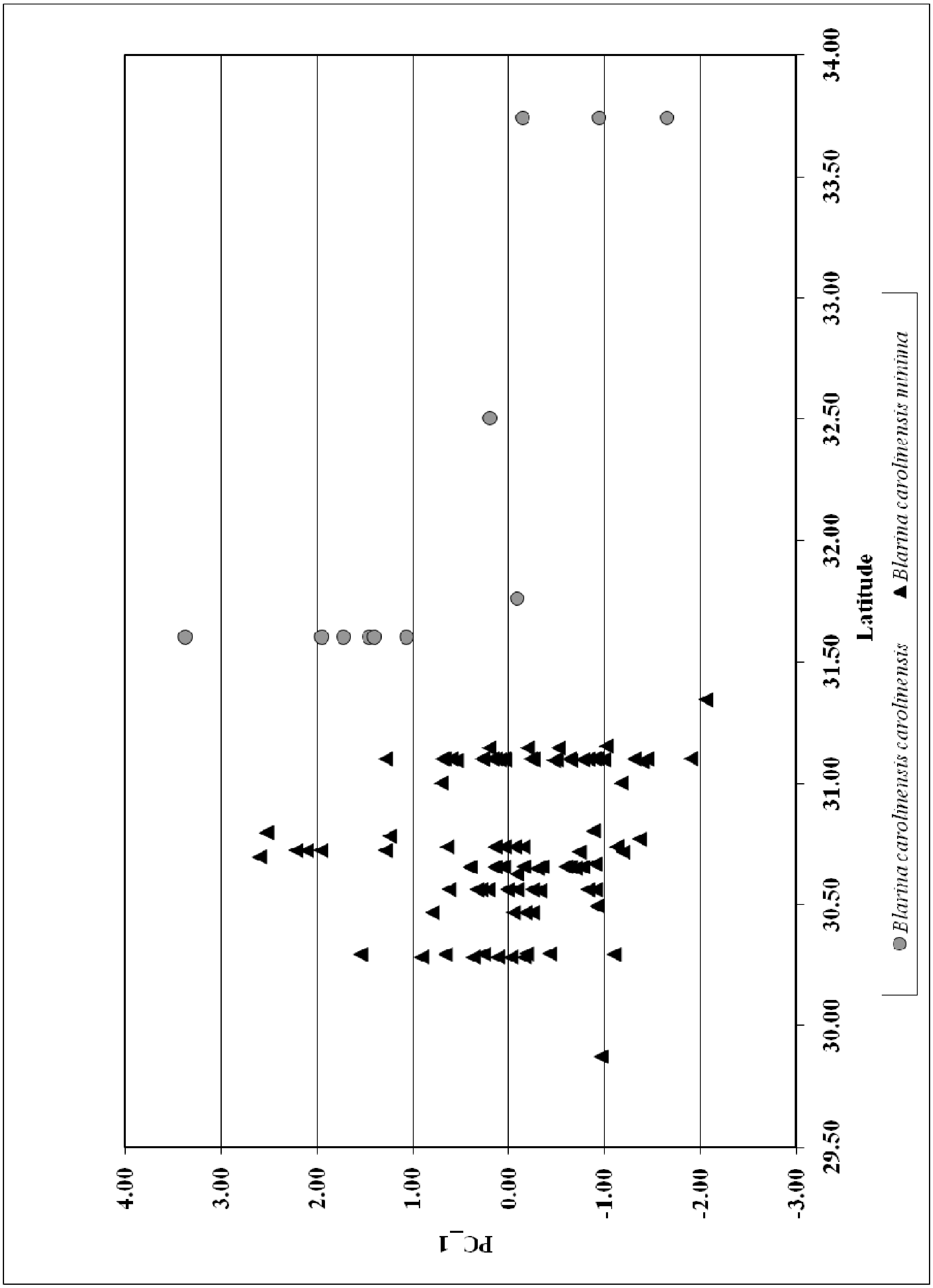

PC_1
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
29.50
30.00
30.50
31.00
31.50
32.00
32.50
33.00
33.50
34.00
Latitude
Blarina carolinensis carolinensis
Blarina carolinensis minima

Fig. 18 - Longitude and the scores from the 1st principal component of the PCA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Texas.

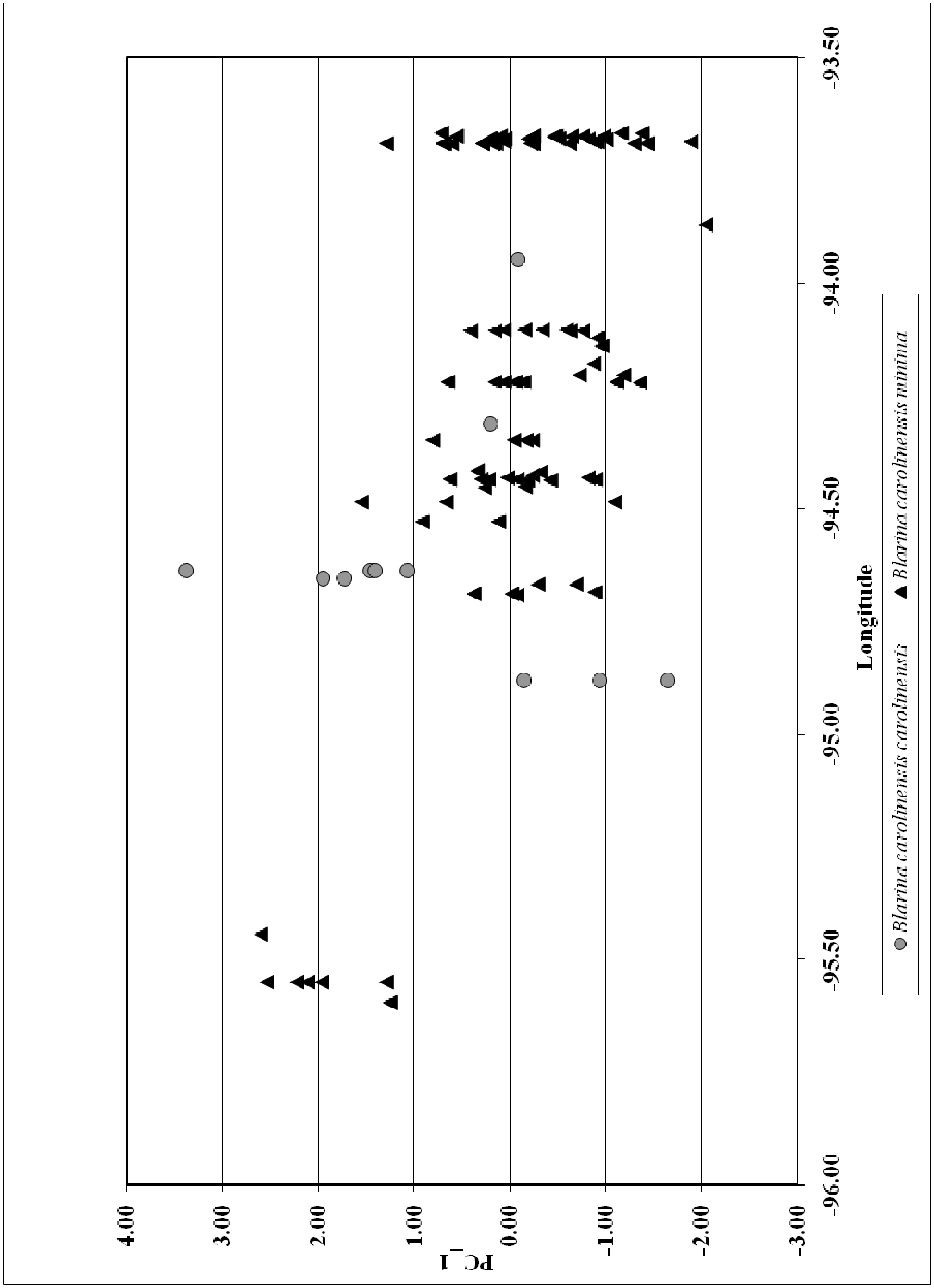

4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
PC_1
-96.00
-95.50
-95.00
-94.50
-94.00
-93.50
Longitude
Blarina carolinensis carolinensis
Blarina carolinensis minima

Fig. 19 - Latitude and the discriminant scores of function 1 from the DFA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Texas.

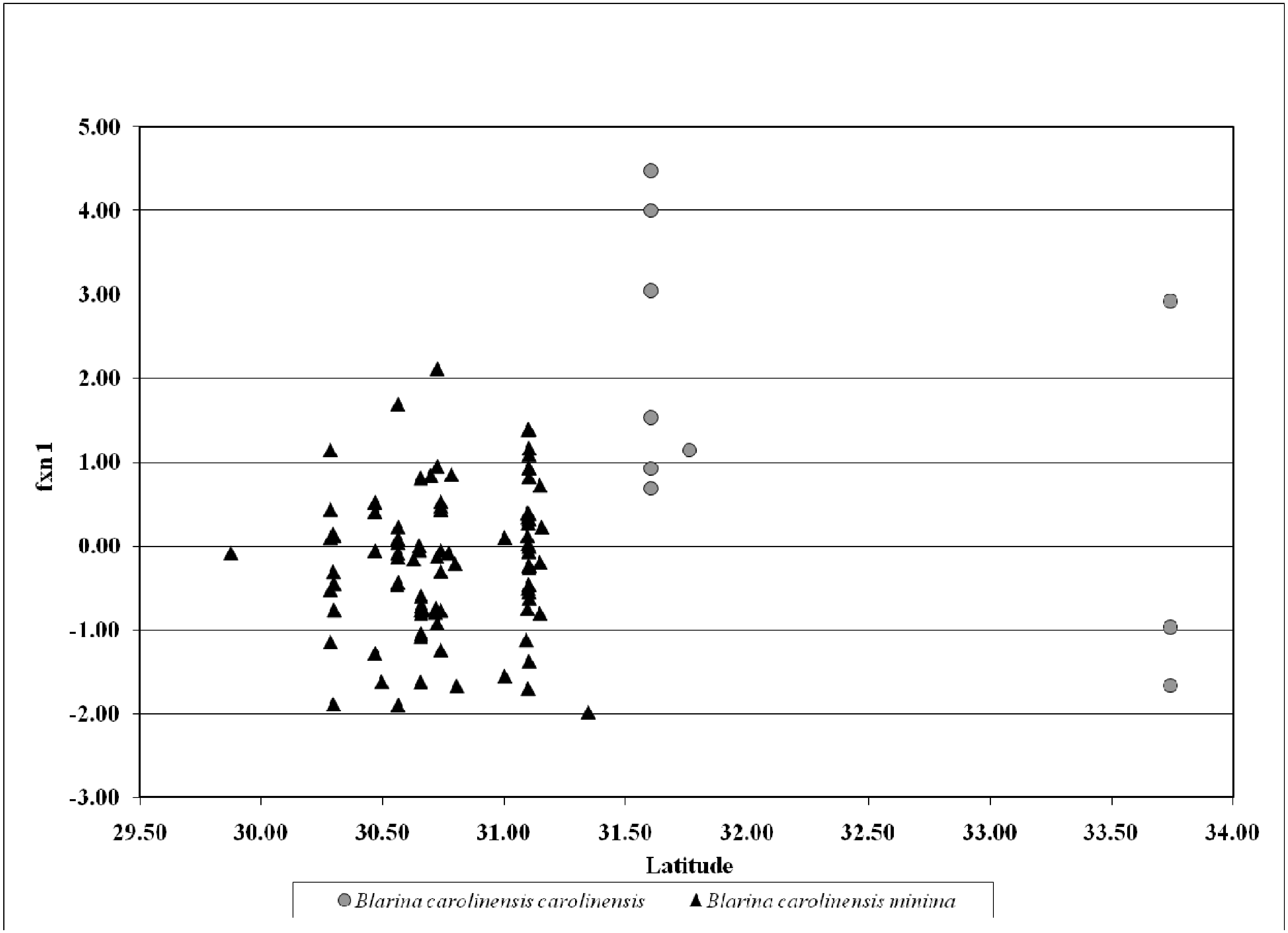

5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
fxn 1
29.50
30.00
30.50
31.00
31.50
32.00
32.50
33.00
33.50
34.00
Latitude
Blarina carolinensis carolinensis
Blarina carolinensis minima

Fig. 20 - Longitude and the discriminant scores of function 1 from the DFA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Texas.

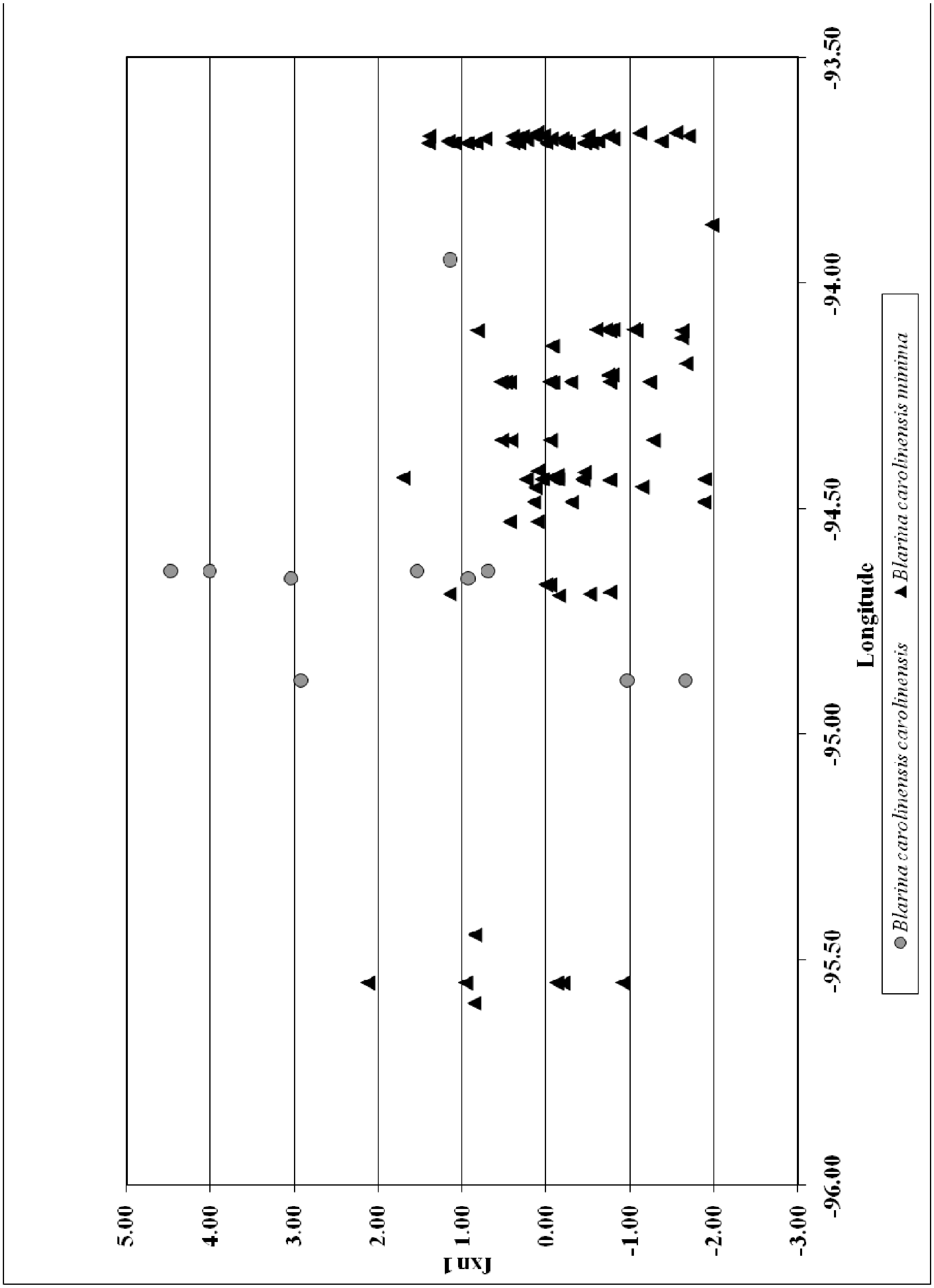

5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-96.00
-95.50
-95.00
-94.50
-94.00
-93.50
Longitude
Blarina carolinensis carolinensis
Blarina carolinensis minima

Fig. 21 – Scores from 1st and 2nd principal components of the PCA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Arkansas.

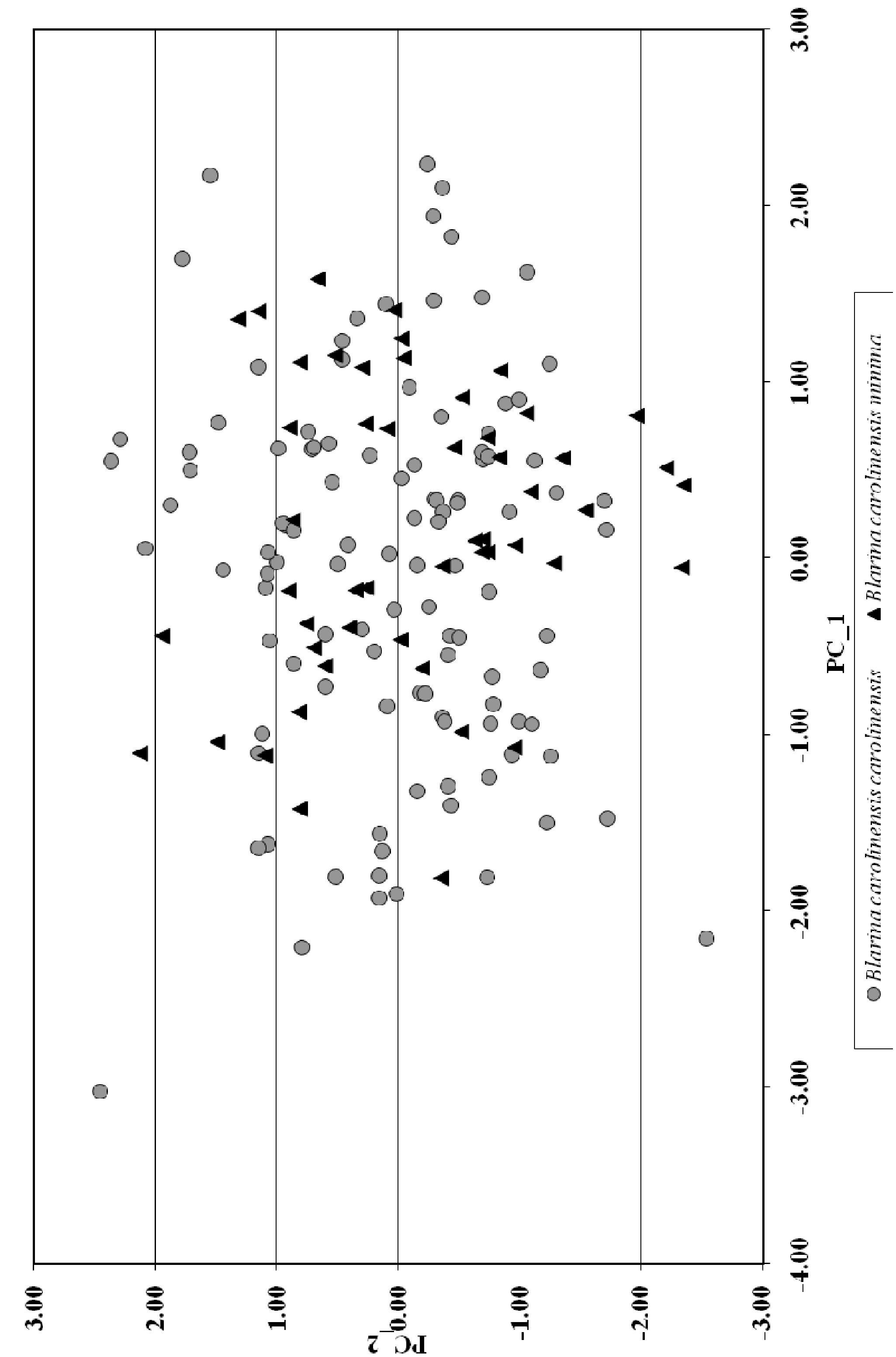

PC_1
PC_2
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
Blarina carolinensis carolinensis
Blarina carolinensis minima

Fig. 22 - Latitude and the scores from 1st principal component of the PCA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Arkansas.

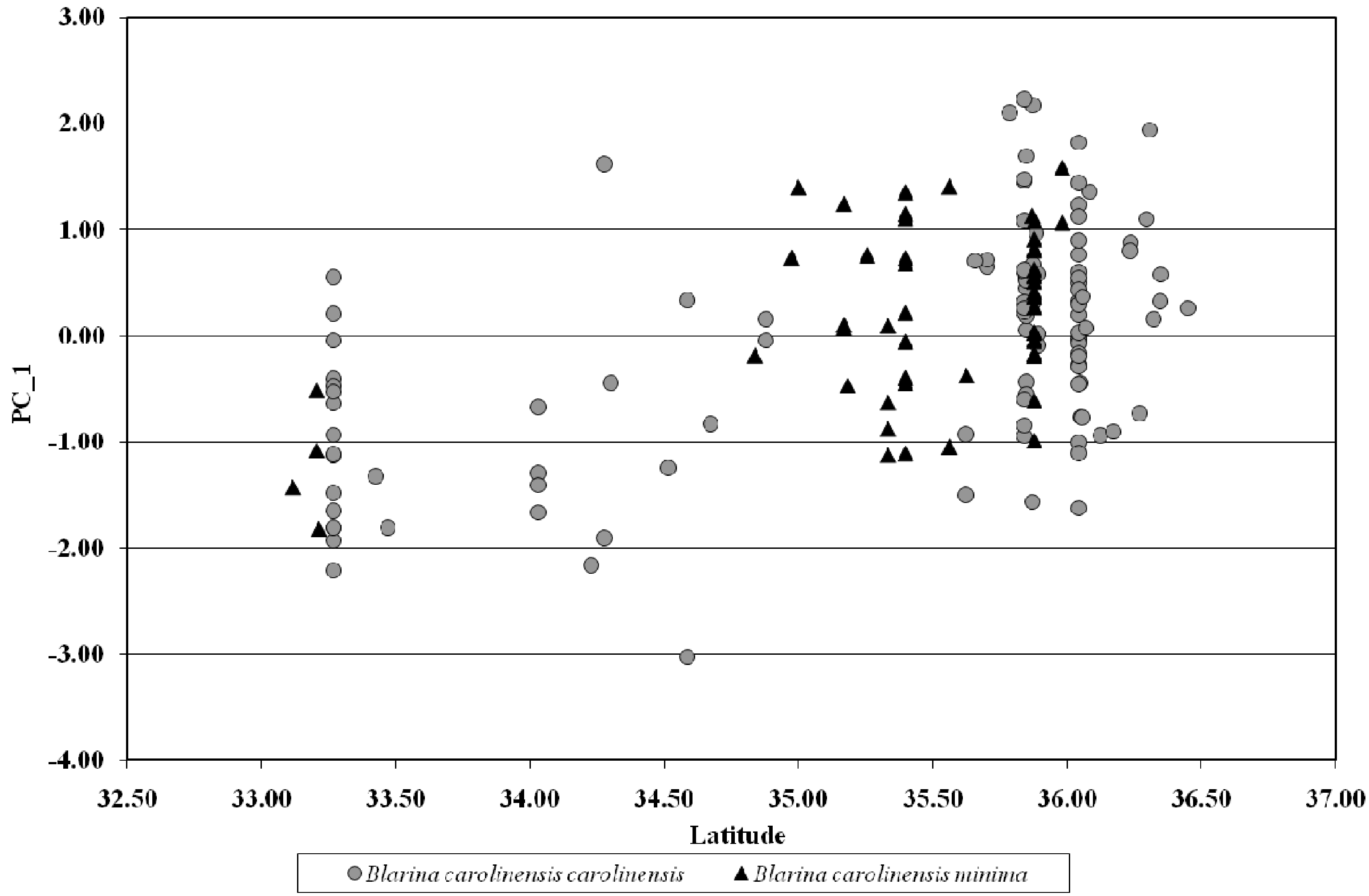
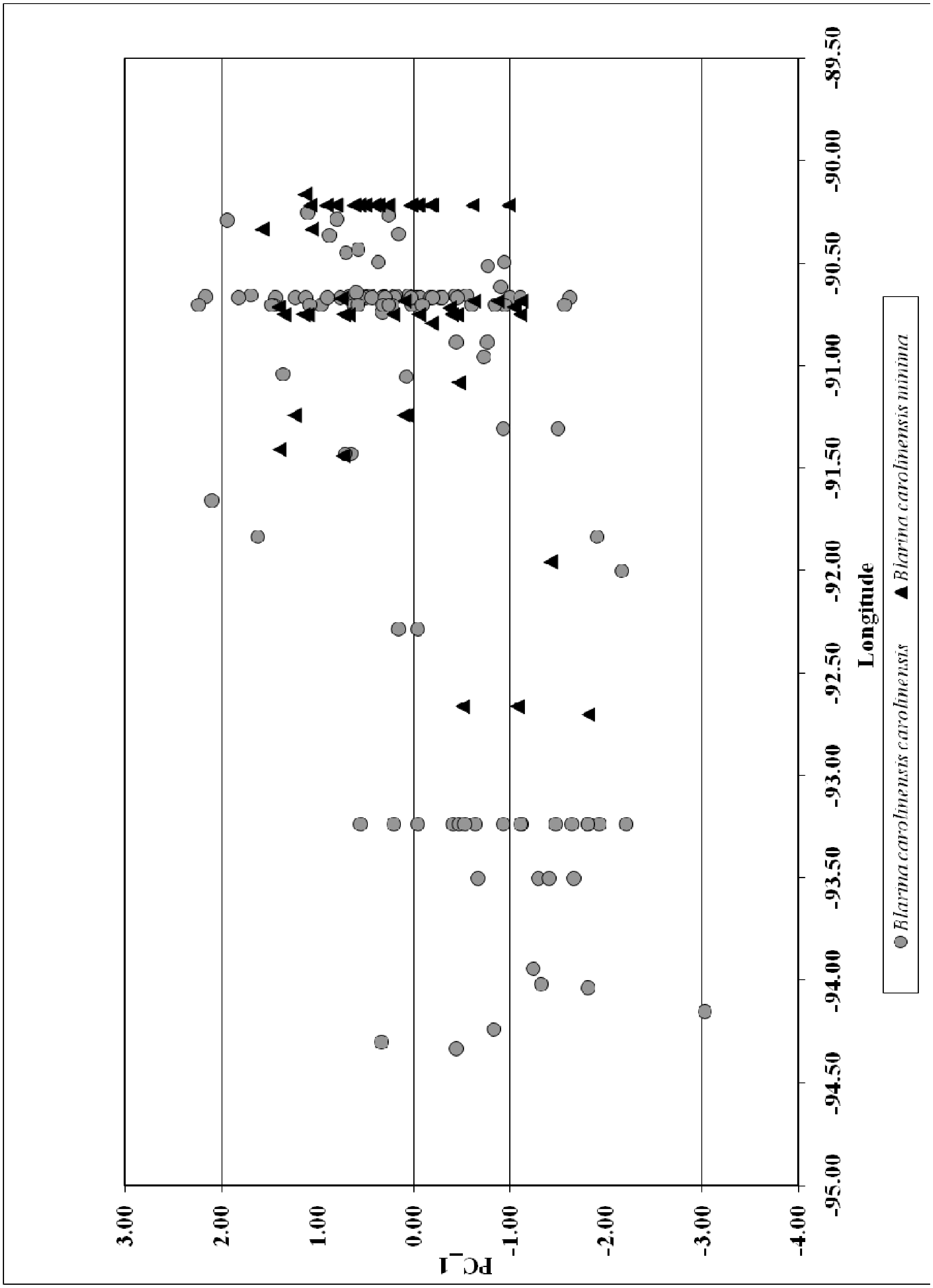
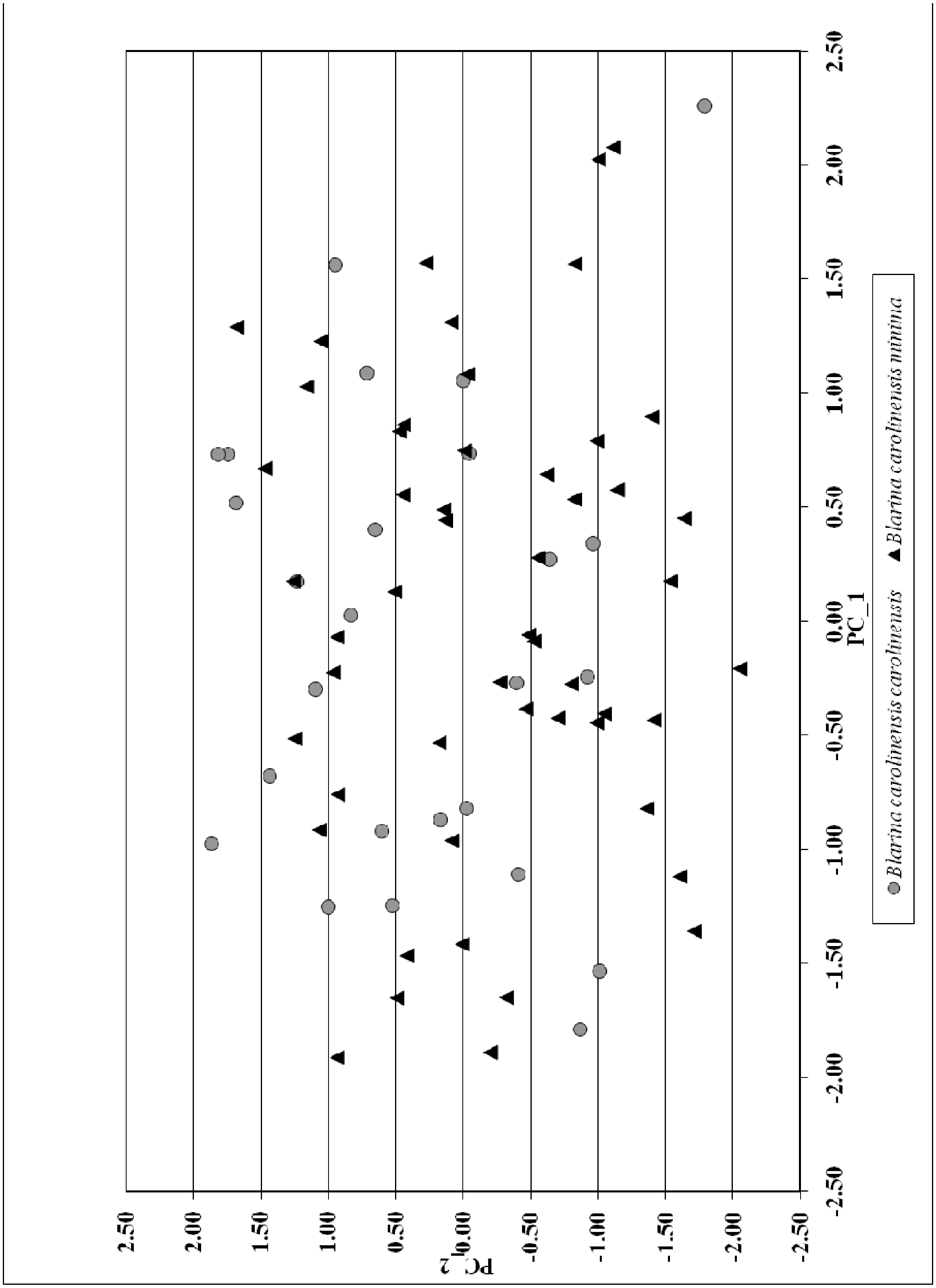

3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
PC_1
32.50
33.00
33.50
34.00
34.50
35.00
35.50
36.00
36.50
37.00
Latitude
Blarina carolinensis carolinensis
Blarina carolinensis minima

Fig. 23 - Longitude and the scores from 1st principal component of the PCA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Arkansas.



PC_1
Longitude
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
-95.00
-94.50
-94.00
-93.50
-93.00
-92.50
-92.00
-91.50
-91.00
-90.50
-90.00
-89.50
Blarina carolinensis carolinensis
Blarina carolinensis minima

Fig. 24 - Scores from 1st and 2nd principal components of the PCA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Mississippi.



PC_1
PC_2
Blarina carolinensis carolinensis
Blarina carolinensis minima

Fig. 25 – Latitude and the scores from 1st principal component of the PCA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Mississippi.

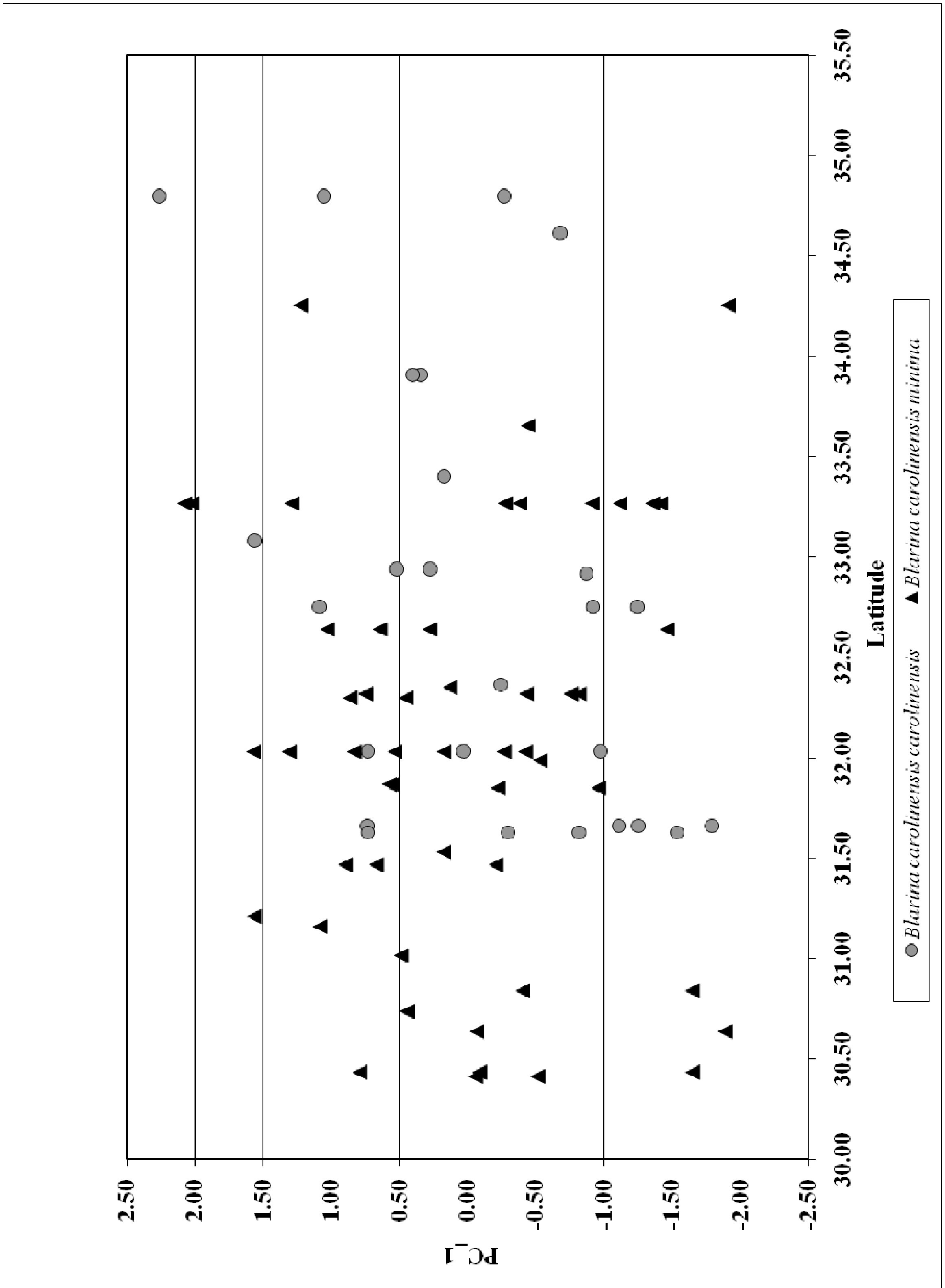

PC_1
Latitude
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
30.00
30.50
31.00
31.50
32.00
32.50
33.00
33.50
34.00
34.50
35.00
35.50
Blarina carolinensis carolinensis
Blarina carolinensis minima

Fig. 26 - Longitude and the scores from 1st principal component of the PCA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Mississippi.

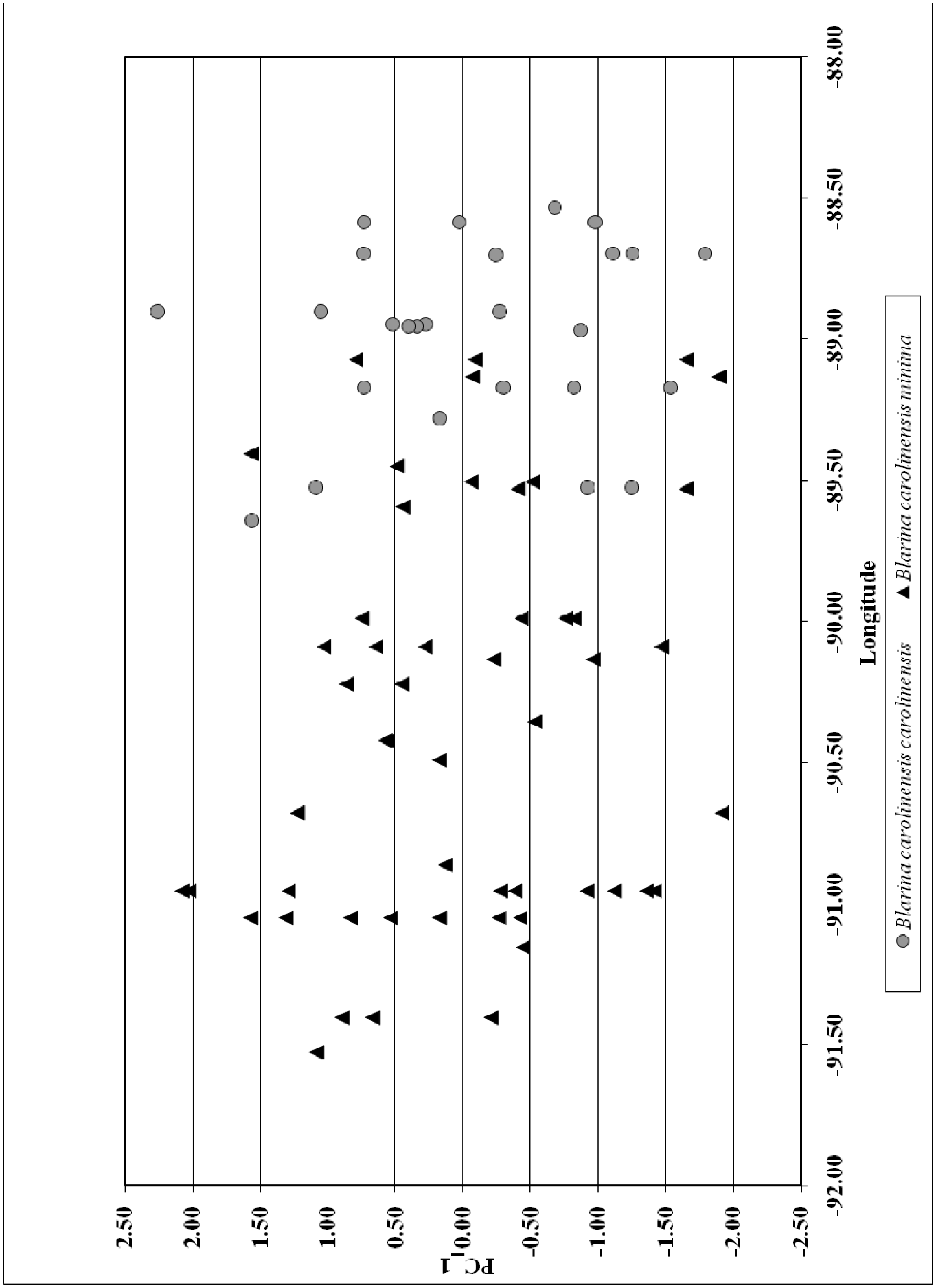

PC_1
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-92.00
-91.50
-91.00
-90.50
-90.00
-89.50
-89.00
-88.50
-88.00
Longitude
Blarina carolinensis carolinensis
Blarina carolinensis minima

Fig. 27 – Latitude and the discriminant scores of function 1 from the DFA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Mississippi.

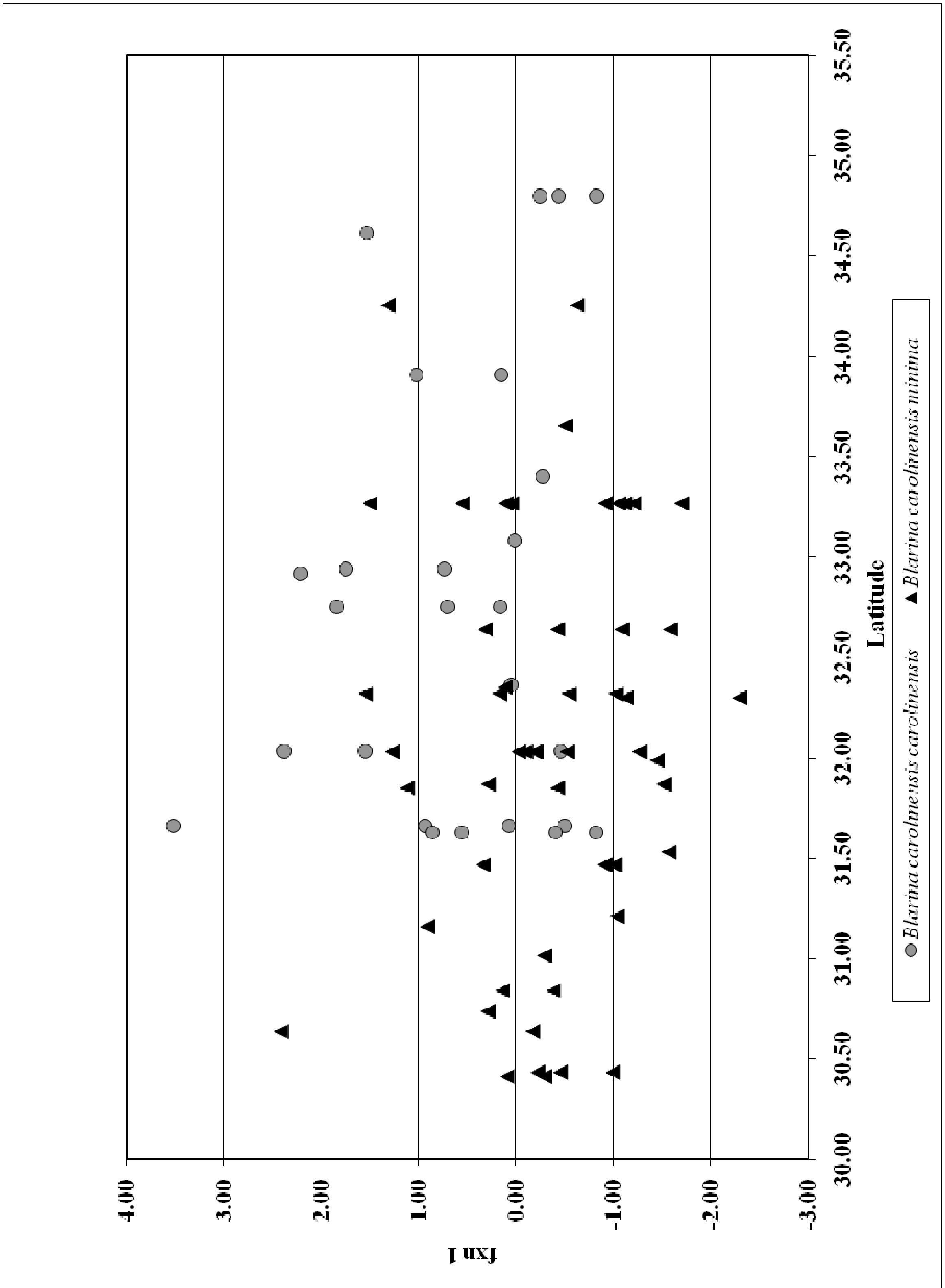
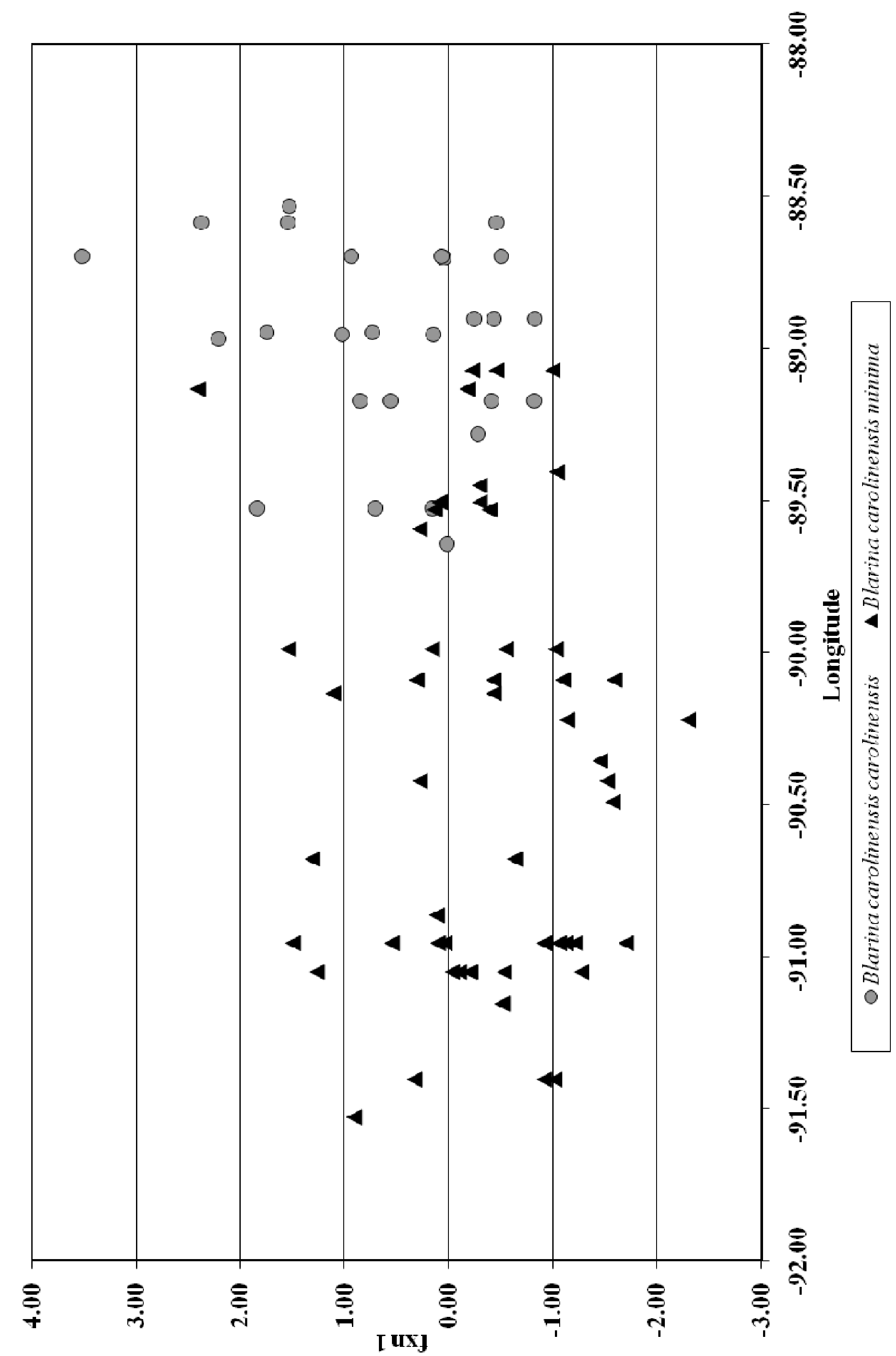
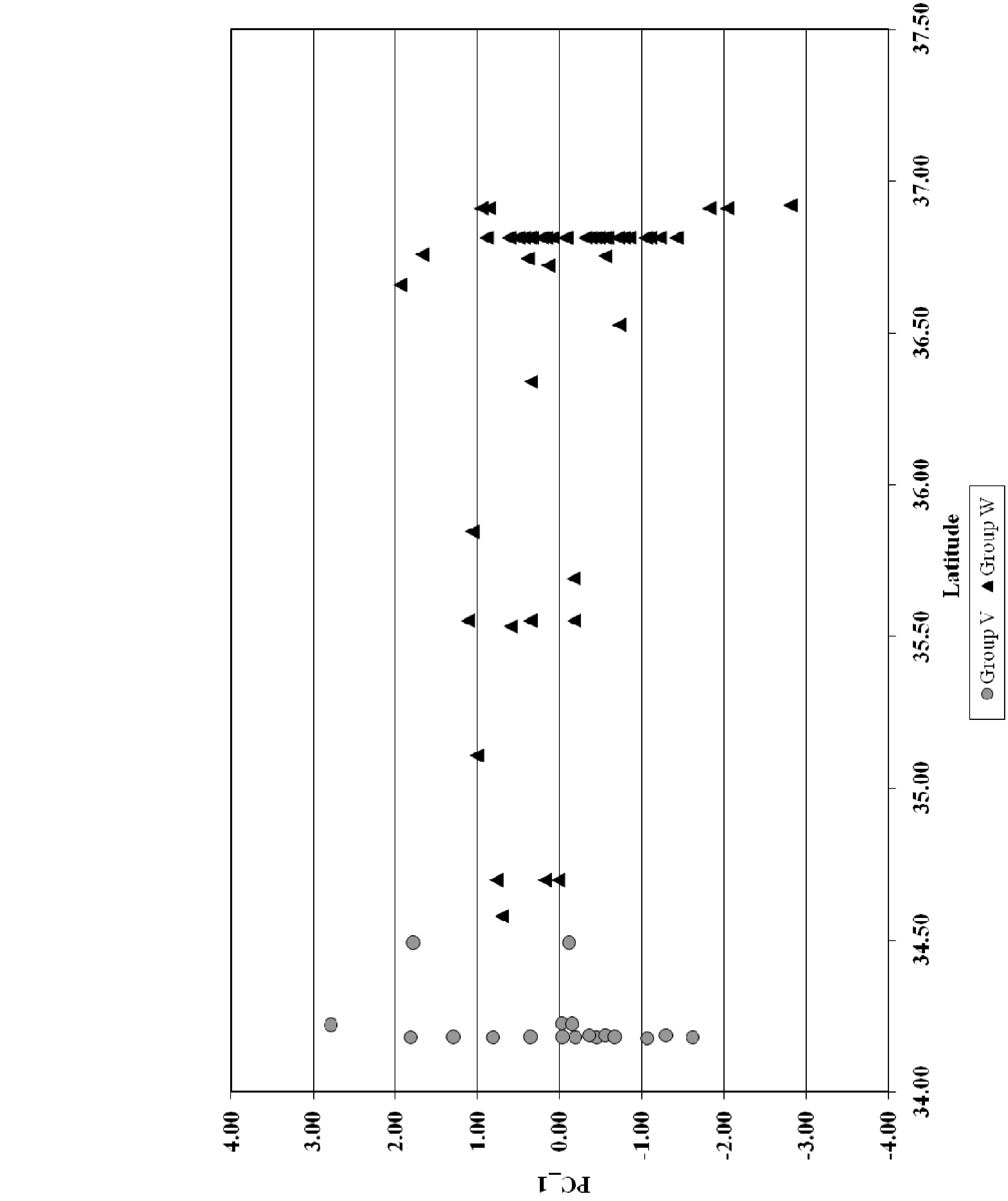

fxn 1
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
30.00
30.50
31.00
31.50
32.00
32.50
33.00
33.50
34.00
34.50
35.00
35.50
Latitude
Blarina carolinensis carolinensis
Blarina carolinensis minima

Fig. 28 - Longitude and the discriminant scores of function 1 from the DFA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis minima* from Mississippi.



Fxn 1
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
Longitude
-92.00
-91.50
-91.00
-90.50
-90.00
-89.50
-89.00
-88.50
-88.00
Blarina carolinensis carolinensis
Blarina carolinensis minima

Fig. 29 – Latitude and the scores from the 1st principal component of the PCA, based on the measurements of the *Blarina carolinensis* from groups V and W. Group V is located in southeastern North Carolina. Group W is located in northeastern North Carolina and southeastern Virginia.



PC_1
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
34.00
34.50
35.00
35.50
36.00
36.50
37.00
37.50
Latitude
Group V
Group W

Fig. 30 – Longitude and the scores from the 1st principal component of the PCA, based on the measurements of the *Blarina carolinensis* from groups V and W. Group V is located in southeastern North Carolina. Group W is located in northeastern North Carolina and southeastern Virginia.

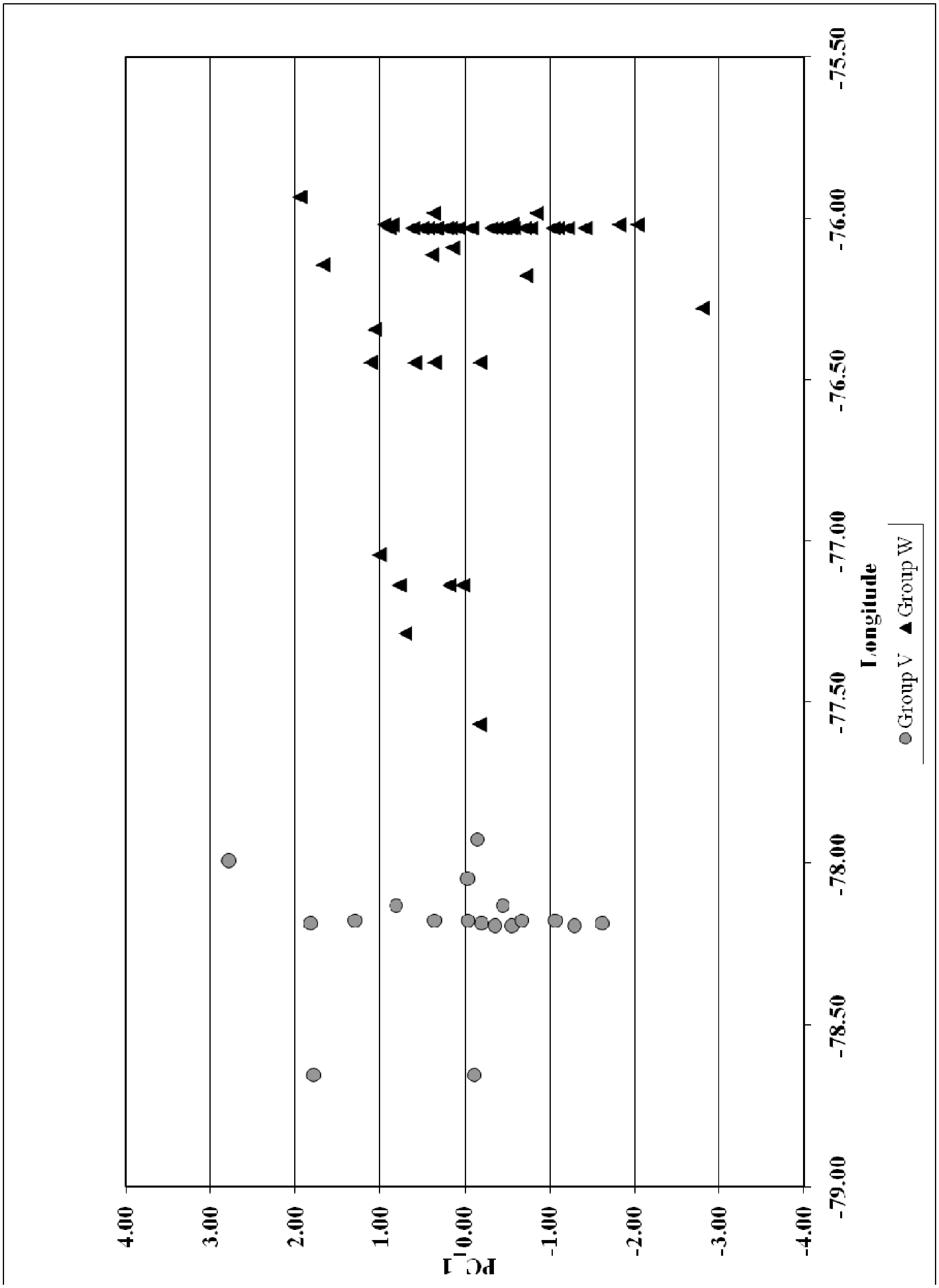

PC_1
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
-79.00
-78.50
-78.00
-77.50
-77.00
-76.50
-76.00
-75.50
Longitude
Group V
Group W

Fig. 31 – Latitude and the scores from the 1st principle component of the PCA, based on the measurements of the *Blarina carolinensis* from groups W and X. Group W is located in northeastern North Carolina and southeastern Virginia. Group X is west of group W in central North Carolina with a small portion extending into southcentral Virginia.

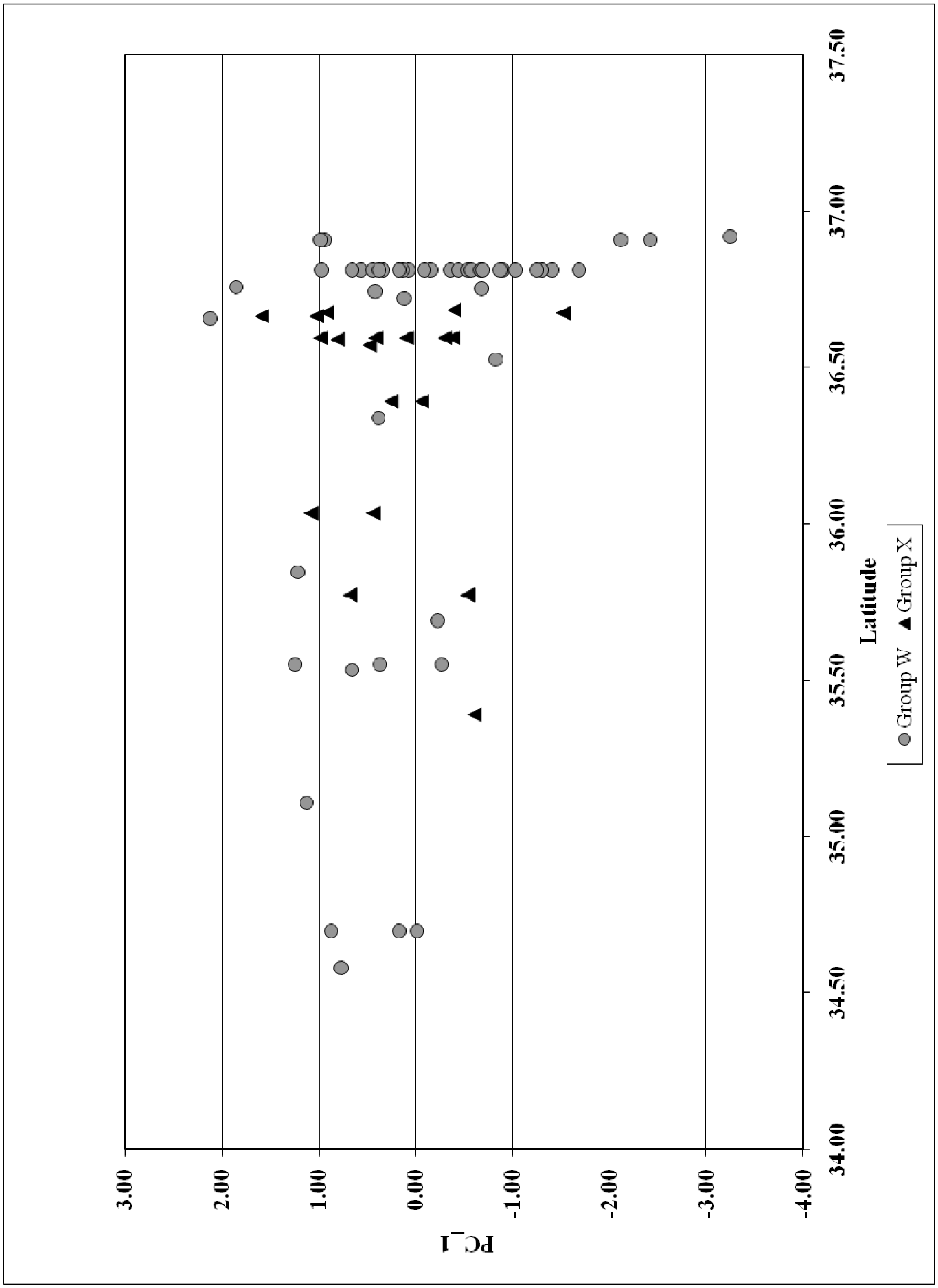

PC_1
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
34.00
34.50
35.00
35.50
36.00
36.50
37.00
37.50
Latitude
Group W
Group X

Fig. 32 - Longitude and the scores from the 1st principle component of the PCA, based on the measurements of the *Blarina carolinensis* from groups W and X. Group W is located in northeastern North Carolina and southeastern Virginia. Group X is west of group W in central North Carolina with a small portion extending into southcentral Virginia.

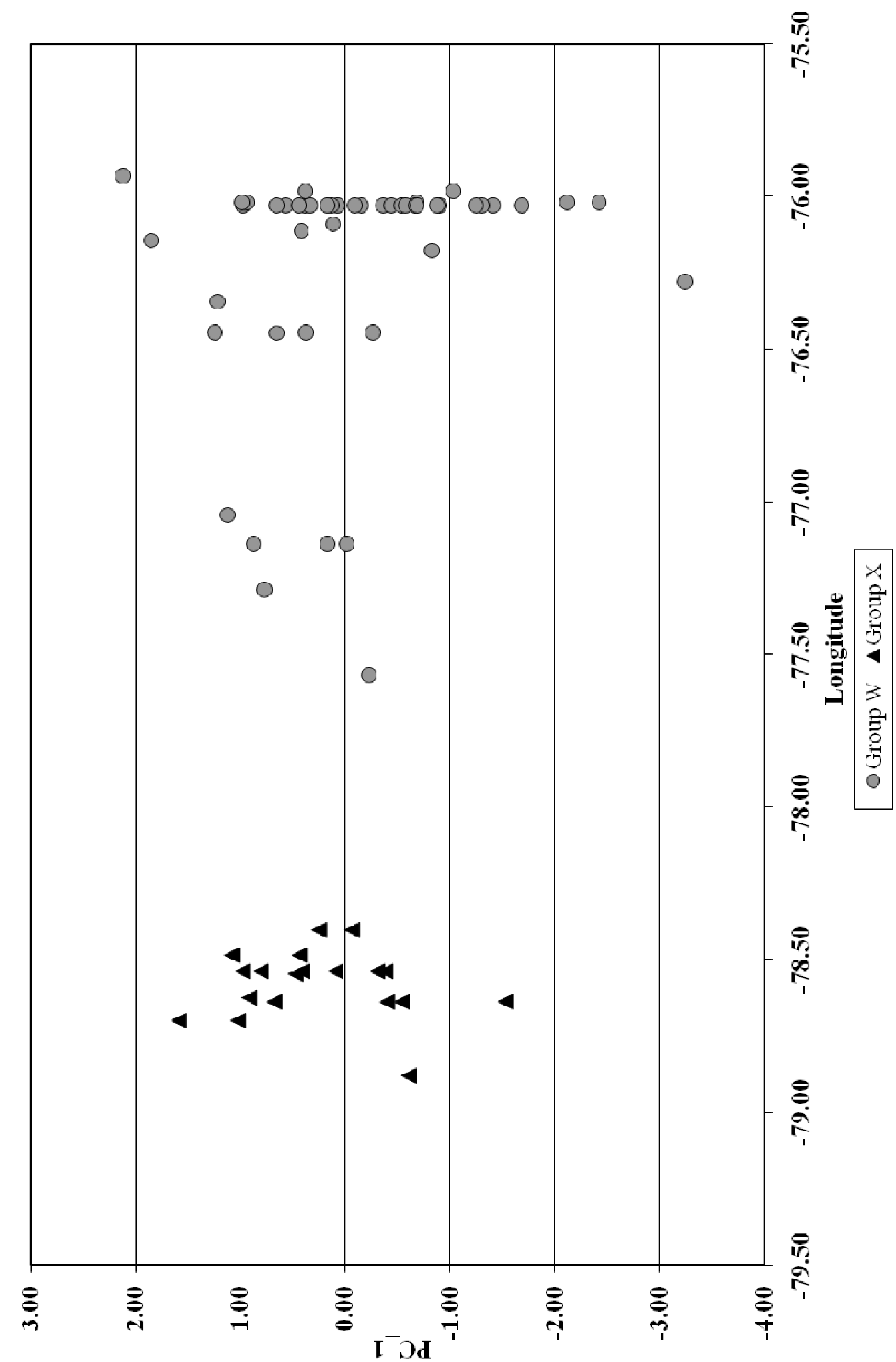

PC_1
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
Longitude
-79.50
-79.00
-78.50
-78.00
-77.50
-77.00
-76.50
-76.00
-75.50
Group W
Group X

Fig. 33 – Latitude and the scores from the 1st principal component of the PCA, based on the measurements of the *Blarina carolinensis* from groups Y and W. Group Y is located in westcentral North Carolina. Group W is located in northeastern North Carolina and southeastern Virginia.

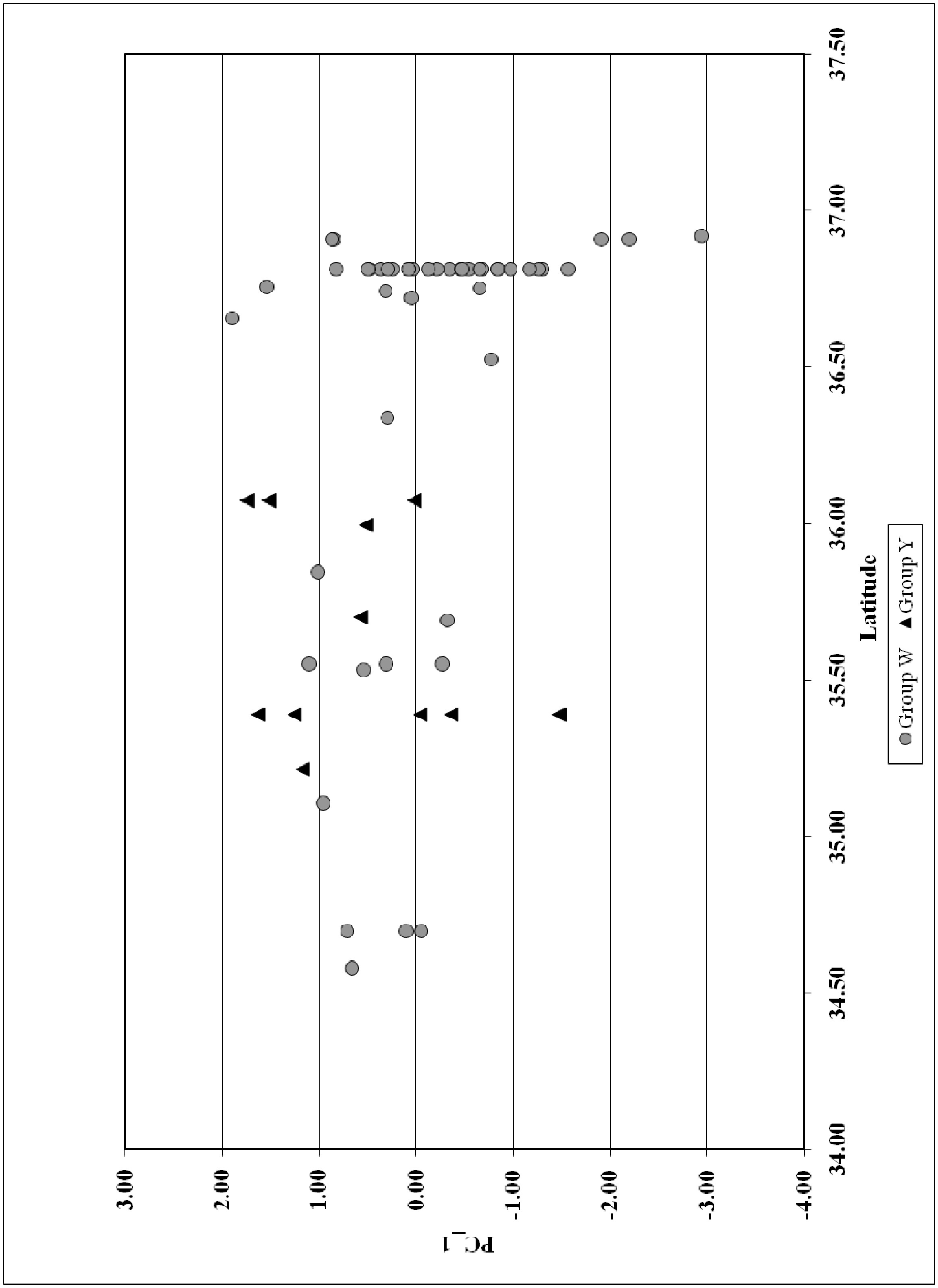

PC_1
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
34.00
34.50
35.00
35.50
36.00
36.50
37.00
37.50
Latitude
Group W
Group Y

Fig. 34 - Longitude and the scores from the 1st principal component of the PCA, based on the measurements of the *Blarina carolinensis* from groups Y and W. Group Y is located in westcentral North Carolina. Group W is located in northeastern North Carolina and southeastern Virginia.

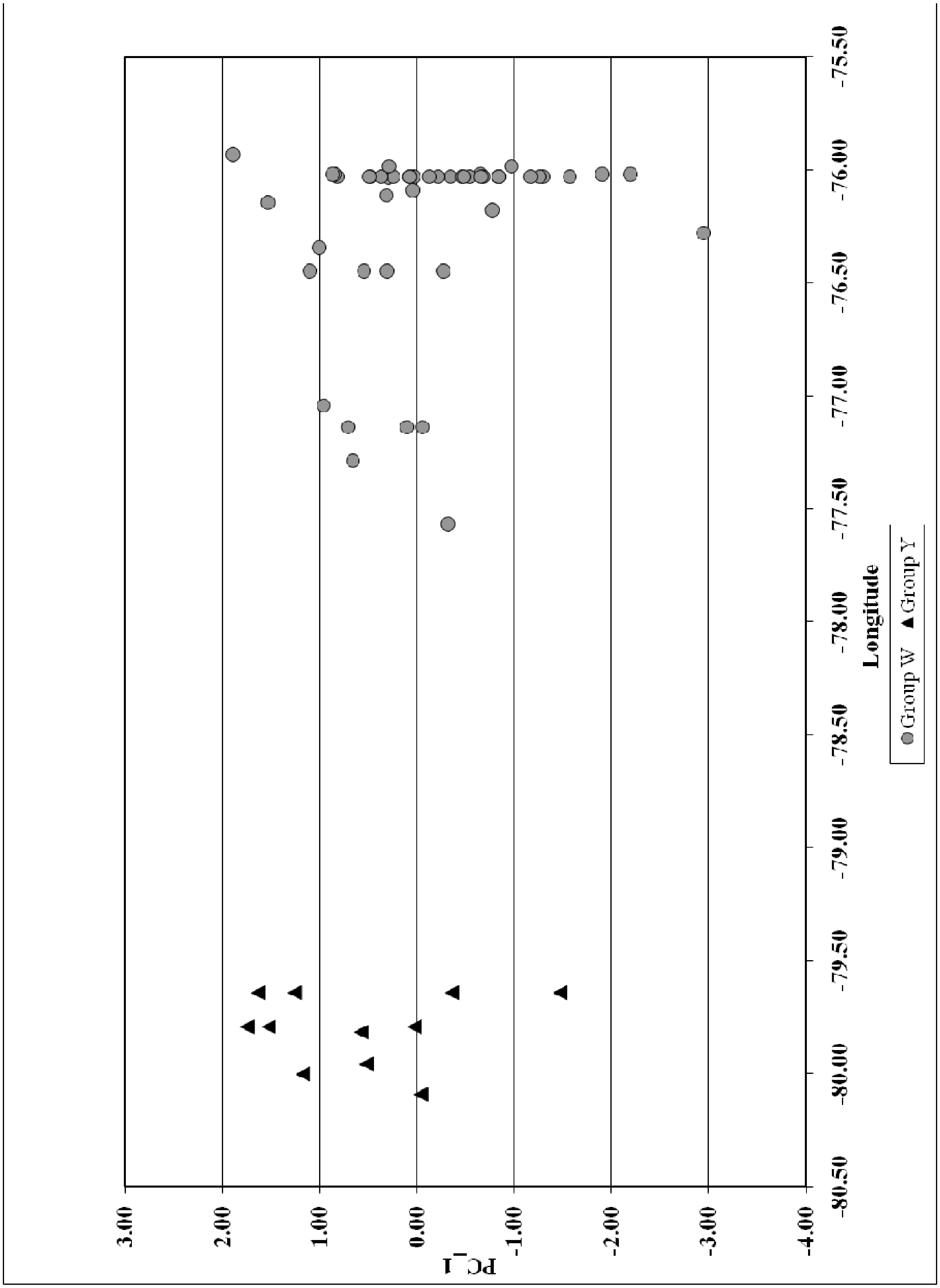

PC_1
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
-80.50
-80.00
-79.50
-79.00
-78.50
-78.00
-77.50
-77.00
-76.50
-76.00
-75.50
Longitude
Group W
Group Y

Fig. 35 – Discriminant scores of function 1 and function 2 from the DFA, based on the measurements of *Blarina carolinensis* from groups V, W, X, and Y. Group V is located in southeastern North Carolina. Group W is located in northeastern North Carolina and southeastern Virginia. Group X is west of group W in central North Carolina with a small portion extending into southcentral Virginia. Group Y is located in westcentral North Carolina.

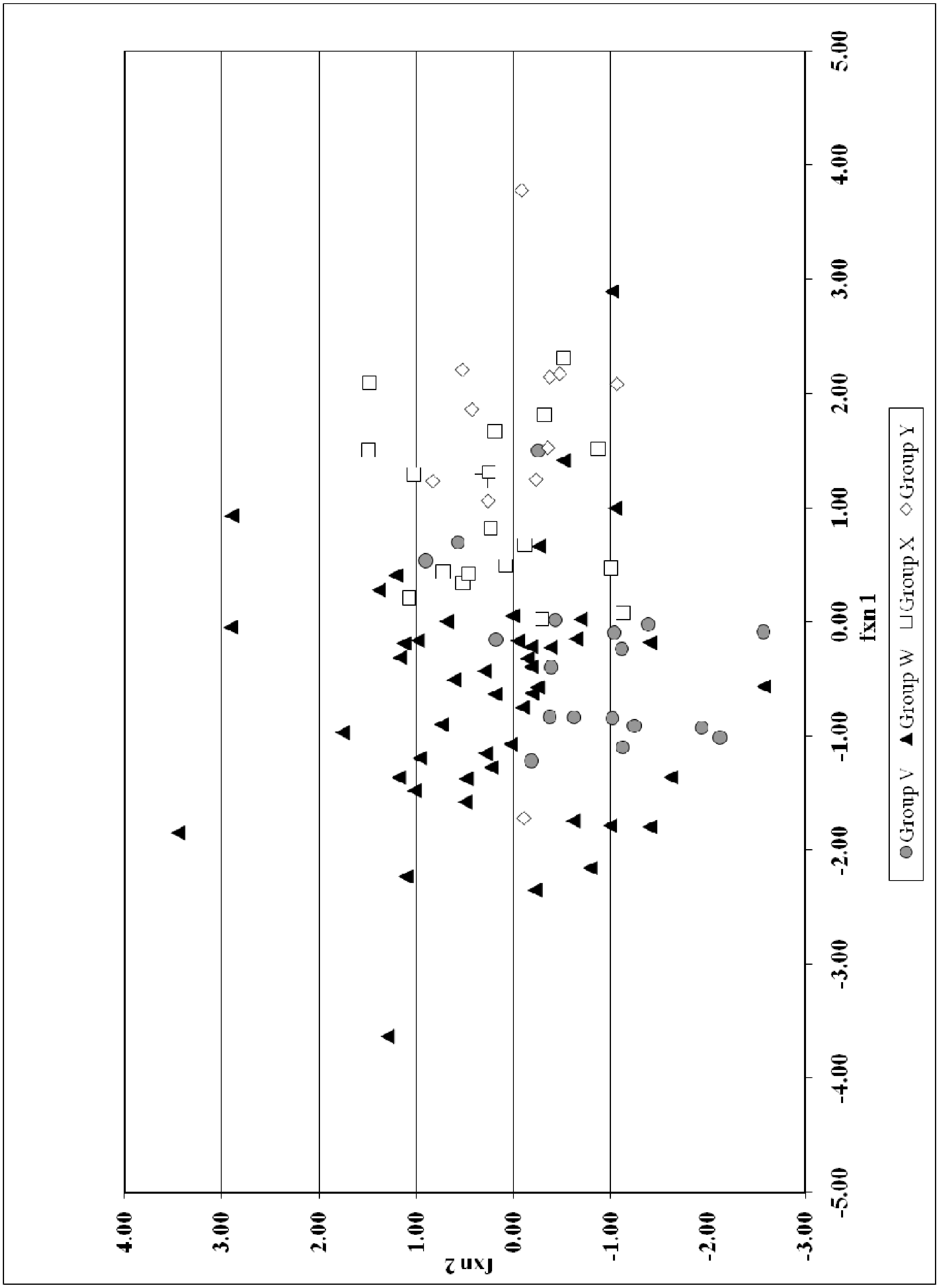

fxn 1
fxn 2
-5.00
-4.00
-3.00
-2.00
-1.00
0.00
1.00
2.00
3.00
4.00
5.00
Group V
Group W
Group X
Group Y

Fig. 36 - Latitude and the discriminant scores of function 1 from the DFA, based on the measurements of *Blarina carolinensis* from groups V, W, X, and Y. Group V is located in southeastern North Carolina. Group W is located in northeastern North Carolina and southeastern Virginia. Group X is west of group W in central North Carolina with a small portion extending into southcentral Virginia. Group Y is located in westcentral North Carolina.

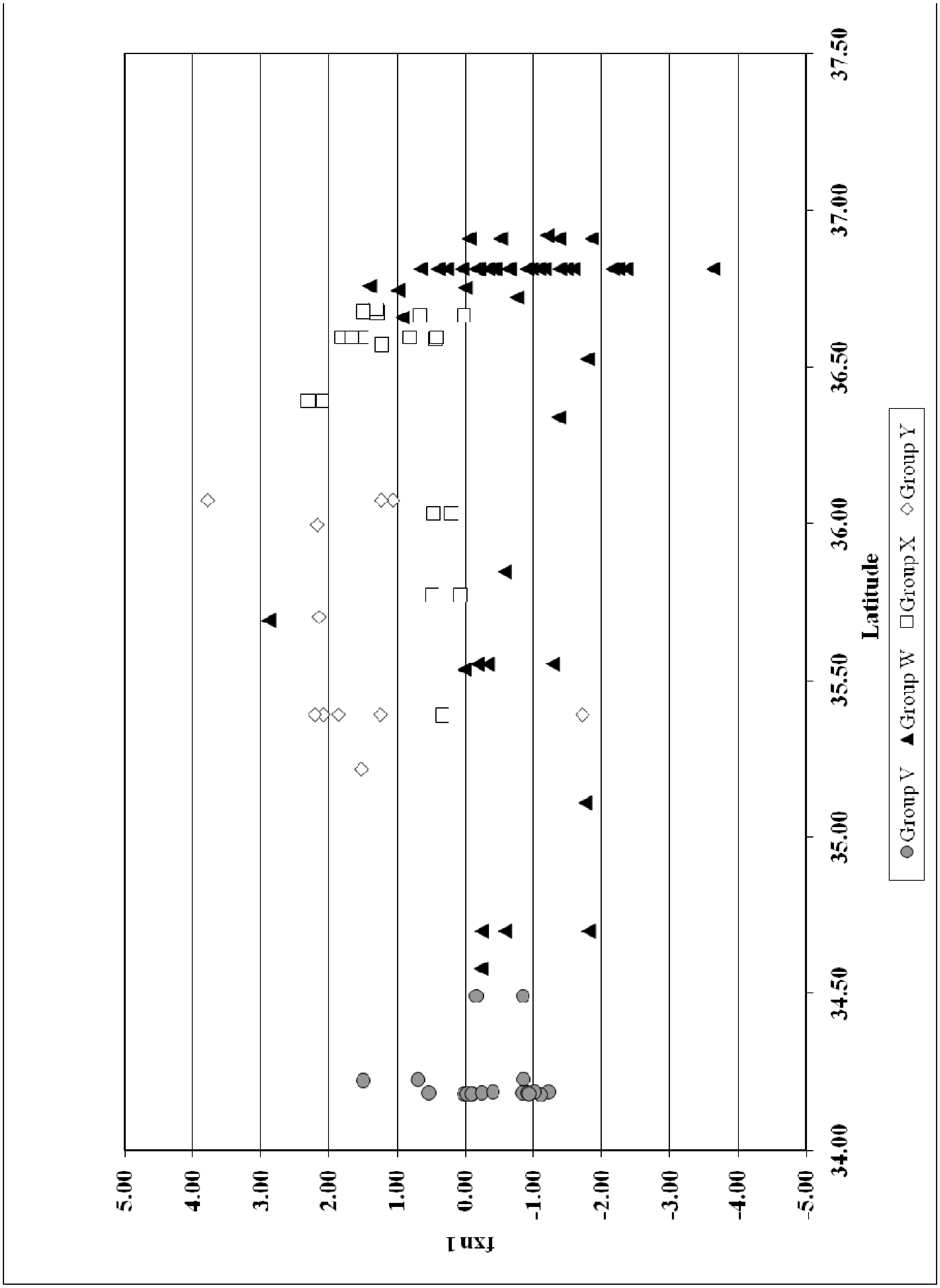
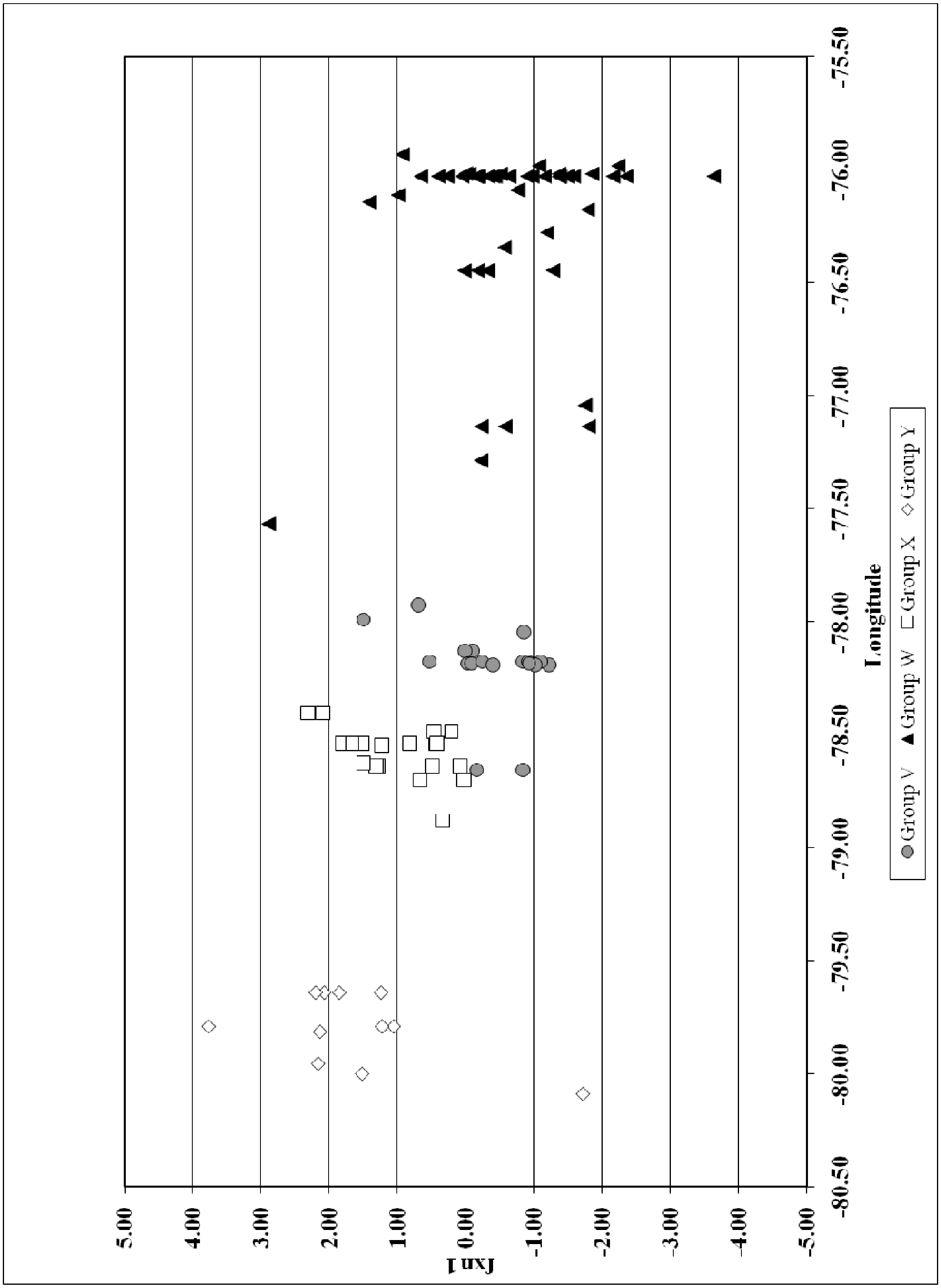

fxn 1
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
-5.00
34.00
34.50
35.00
35.50
36.00
36.50
37.00
37.50
Latitude
Group V
Group W
Group X
Group Y

Fig. 37 - Longitude and the discriminant scores of function 1 from the DFA, based on the measurements of *Blarina carolinensis* from groups V, W, X, and Y. Group V is located in southeastern North Carolina. Group W is located in northeastern North Carolina and southeastern Virginia. Group X is west of group W in central North Carolina with a small portion extending into southcentral Virginia. Group Y is located in westcentral North Carolina.



Fxn 1
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
-5.00
-80.50
-80.00
-79.50
-79.00
-78.50
-78.00
-77.50
-77.00
-76.50
-76.00
-75.50
Longitude
Group V
Group W
Group X
Group Y

Fig. 38 – Scores from the 1st and 2nd principal components of the PCA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis peninsulae* from Florida.

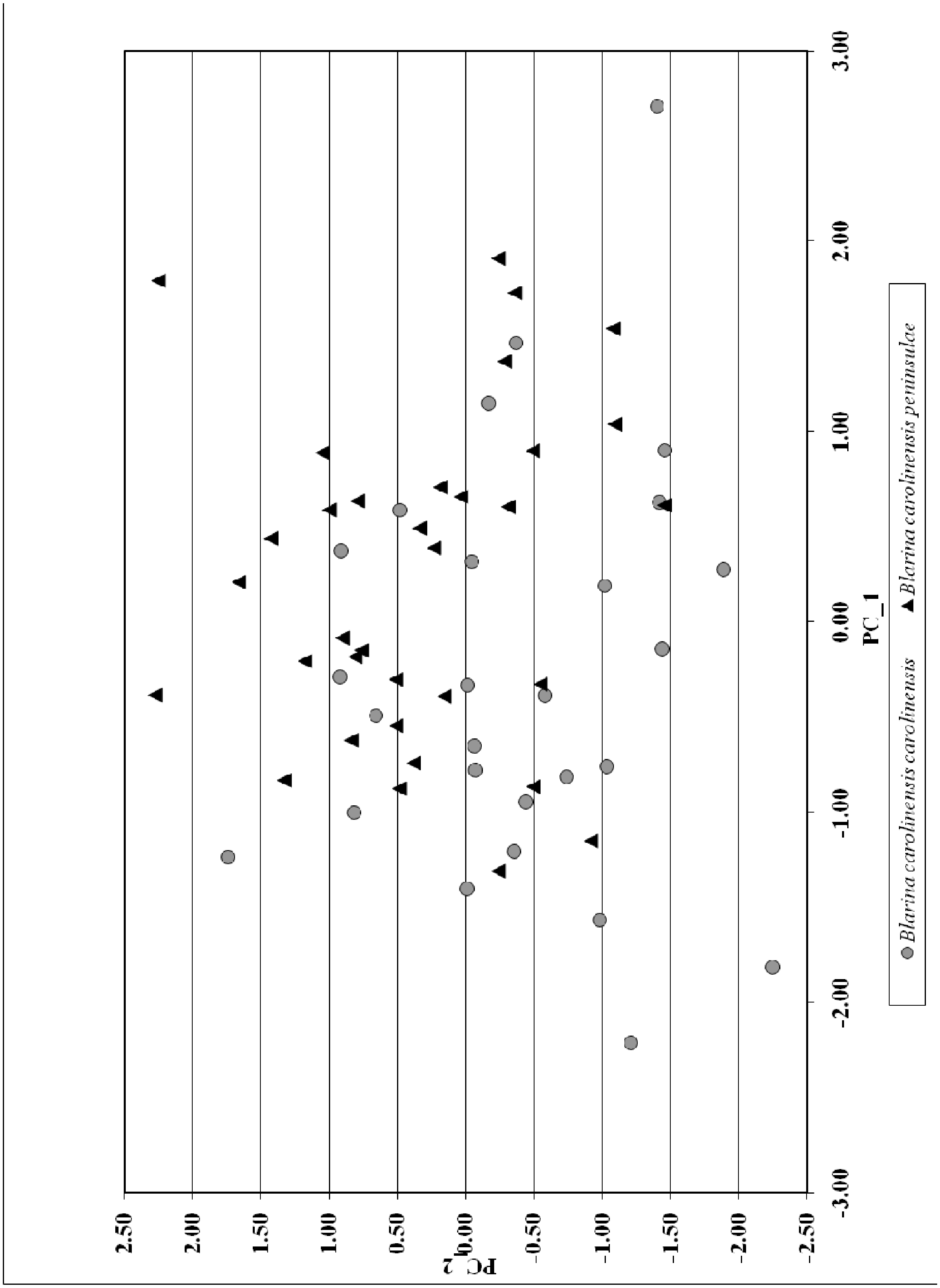

PC_1
PC_2
-3.00
-2.00
-1.00
0.00
1.00
2.00
3.00
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
Blarina carolinensis carolinensis
Blarina carolinensis peninsulae

Fig. 39 –Latitude and the scores from the 1st principal component of the PCA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis peninsulae* from Florida.

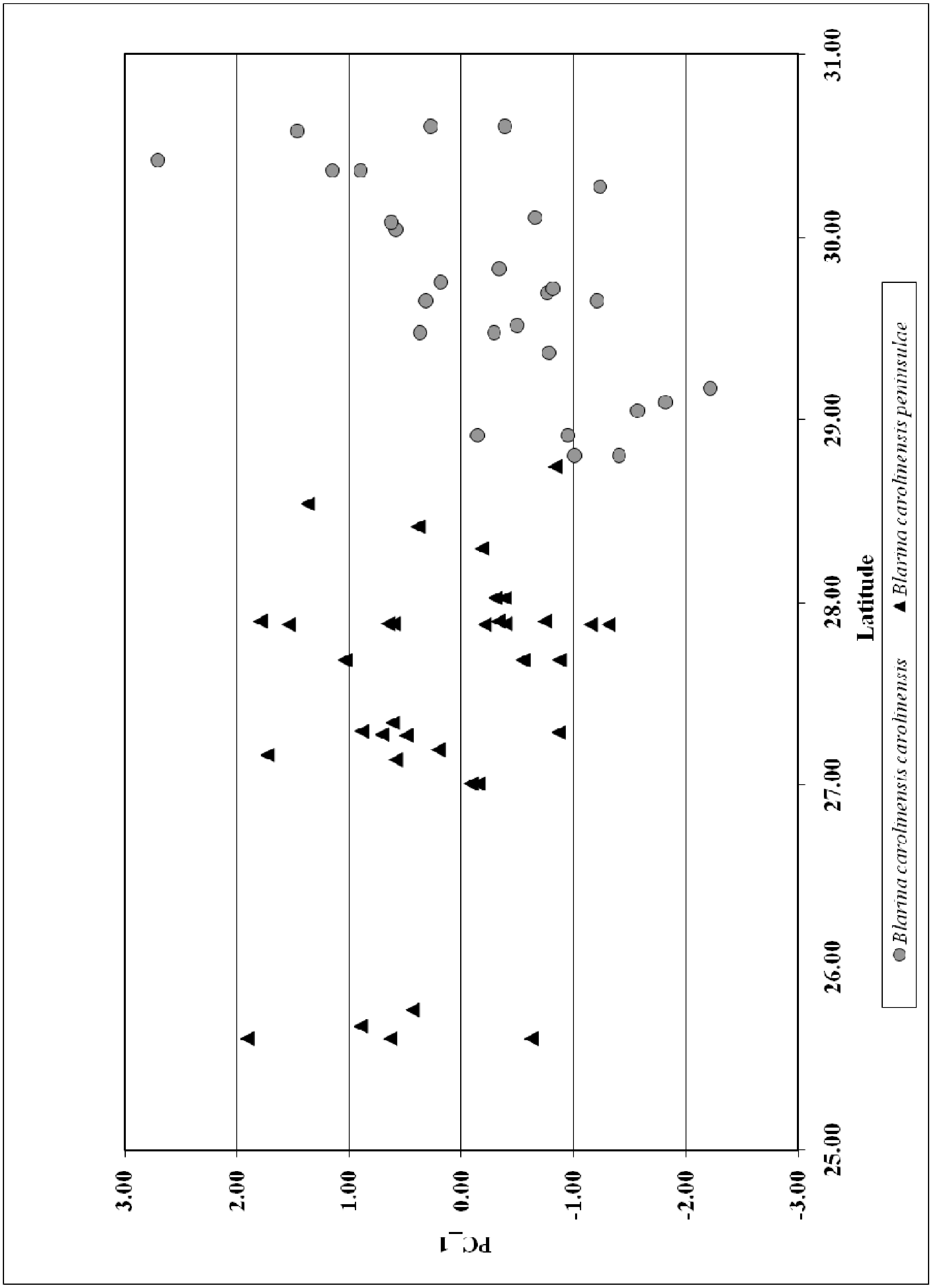

PC_1
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
25.00
26.00
27.00
28.00
29.00
30.00
31.00
Latitude
Blarina carolinensis carolinensis
Blarina carolinensis peninsulae

Fig. 40 - Longitude and the scores from the 1st principal component of the PCA, based on the measurements of *Blarina carolinensis carolinensis* and *Blarina carolinensis peninsulae* from Florida.

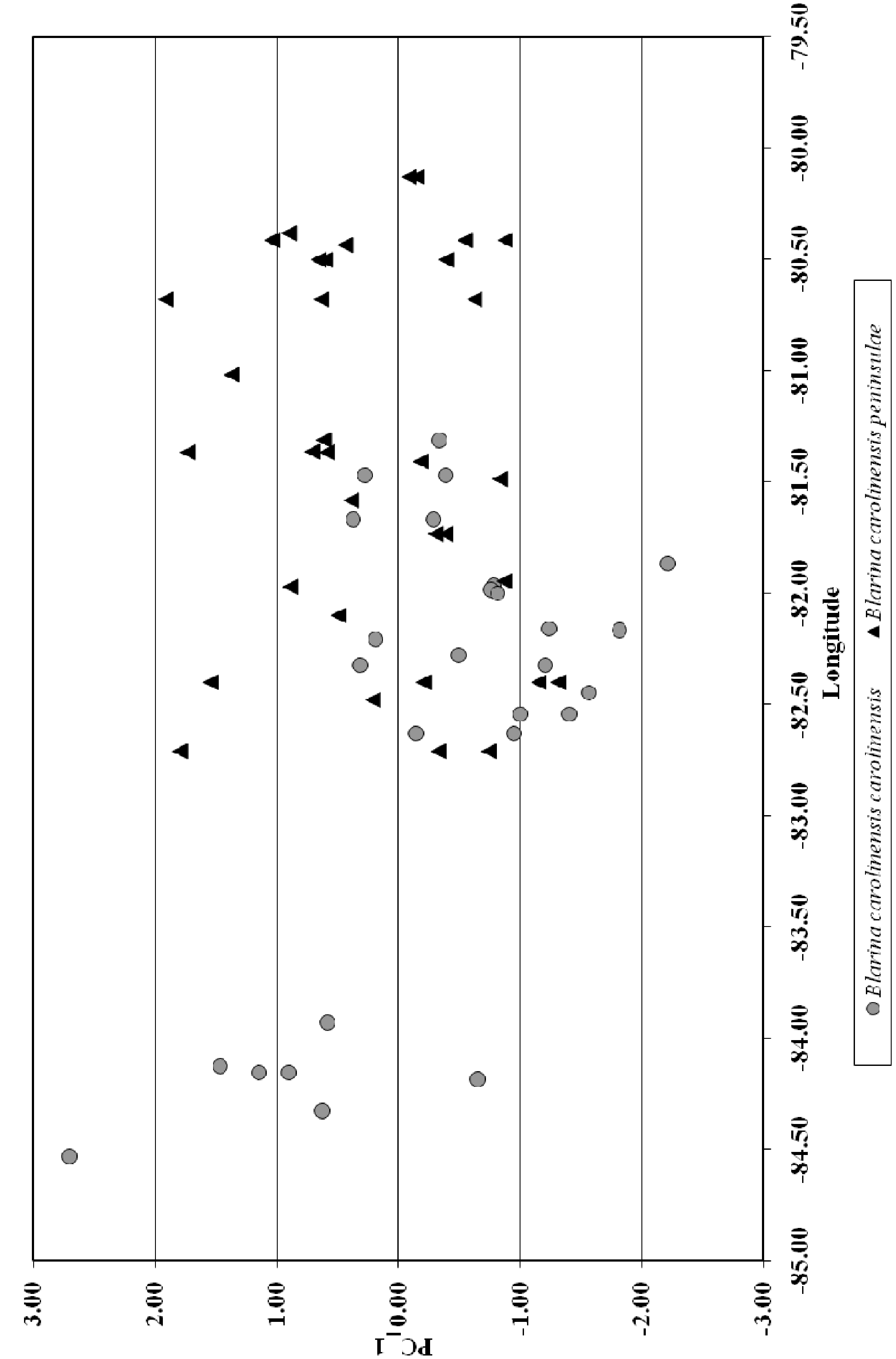

PC_1
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-85.00
-84.50
-84.00
-83.50
-83.00
-82.50
-82.00
-81.50
-81.00
-80.50
-80.00
-79.50
Longitude
Blarina carolinensis carolinensis
Blarina carolinensis peninsulae

Fig. 41 – Scores from the 1st and 2nd principal components of the PCA, based on the measurements of the *Blarina carolinensis* from groups Q and R. Group Q is located in northwestern Florida and southeastern Georgia. Group R is located in northeastern and central Florida.

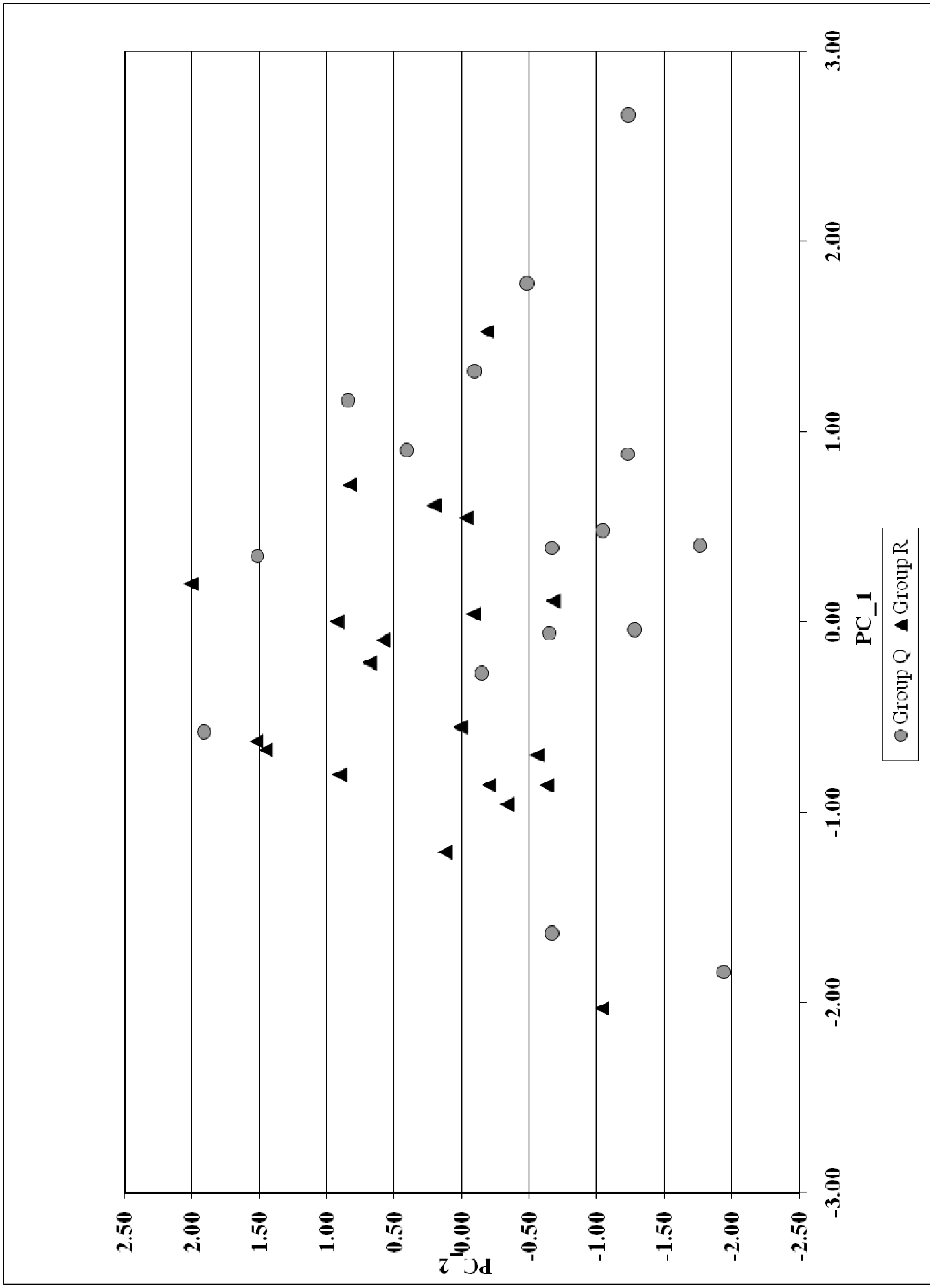

PC_2
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
PC_1
-3.00
-2.00
-1.00
0.00
1.00
2.00
3.00
Group Q
Group R

Fig. 42 - Latitude and the scores from the 1st principal component of the PCA, based on the measurements of the *Blarina carolinensis* from groups Q and R. Group Q is located in northwestern Florida and southeastern Georgia. Group R is located in northeastern and central Florida.

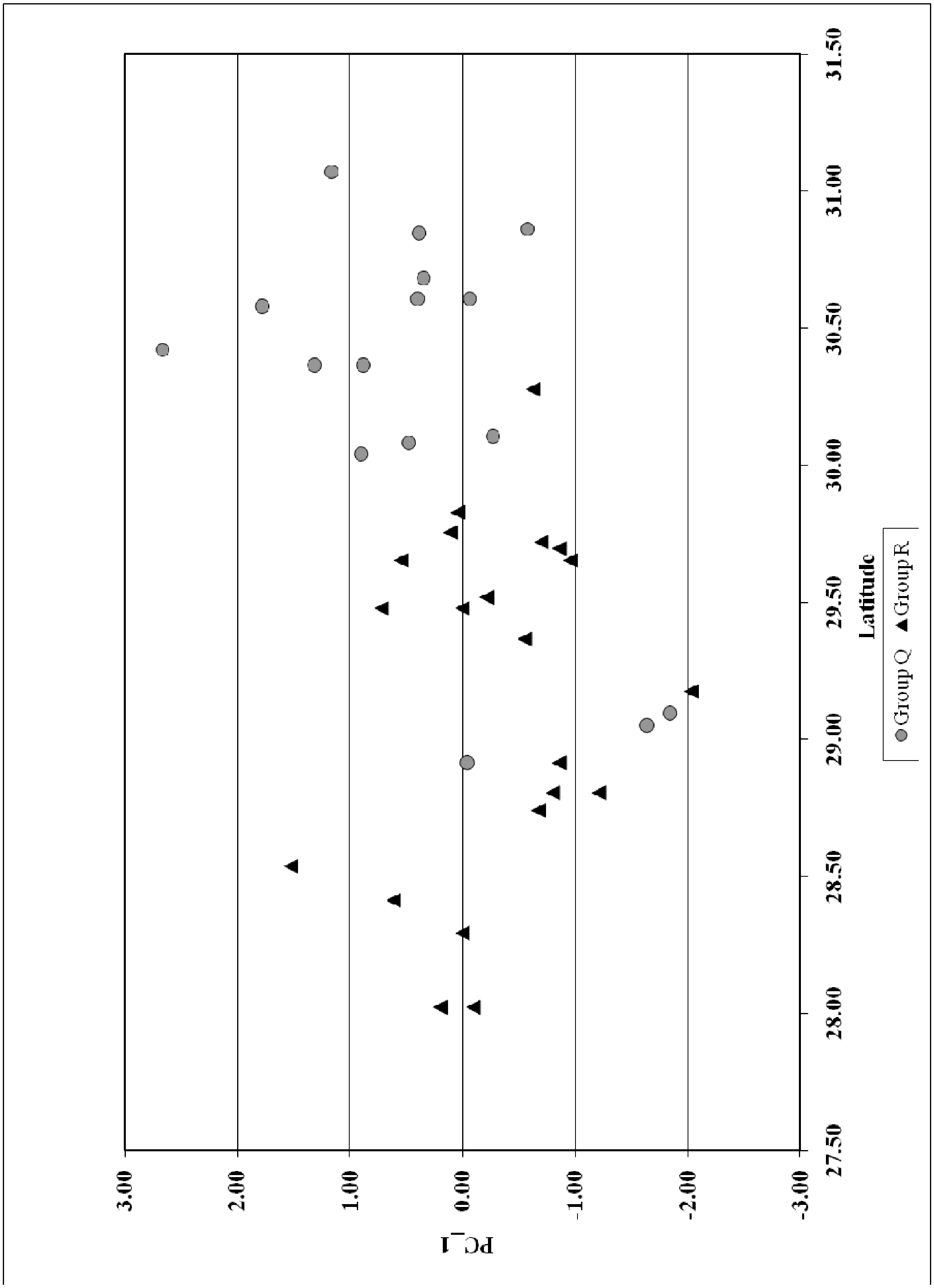
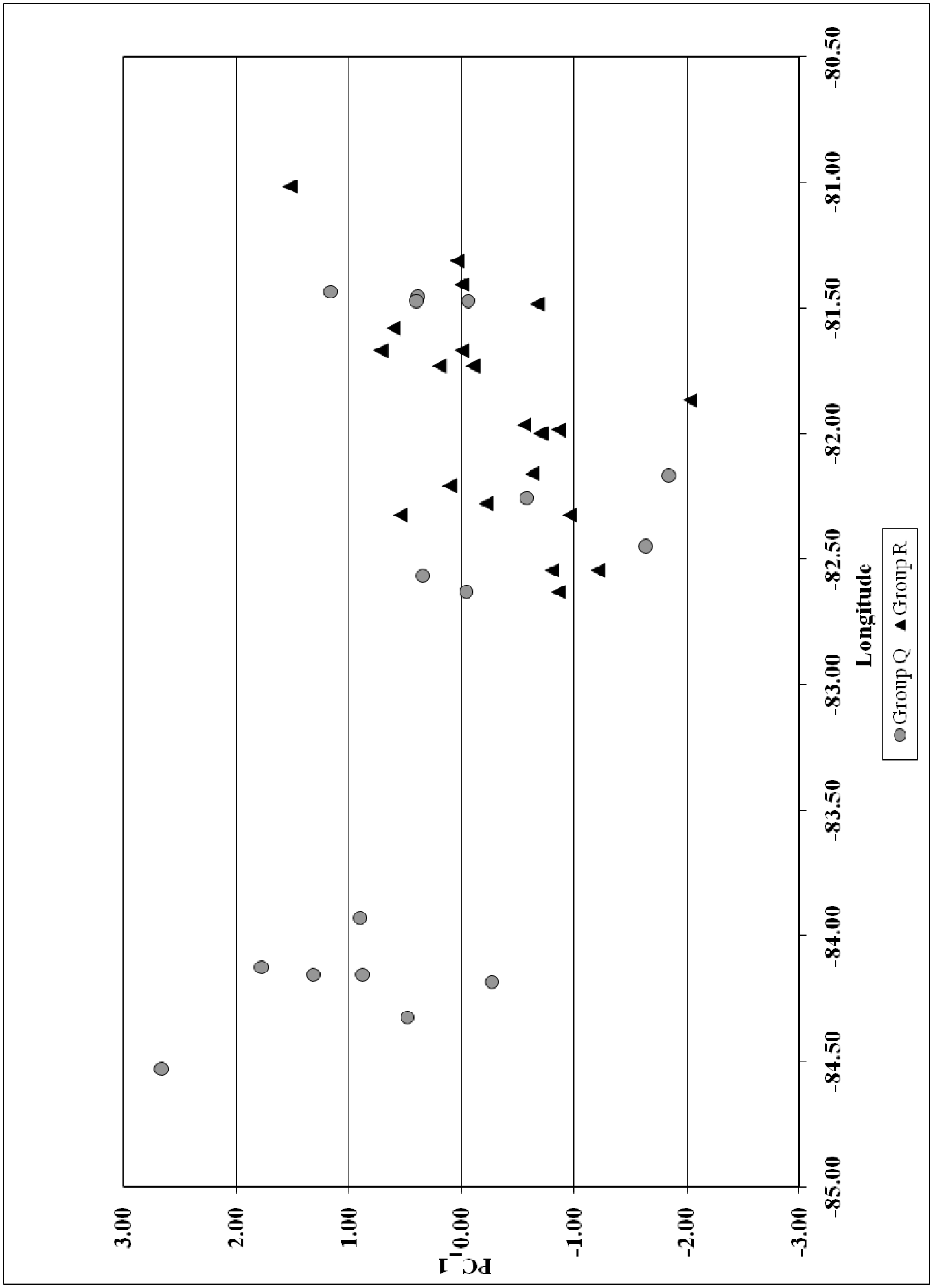
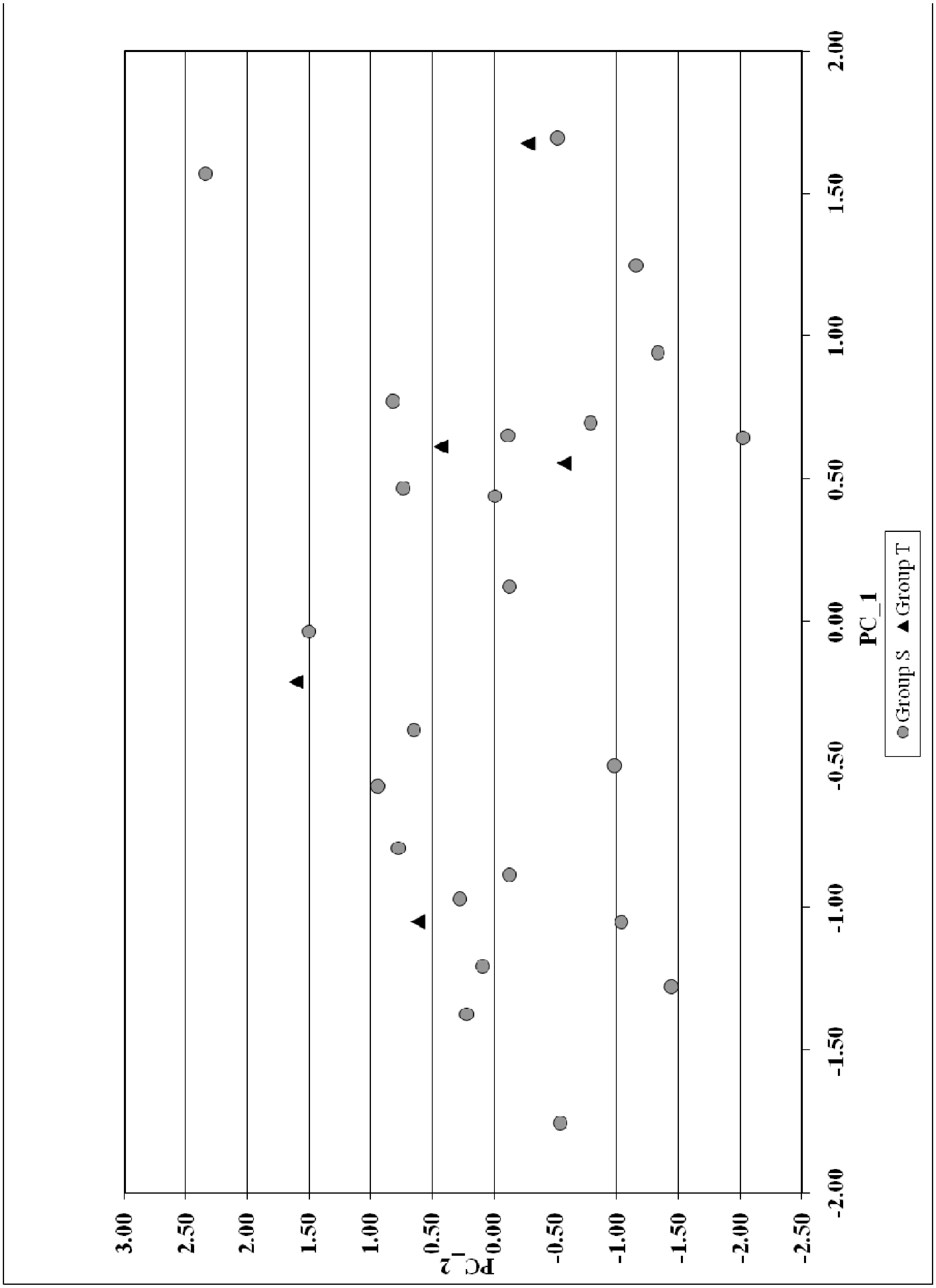

PC_1
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
27.50
28.00
28.50
29.00
29.50
30.00
30.50
31.00
31.50
Latitude
Group Q
Group R

Fig. 43 - Longitude and the scores from the 1st principal component of the PCA, based on the measurements of the *Blarina carolinensis* from groups Q and R. Group Q is located in northwestern Florida and southeastern Georgia. Group R is located in northeastern and central Florida.



PC_1
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-85.00
-84.50
-84.00
-83.50
-83.00
-82.50
-82.00
-81.50
-81.00
-80.50
Longitude
Group Q
Group R

Fig. 44 - Scores from the 1st and 2nd principal components of the PCA, based on the measurements of the *Blarina carolinensis* from groups S and T. Group S is located across southcentral Florida. Group T is located in southeastern Florida.



PC_2
3.00
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
PC_1
-2.00
-1.50
-1.00
-0.50
0.00
0.50
1.00
1.50
2.00
Group S
Group T

Fig. 45 - Latitude and the scores from the 1st principal component of the PCA, based on the measurements of the *Blarina carolinensis* from groups S and T. Group S is located across southcentral Florida. Group T is located in southeastern Florida.

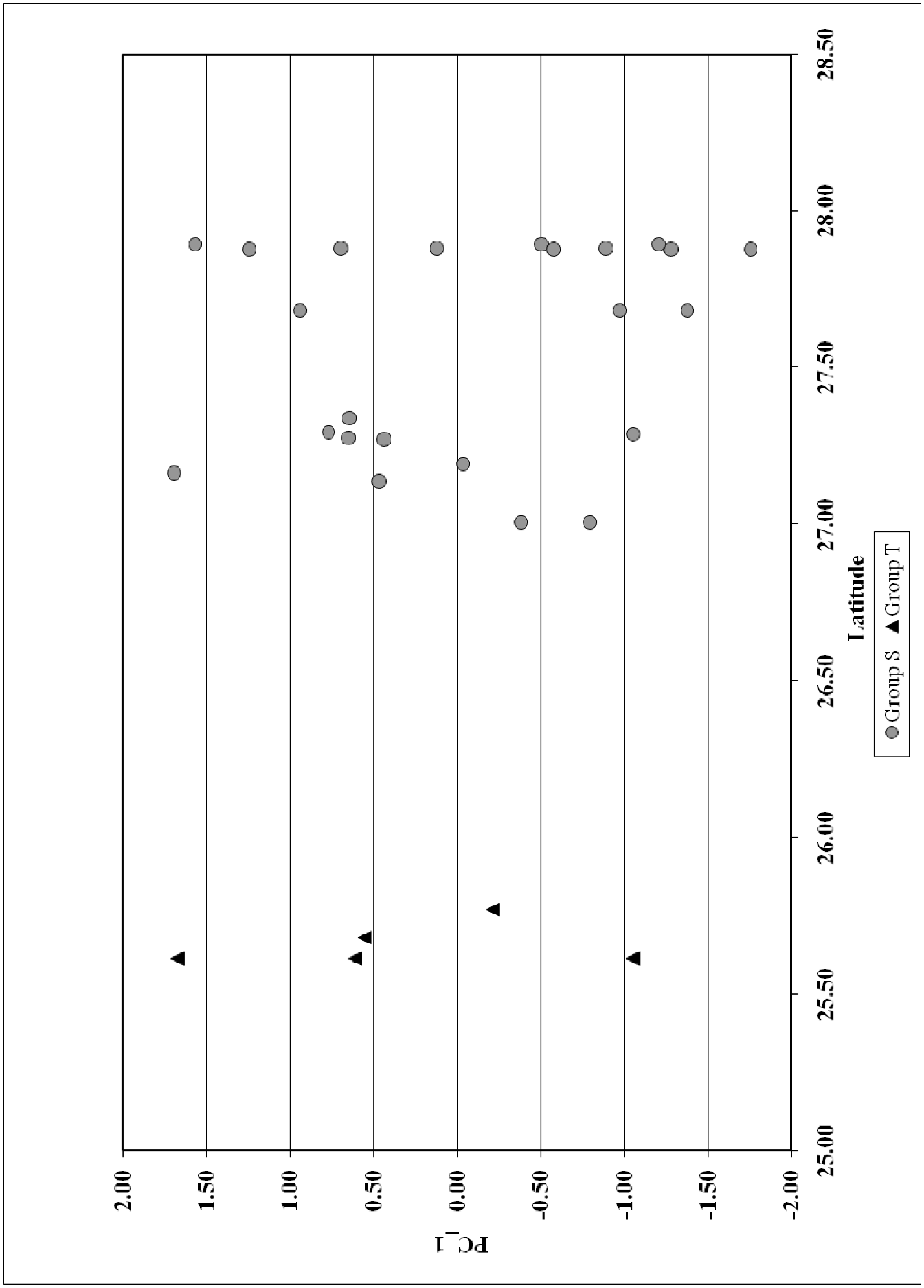
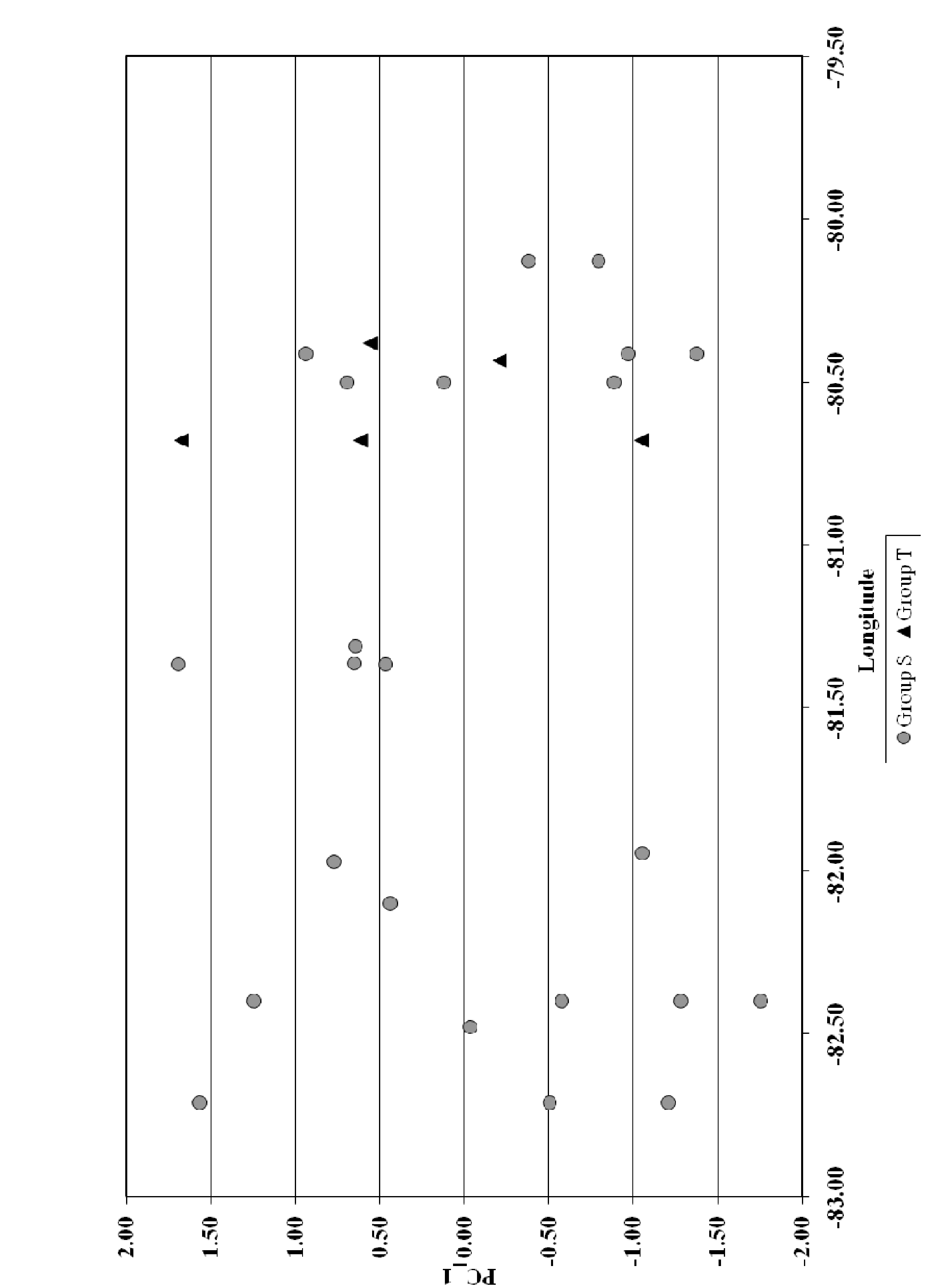
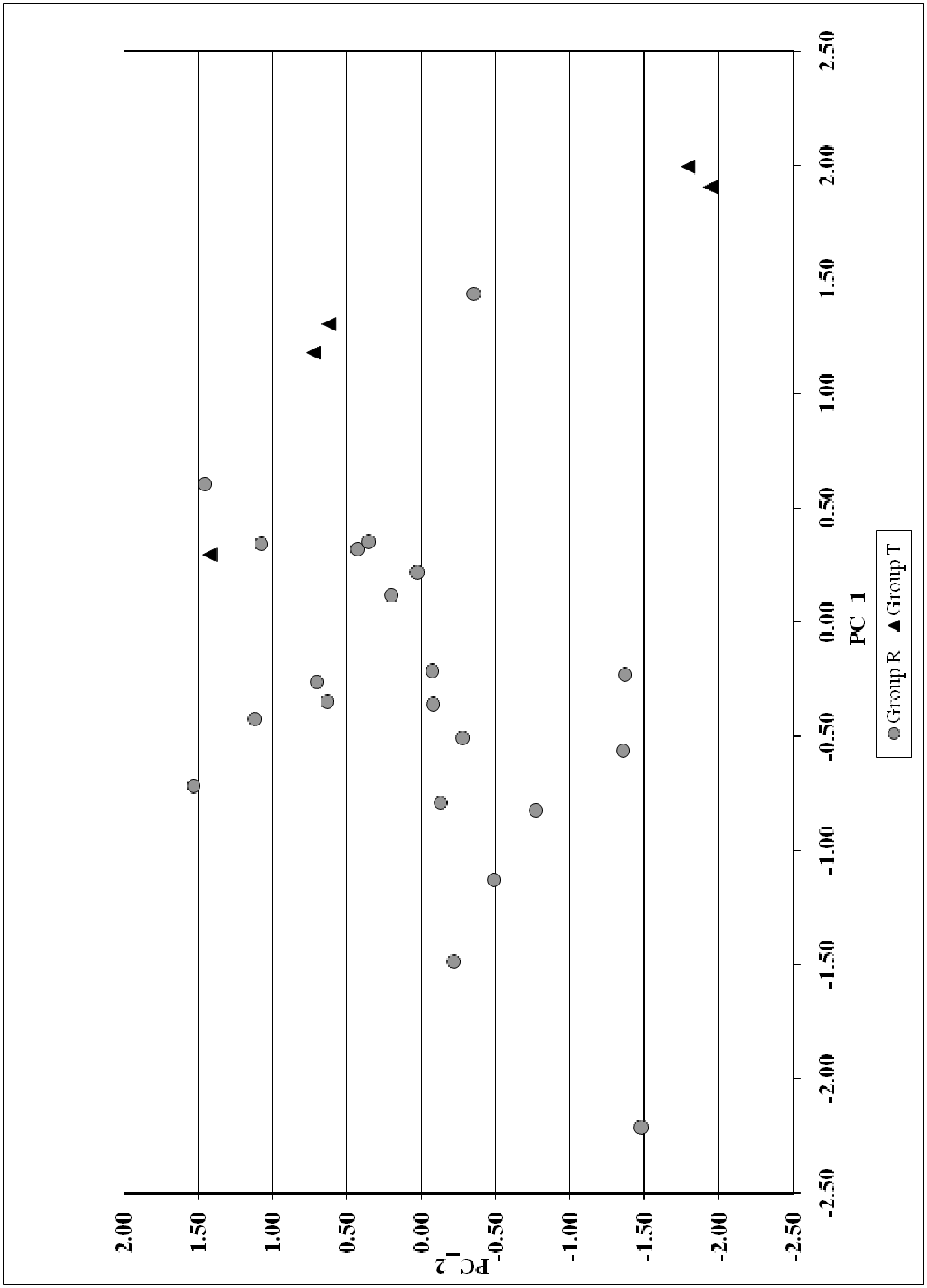

PC_1
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
25.00
25.50
26.00
26.50
27.00
27.50
28.00
28.50
Latitude
Group S
Group T

Fig. 46 - Longitude and the scores from the 1st principal component of the PCA, based on the measurements of the *Blarina carolinensis* from groups S and T. Group S is located across southcentral Florida. Group T is located in southeastern Florida.



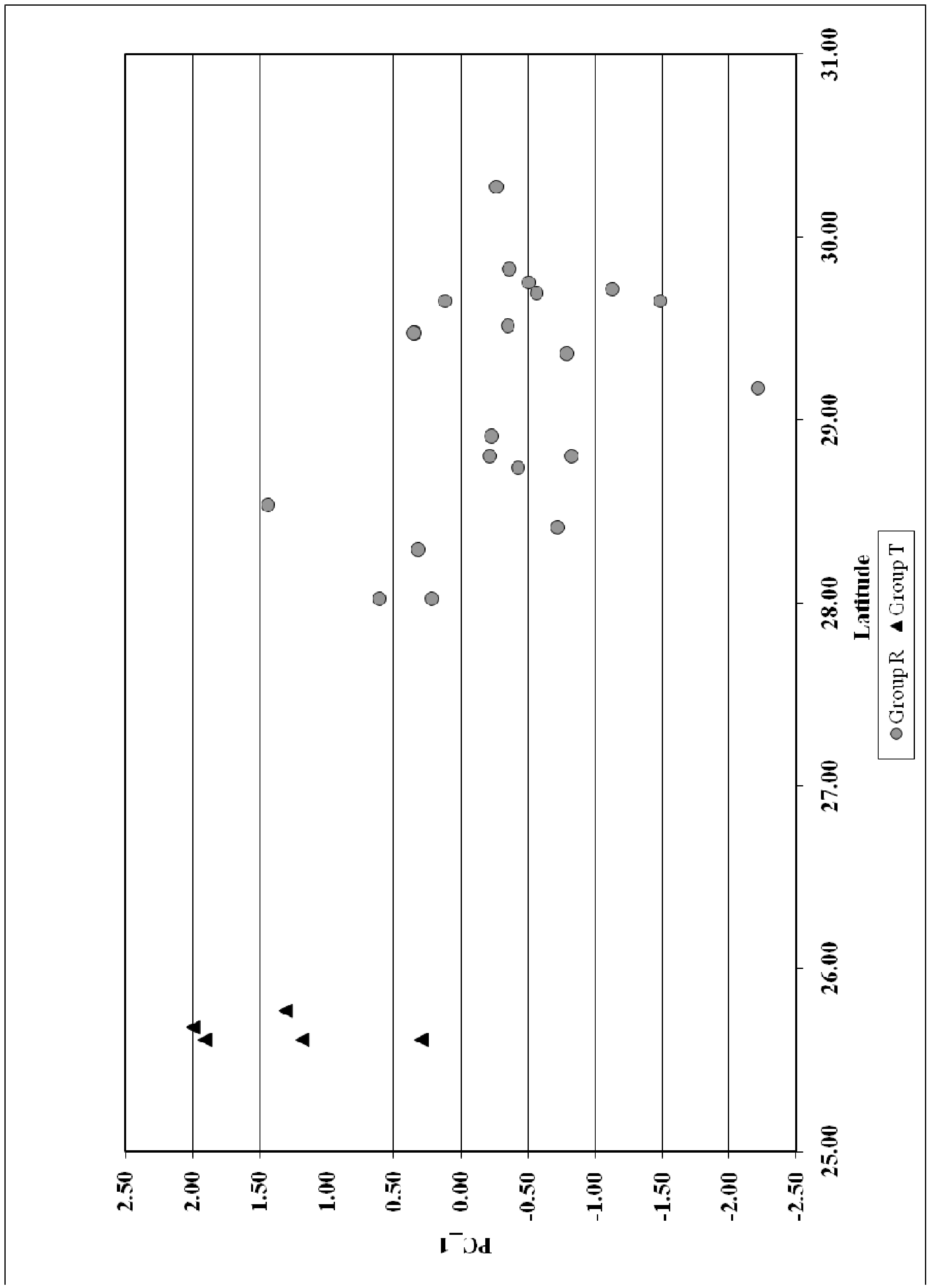
PC_1
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-83.00
-82.50
-82.00
-81.50
-81.00
-80.50
-80.00
-79.50
Longitude
Group S
Group T

Fig. 47 – Scores from the 1st and 2nd principal components of the PCA, based on the measurements of the *Blarina carolinensis* from groups R and T. Group R is located in northeastern and central Florida. Group T is located in southeastern Florida.



PC_1
PC_2
Group R
Group T
-2.50
-2.00
-1.50
-1.00
-0.50
0.00
0.50
1.00
1.50
2.00
2.50

Fig. 48 - Latitude and the scores from the 1st principal component of the PCA, based on the measurements of the *Blarina carolinensis* from groups R and T. Group R is located in northeastern and central Florida. Group T is located in southeastern Florida.



PC_1
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
25.00
26.00
27.00
28.00
29.00
30.00
31.00
Latitude
Group R
Group T

Fig. 49 - Longitude and the scores from the 1st principal component of the PCA, based on the measurements of the *Blarina carolinensis* from groups R and T. Group R is located in northeastern and central Florida. Group T is located in southeastern Florida.

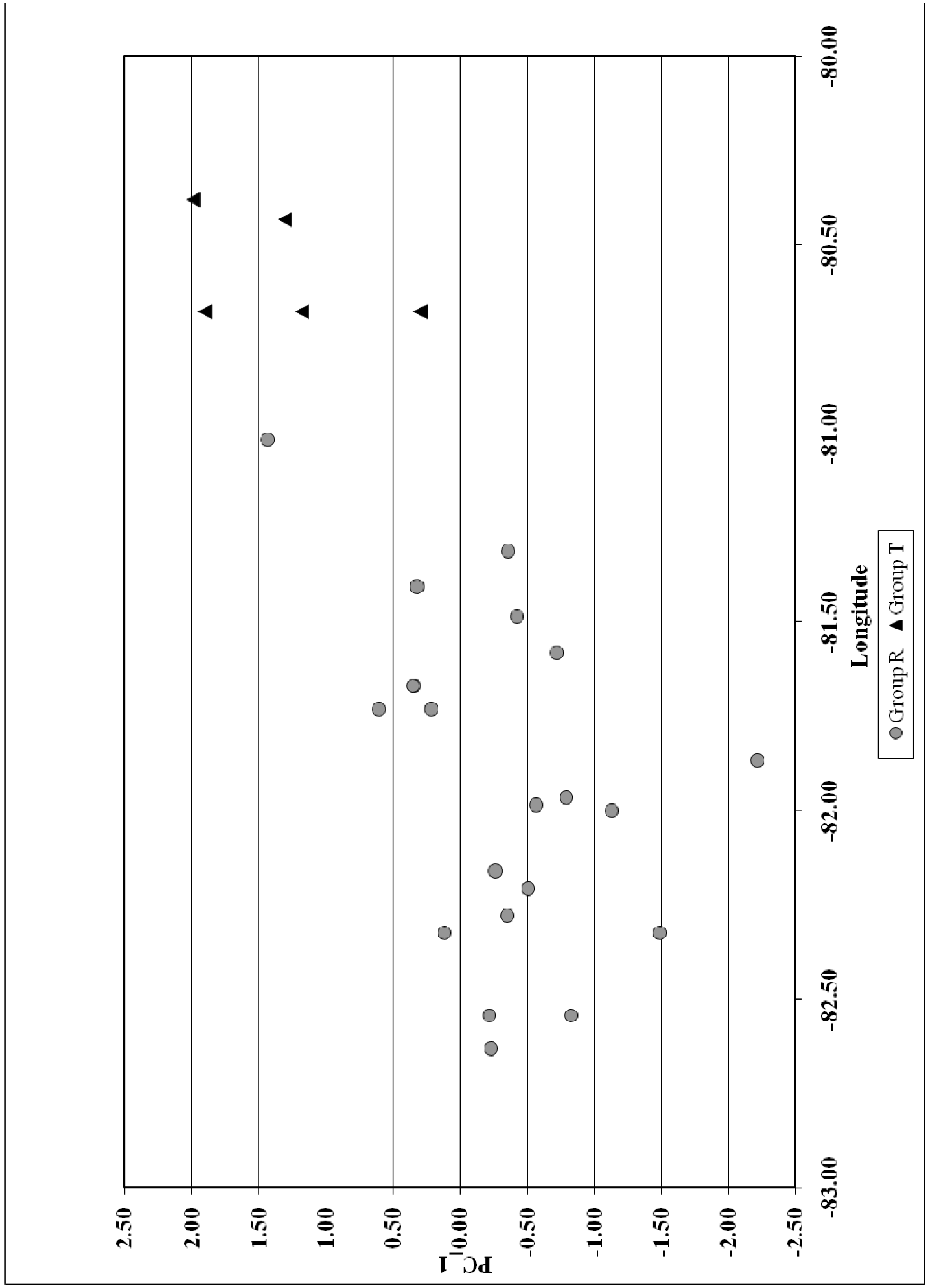

PC_1
2.50
2.00
1.50
1.00
0.50
0.00
-0.50
-1.00
-1.50
-2.00
-2.50
-83.00
-82.50
-82.00
-81.50
-81.00
-80.50
-80.00
Longitude
Group R
Group T

Fig. 50 – Latitude and the scores from the 1st principal component of the PCA, based on the measurements of the *Blarina carolinensis* from groups R and S. Group R is located in northeastern and central Florida. Group S is located across southcentral Florida.

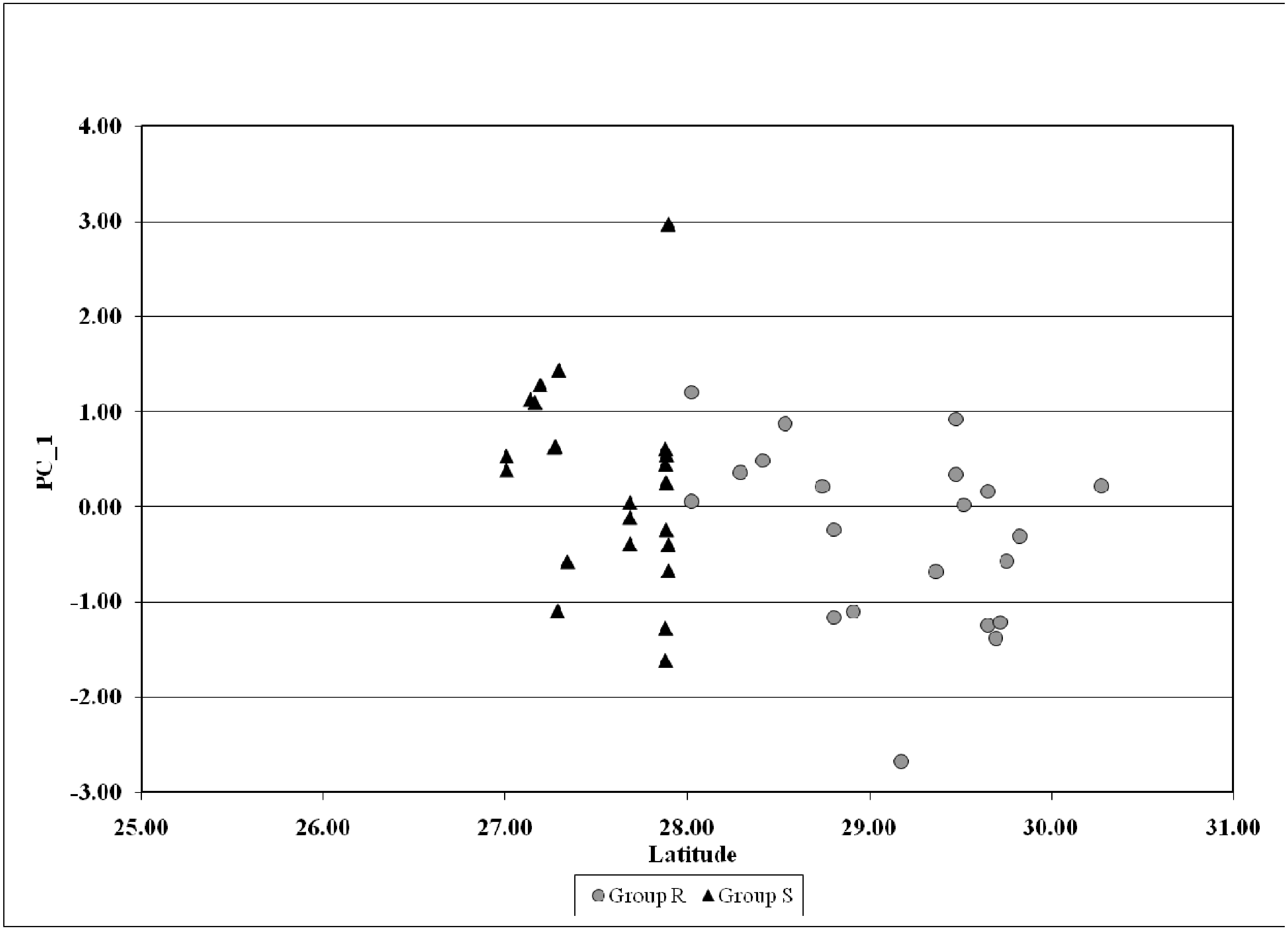

4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
PC_1
25.00
26.00
27.00
28.00
29.00
30.00
31.00
Latitude
Group R
Group S

Fig. 51 – Longitude and the scores from the 1st principal component of the PCA, based on the measurements of the *Blarina carolinensis* from groups R and S. Group R is located in northeastern and central Florida. Group S is located across southcentral Florida.

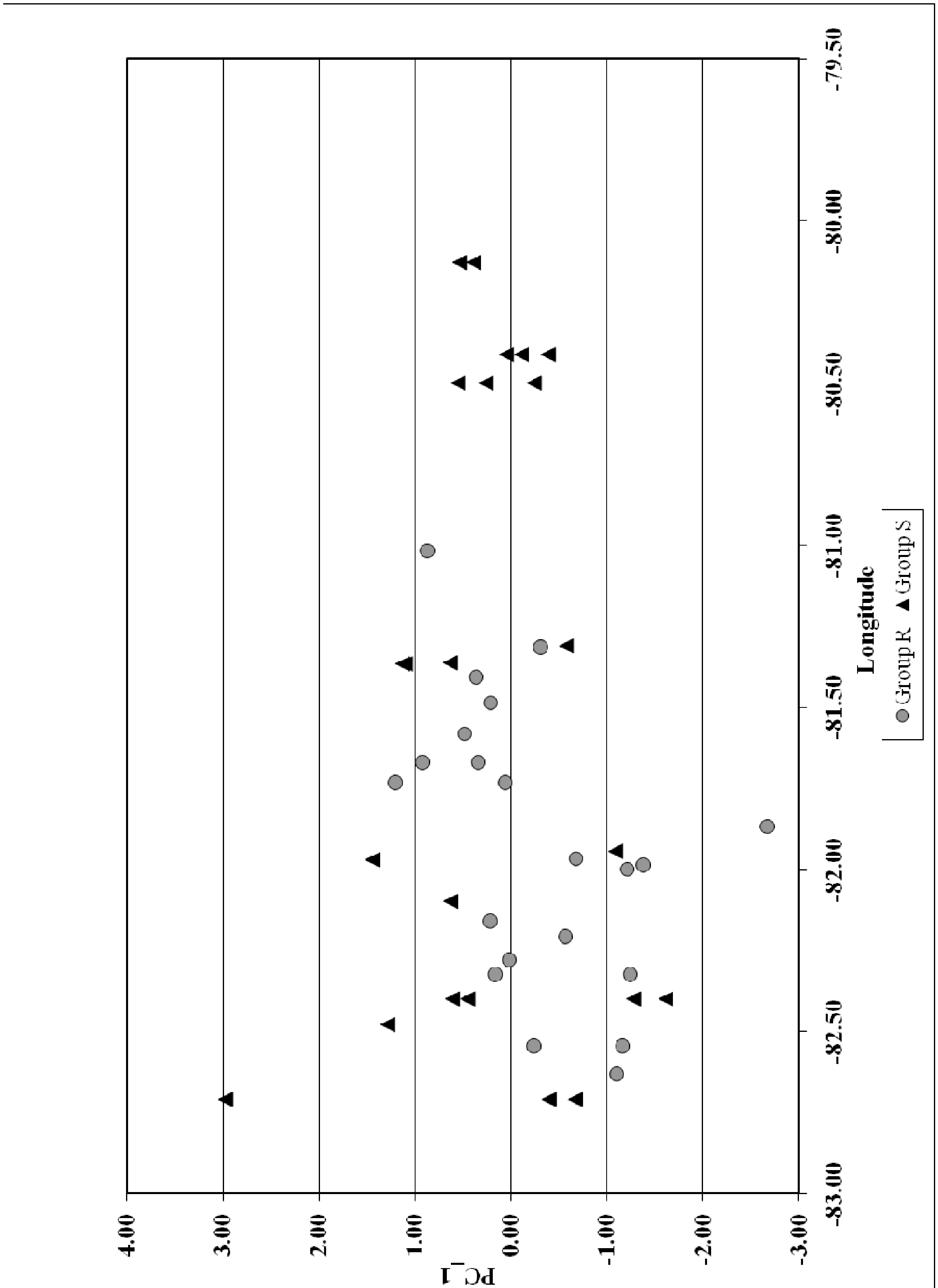

PC_1
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-83.00
-82.50
-82.00
-81.50
-81.00
-80.50
-80.00
-79.50
Longitude
Group R
Group S

Fig. 52 - Scores from the 1st and 2nd principal components of the PCA, based on the measurements of the *Blarina carolinensis* from groups Q and S. Group Q is located in northwestern Florida and southeastern Georgia. Group S is located across southcentral Florida.

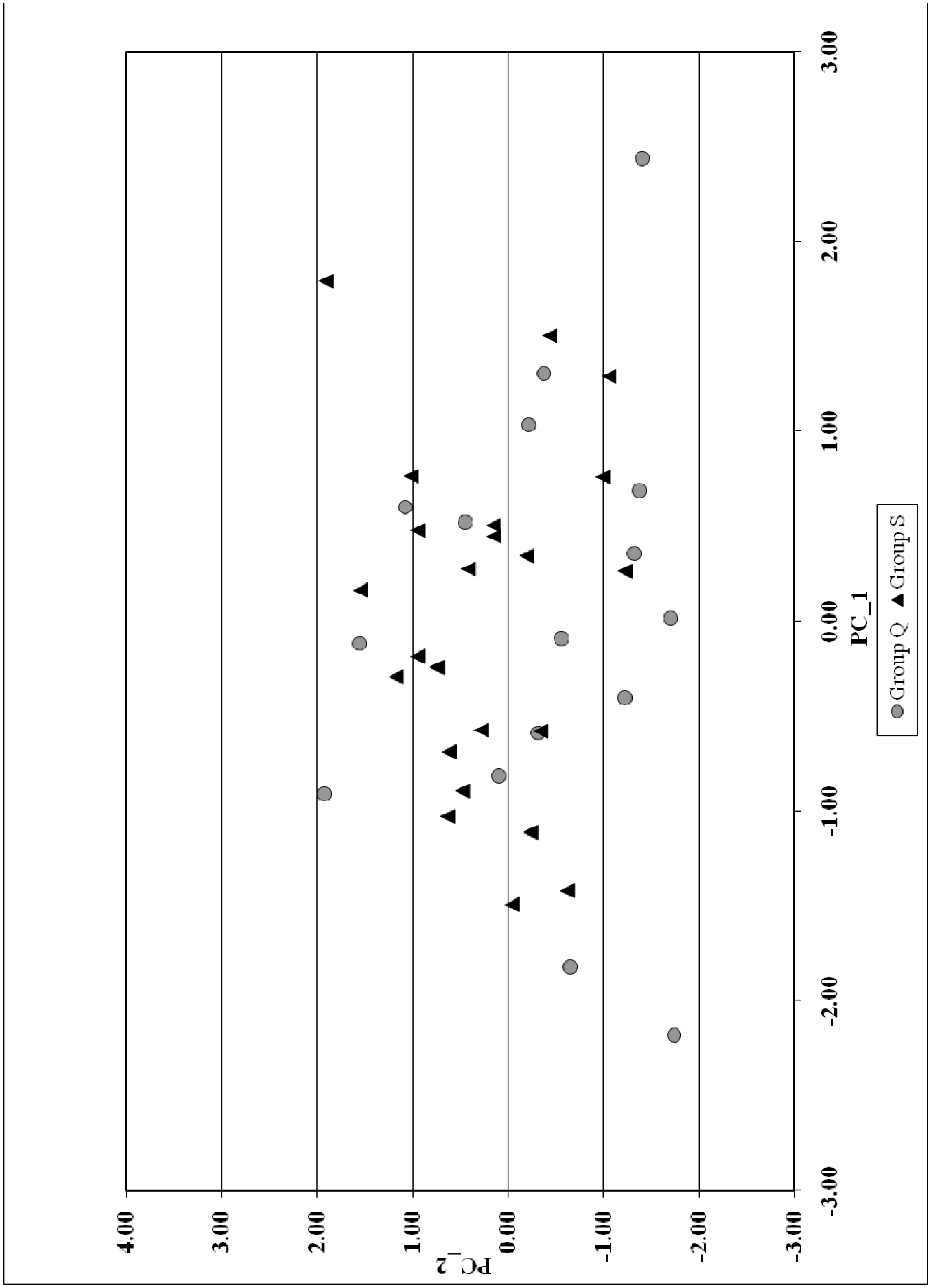

PC_2
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
PC_1
-3.00
-2.00
-1.00
0.00
1.00
2.00
3.00
Group Q
Group S

Fig. 53 - Latitude and the scores from the 1st component of the PCA, based on the measurements of the *Blarina carolinensis* from groups Q and S. Group Q is located in northwestern Florida and southeastern Georgia. Group S is located across southcentral Florida.

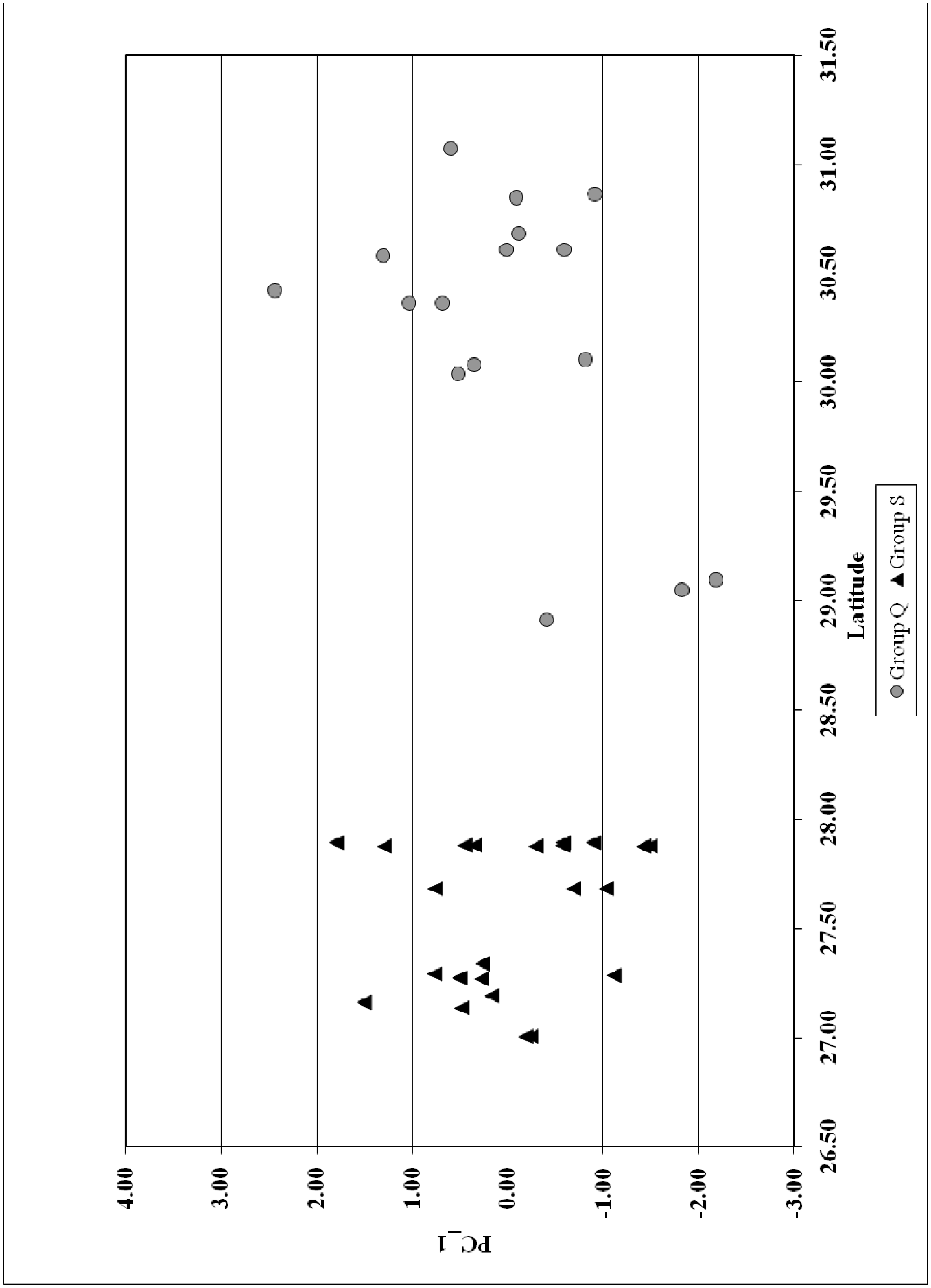

PC_1
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
26.50
27.00
27.50
28.00
28.50
29.00
29.50
30.00
30.50
31.00
31.50
Latitude
Group Q
Group S

Fig. 54 - Longitude and the scores from the 1st component of the PCA, based on the measurements of the *Blarina carolinensis* from groups Q and S. Group Q is located in northwestern Florida and southeastern Georgia. Group S is located across southcentral Florida.

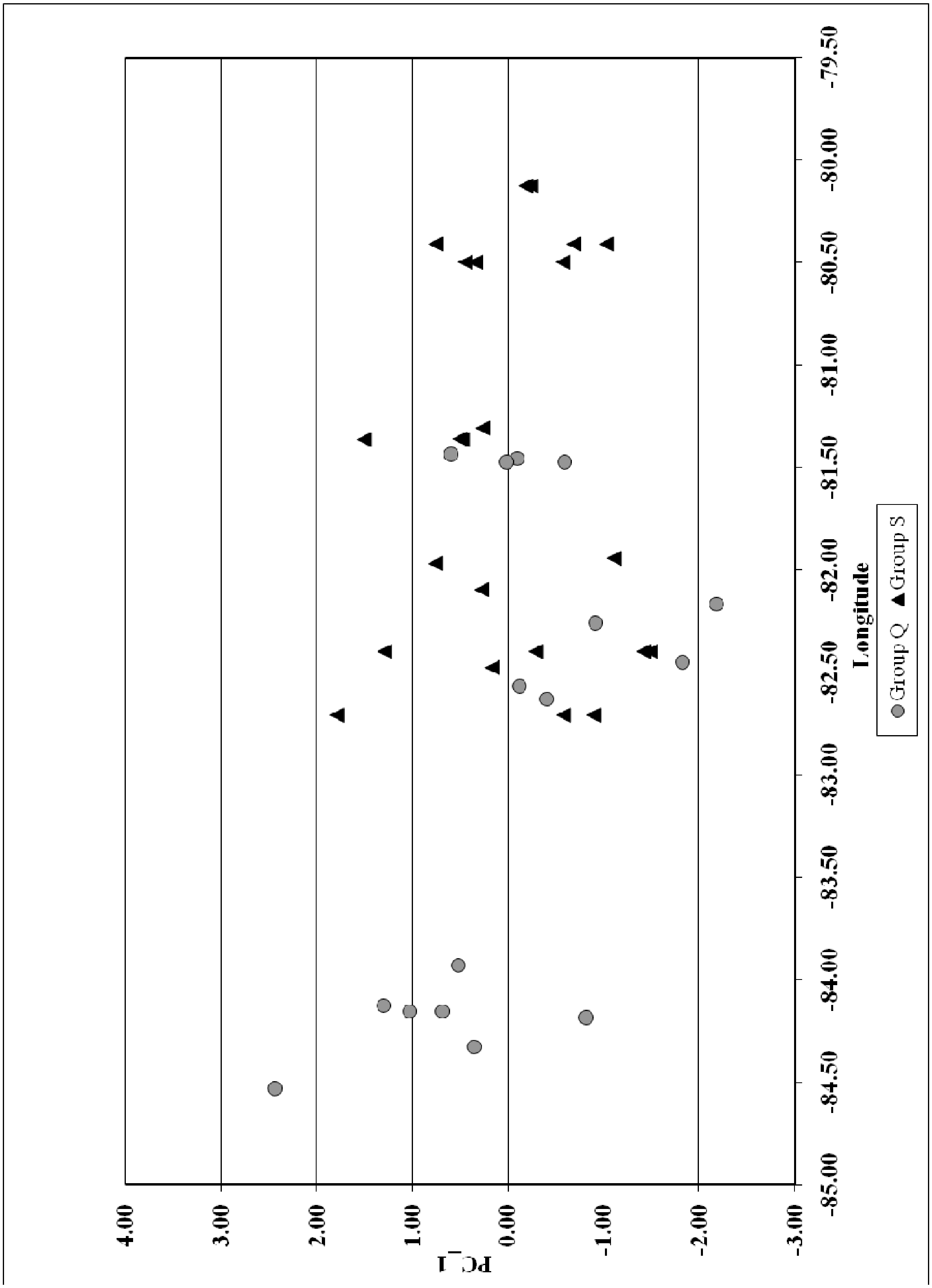

PC_1
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-85.00
-84.50
-84.00
-83.50
-83.00
-82.50
-82.00
-81.50
-81.00
-80.50
-80.00
-79.50
Longitude
Group Q
Group S

Fig. 55 - Scores from the 1st and 2nd principal components of the PCA, based on the measurements of the *Blarina carolinensis* from groups Q and T. Group Q is located in northwestern Florida and southeastern Georgia. Group T is located in southeastern Florida.

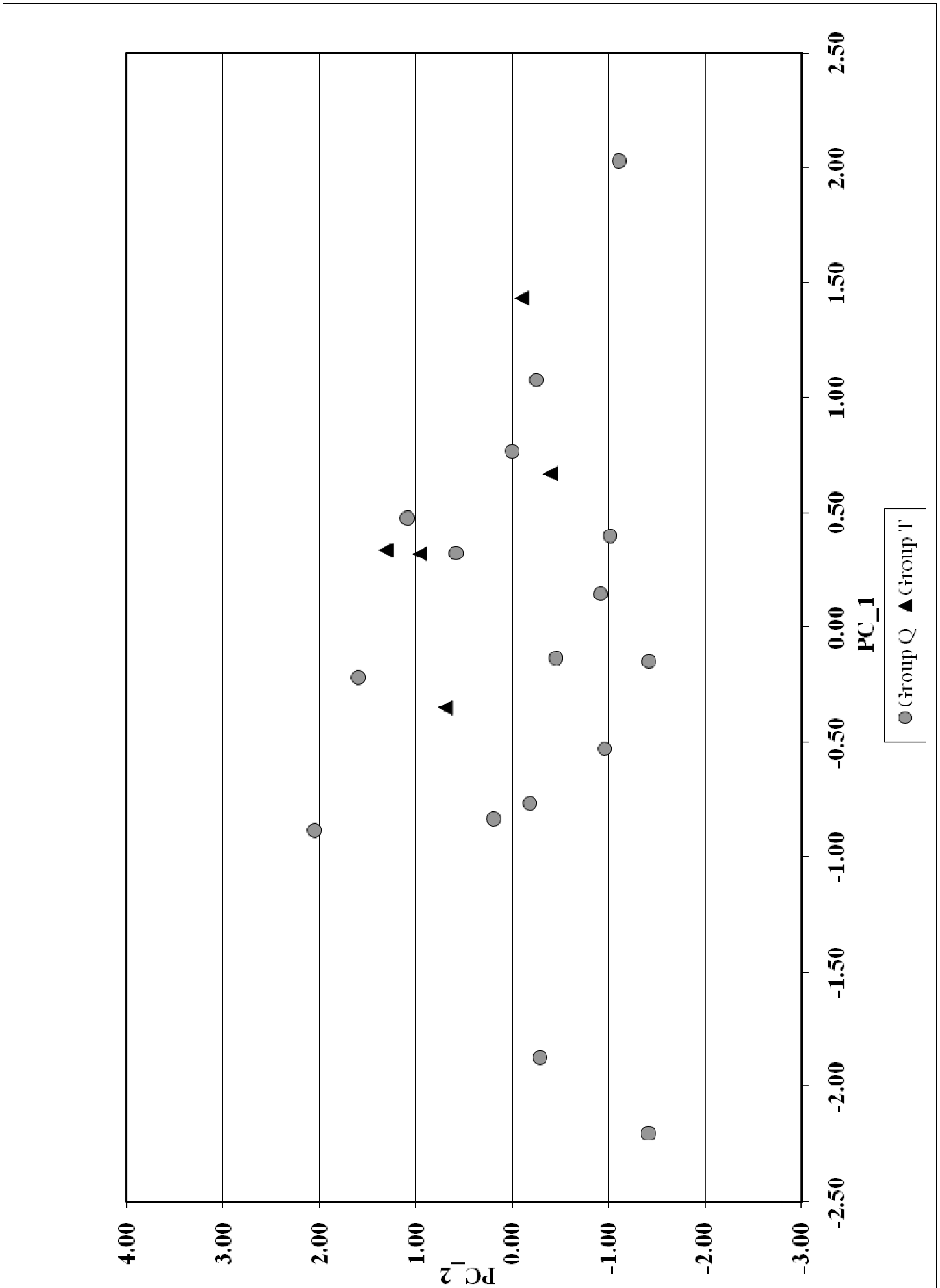

PC_1
PC_2
Group Q
Group T
-2.50
-2.00
-1.50
-1.00
-0.50
0.00
0.50
1.00
1.50
2.00
2.50
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00

Fig. 56 - Latitude and the scores from the 1st principal component of the PCA, based on the measurements of the *Blarina carolinensis* from groups Q and T. Group Q is located in northwestern Florida and southeastern Georgia. Group T is located in southeastern Florida.

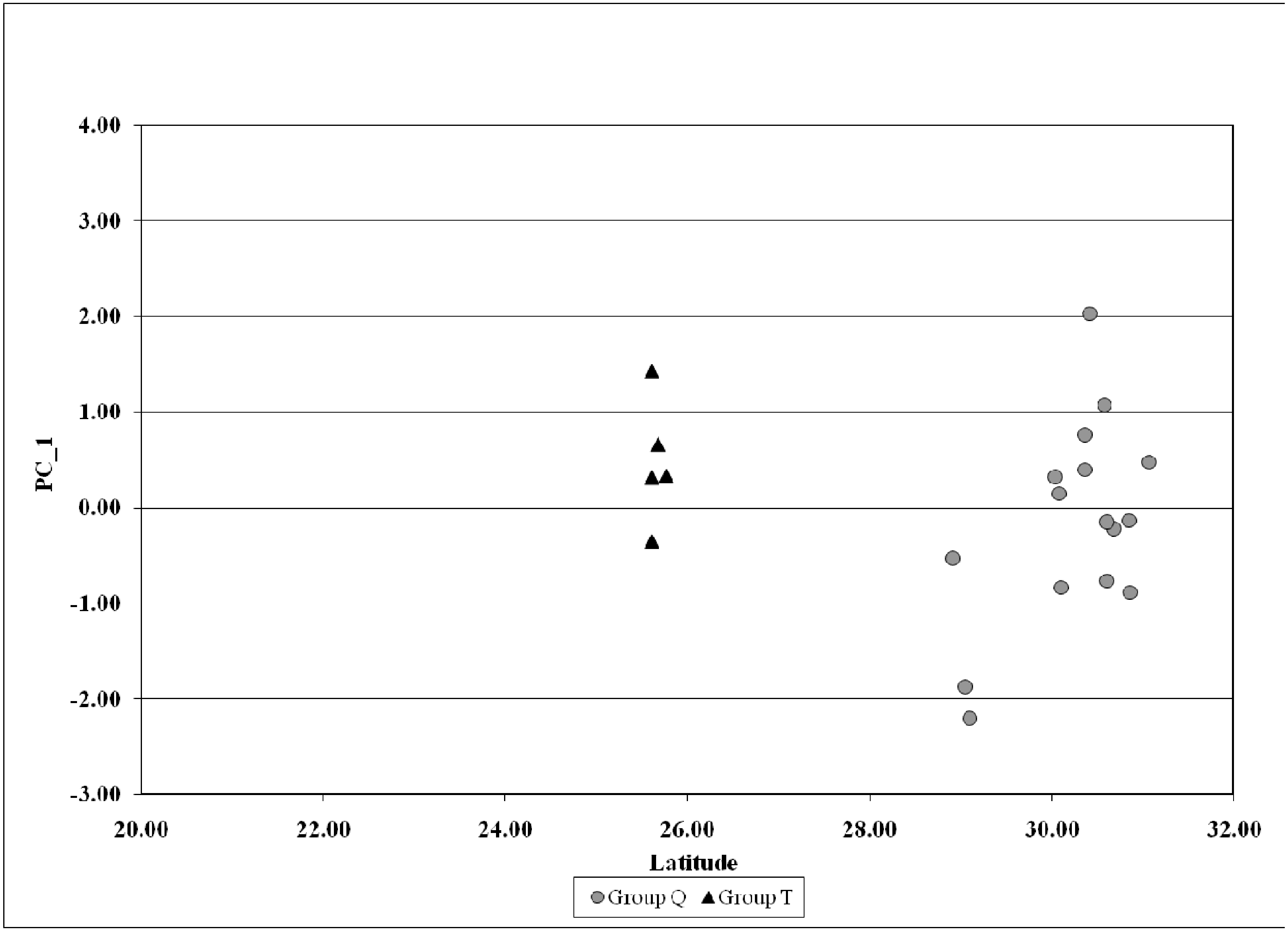

4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
PC_1
20.00
22.00
24.00
26.00
28.00
30.00
32.00
Latitude
Group Q
Group T

Fig. 57 - Longitude and the scores from the 1st principal component of the PCA, based on the measurements of the *Blarina carolinensis* from groups Q and T. Group Q is located in northwestern Florida and southeastern Georgia. Group T is located in southeastern Florida.

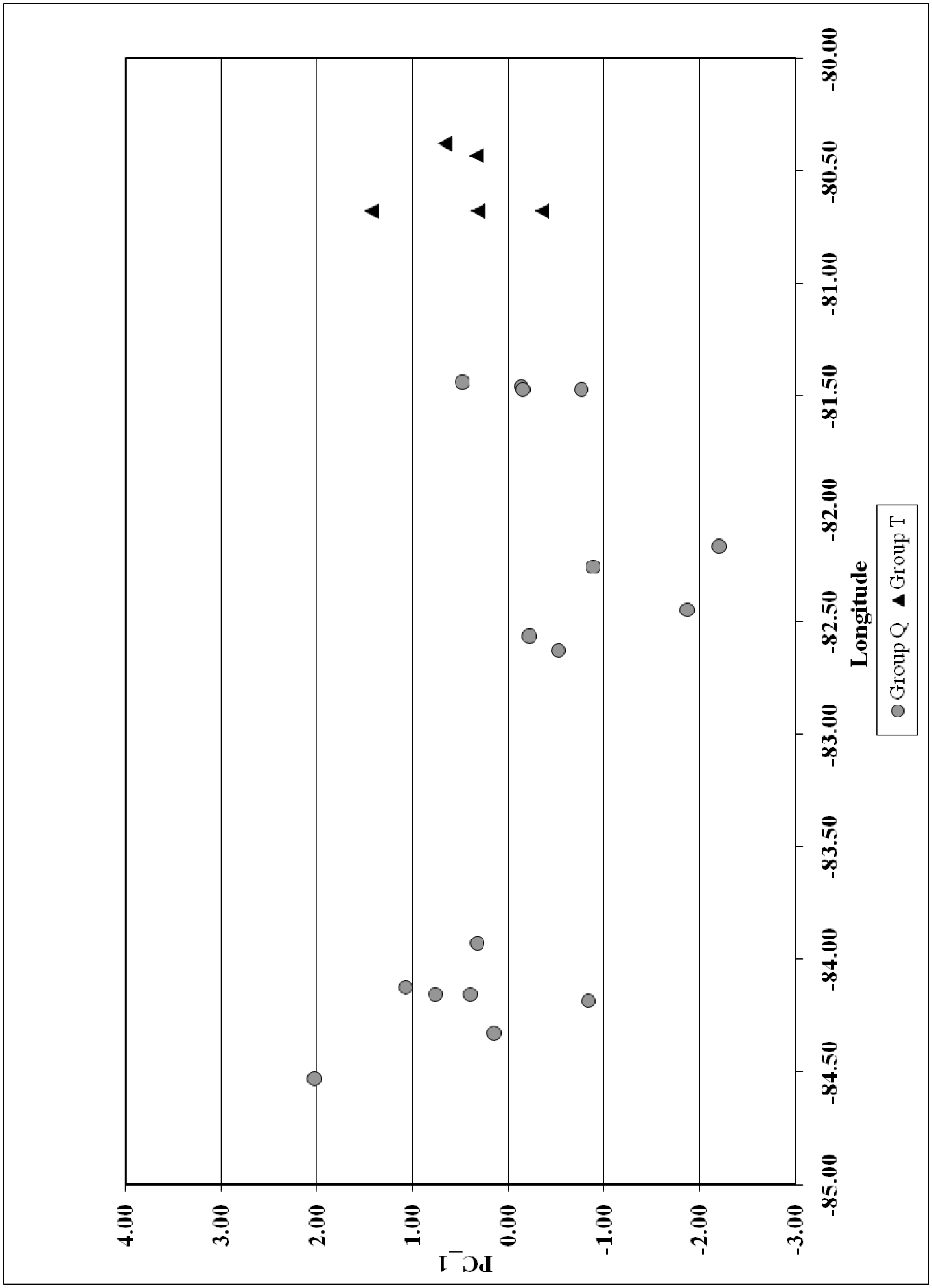

PC_1
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-85.00
-84.50
-84.00
-83.50
-83.00
-82.50
-82.00
-81.50
-81.00
-80.50
-80.00
Longitude
Group Q
Group T

Fig. 58 – Discriminant scores of function 1 and function 2 from the DFA, based on the measurements of *Blarina carolinensis* from groups P, Q, R, S, and T. Group P is located along the northeastern coast of Georgia, up half of the Georgia/South Carolina border and just into southwestern South Carolina. Group Q is located in northwestern Florida and southeastern Georgia. Group R is located in northeastern and central Florida. Group S is located across southcentral Florida. Group T is located in southeastern Florida.

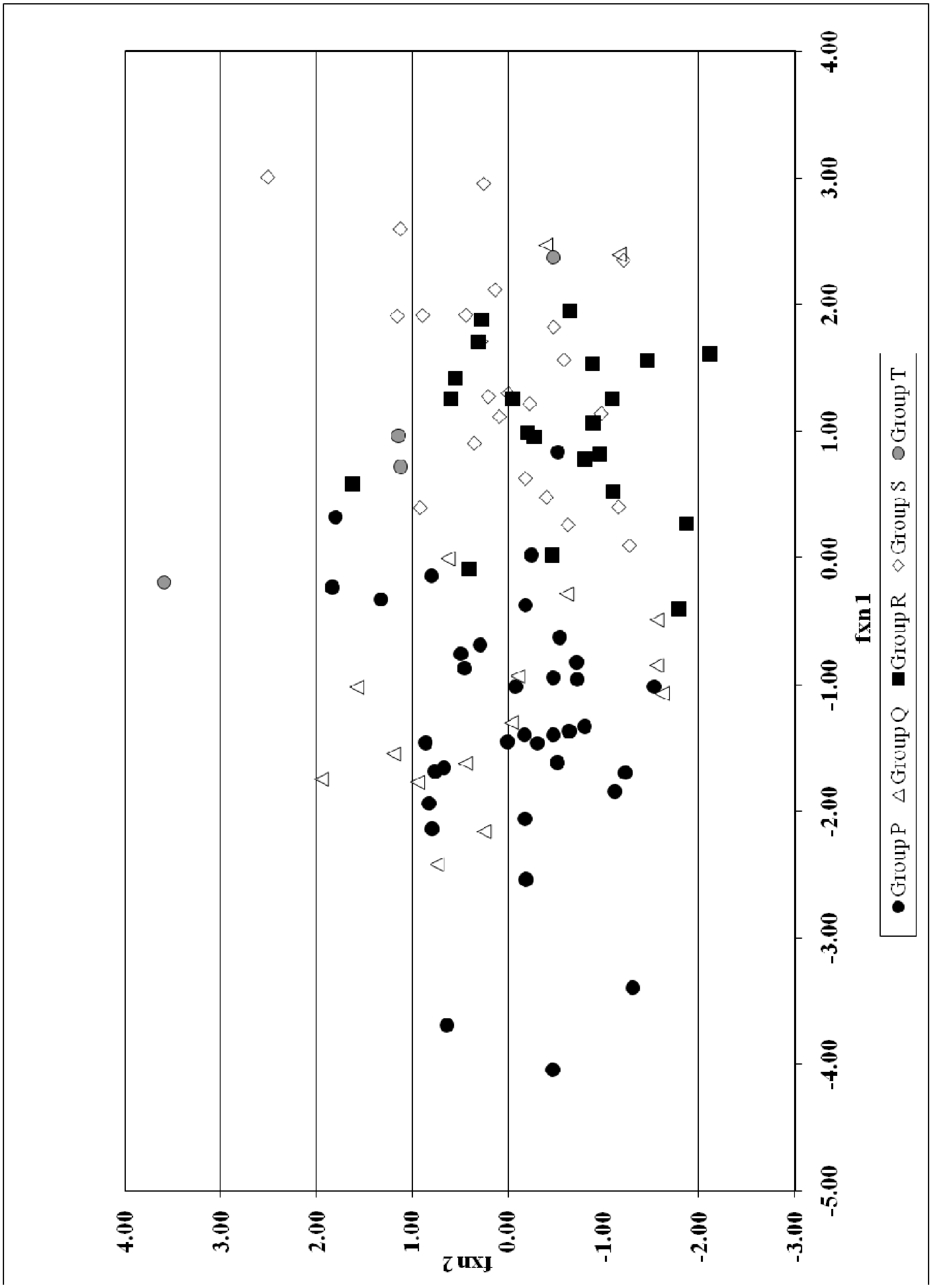

fxn 1
fxn 2
-5.00
-4.00
-3.00
-2.00
-1.00
0.00
1.00
2.00
3.00
4.00
-3.00
-2.00
-1.00
0.00
1.00
2.00
3.00
4.00
Group P
Group Q
Group R
Group S
Group T

Fig. 59 – Latitude and the discriminant scores of function 1 from the DFA, based on the measurements of *Blarina carolinensis* from groups P, Q, R, S, and T. Group P is located along the northeastern coast of Georgia, up half of the Georgia/South Carolina border and just into southwestern South Carolina. Group Q is located in northwestern Florida and southeastern Georgia. Group R is located in northeastern and central Florida. Group S is located across southcentral Florida. Group T is located in southeastern Florida.

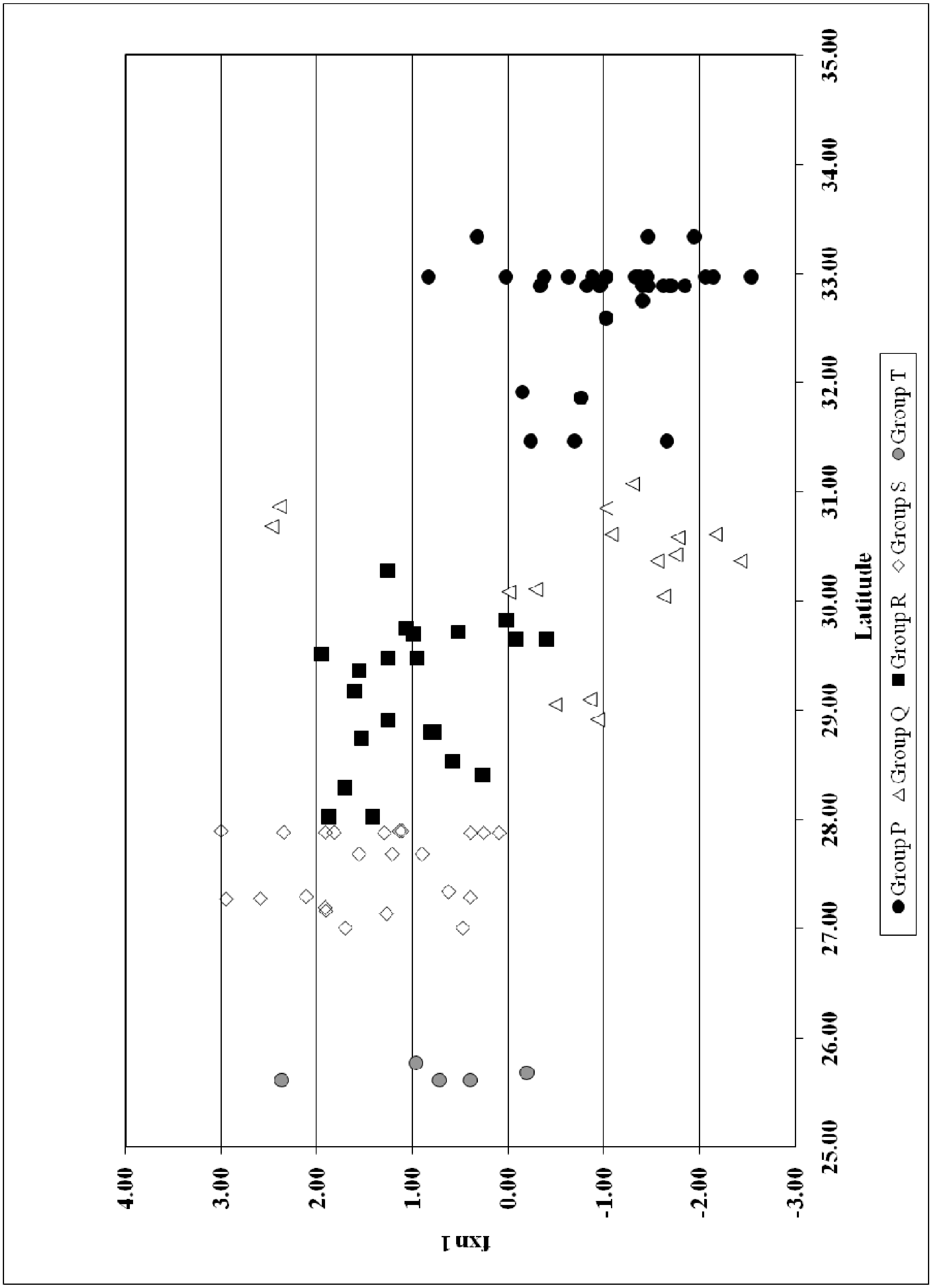

fxn 1
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
25.00
26.00
27.00
28.00
29.00
30.00
31.00
32.00
33.00
34.00
35.00
Latitude
Group P
Group Q
Group R
Group S
Group T

Fig. 60 – Longitude and the discriminant scores of function 1 from the DFA, based on the measurements of *Blarina carolinensis* from groups P, Q, R, S, and T. Group P is located along the northeastern coast of Georgia, up half of the Georgia/South Carolina border and just into southwestern South Carolina. Group Q is located in northwestern Florida and southeastern Georgia. Group R is located in northeastern and central Florida. Group S is located across southcentral Florida. Group T is located in southeastern Florida.

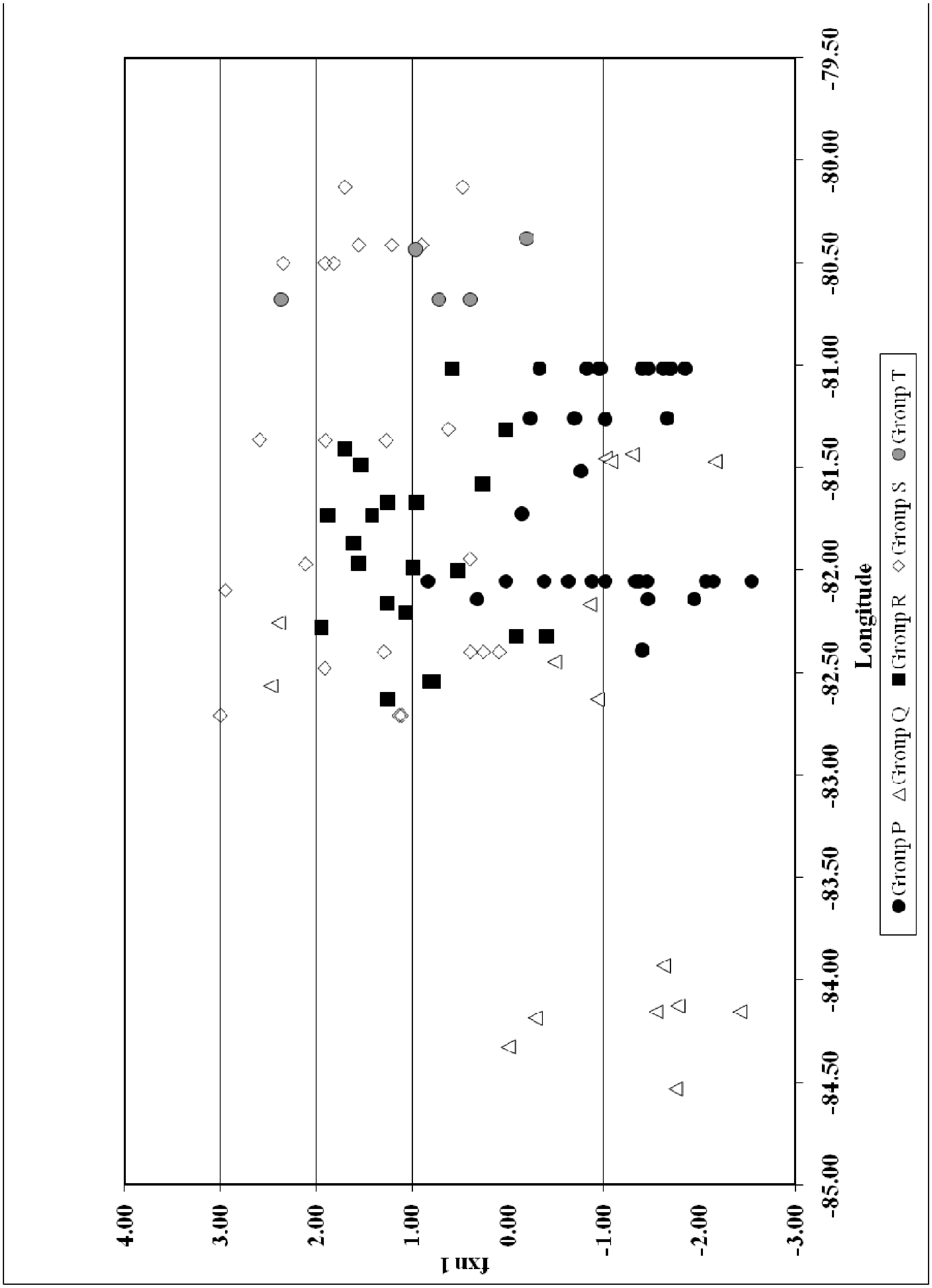

fxn 1
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
Longitude
-85.00
-84.50
-84.00
-83.50
-83.00
-82.50
-82.00
-81.50
-81.00
-80.50
-80.00
-79.50
Group P
Group Q
Group R
Group S
Group T

Fig. 61 – Discriminant scores of function 1 and function 2 from the DFA, based on the measurements of *Blarina carolinensis* from groups P, Q, R, and S. Group P is located along the northeastern coast of Georgia, up half of the Georgia/South Carolina border and just into southwestern South Carolina. Group Q is located in northwestern Florida and southeastern Georgia. Group R is located in northeastern and central Florida. Group S is located across southcentral Florida.

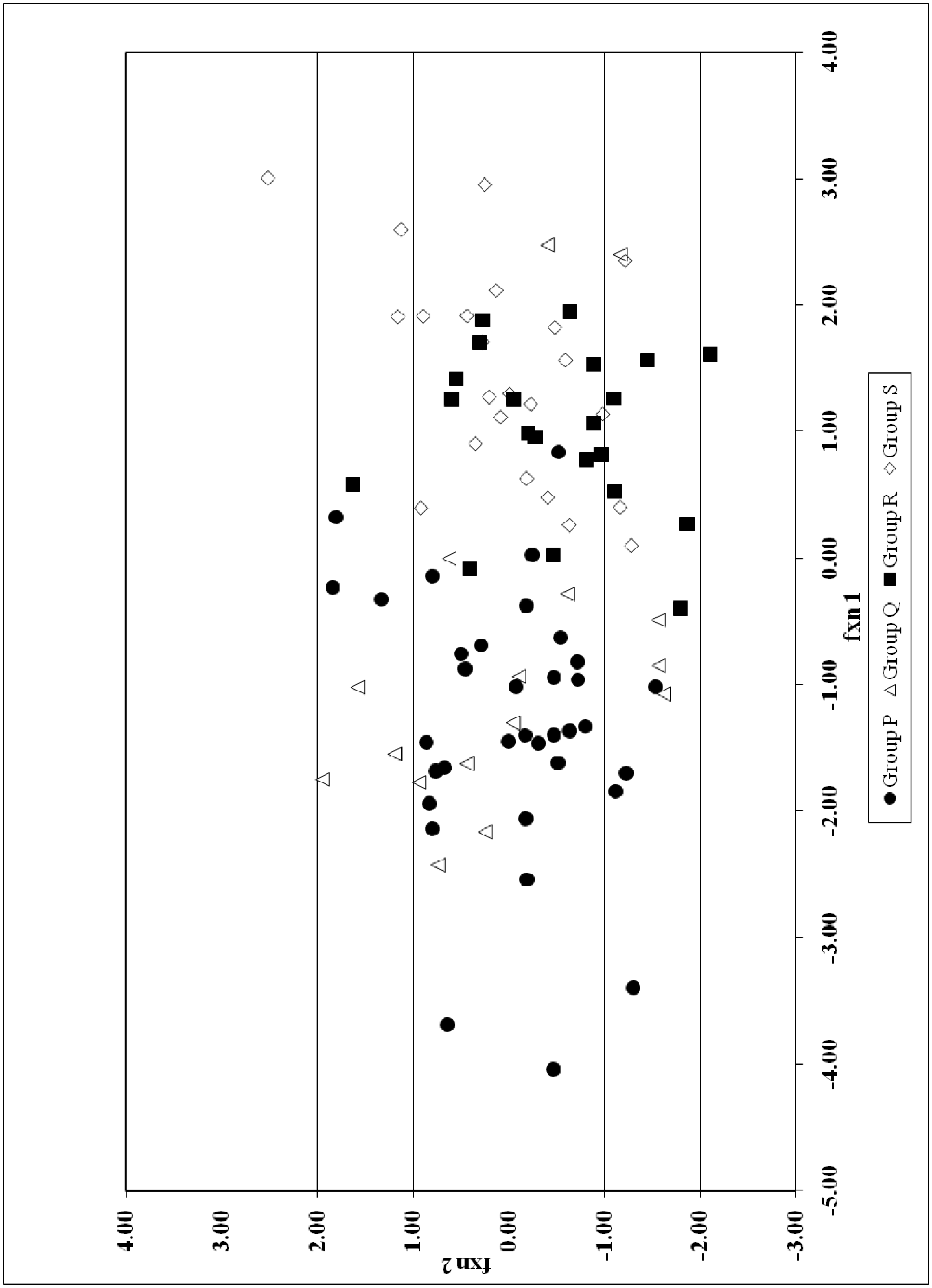

fxn 1
fxn 2
-5.00
-4.00
-3.00
-2.00
-1.00
0.00
1.00
2.00
3.00
4.00
Group P
Group Q
Group R
Group S

Fig. 62 – Latitude and the discriminant scores of function 1 from the DFA, based on the measurements of *Blarina carolinensis* from groups P, Q, R, and S. Group P is located along the northeastern coast of Georgia, up half of the Georgia/South Carolina border and just into southwestern South Carolina. Group Q is located in northwestern Florida and southeastern Georgia. Group R is located in northeastern and central Florida. Group S is located across southcentral Florida.

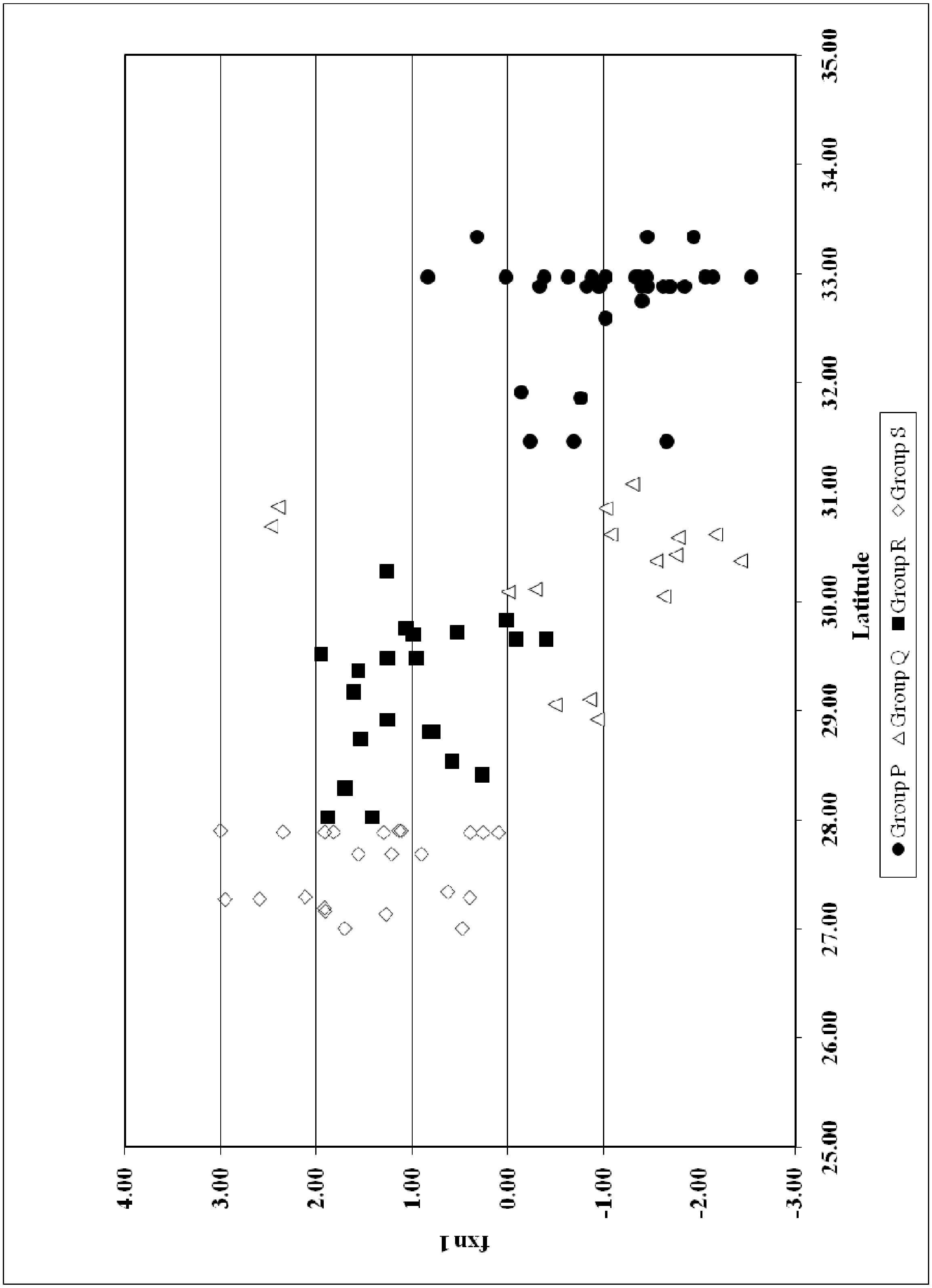

fxn 1
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
25.00
26.00
27.00
28.00
29.00
30.00
31.00
32.00
33.00
34.00
35.00
Latitude
● Group P △ Group Q ■ Group R ◇ Group S

Fig. 63 – Longitude and the discriminant scores of function 1 from the DFA, based on the measurements of *Blarina carolinensis* from groups P, Q, R, and S. Group P is located along the northeastern coast of Georgia, up half of the Georgia/South Carolina border and just into southwestern South Carolina. Group Q is located in northwestern Florida and southeastern Georgia. Group R is located in northeastern and central Florida. Group S is located across southcentral Florida.

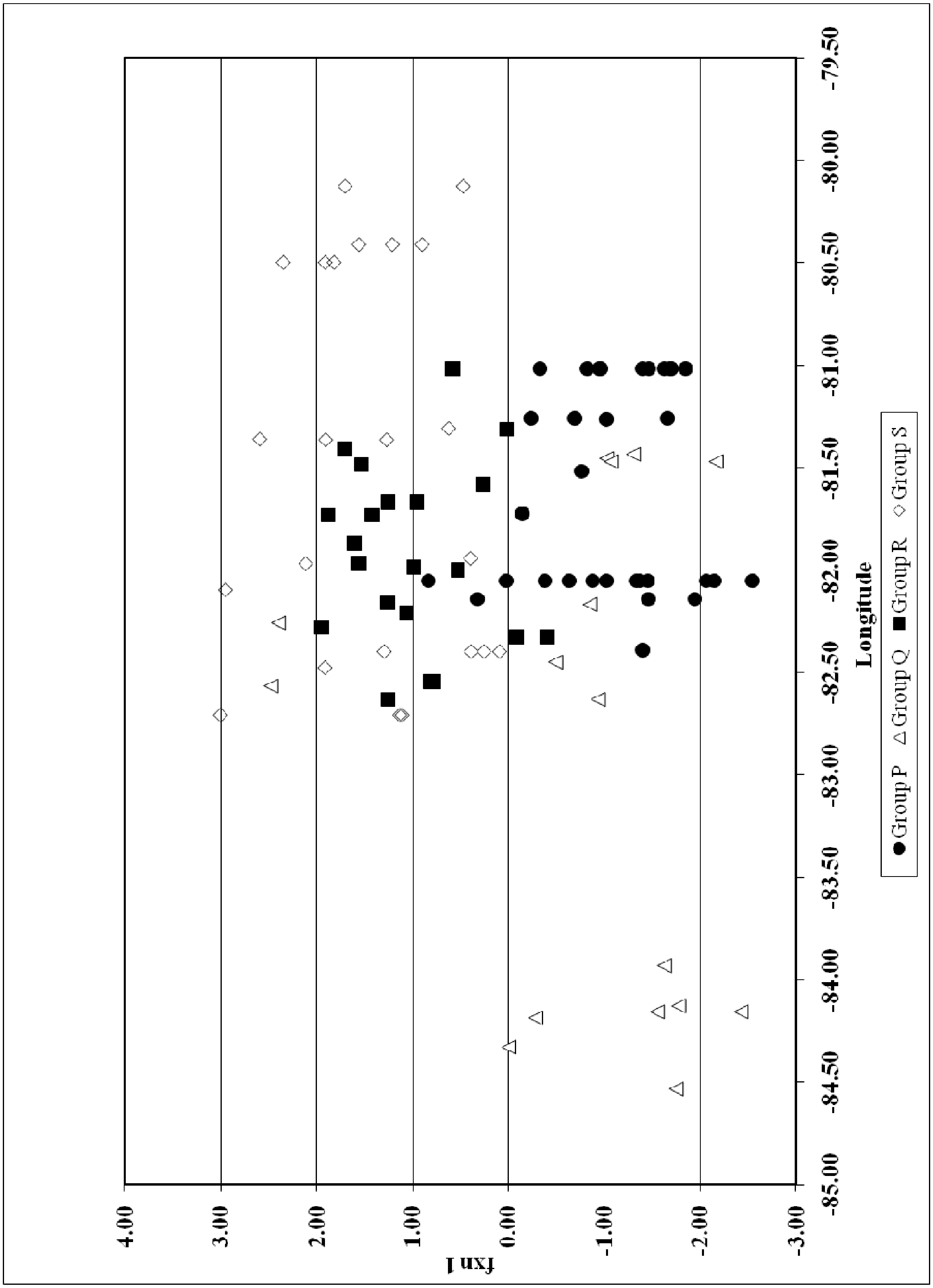
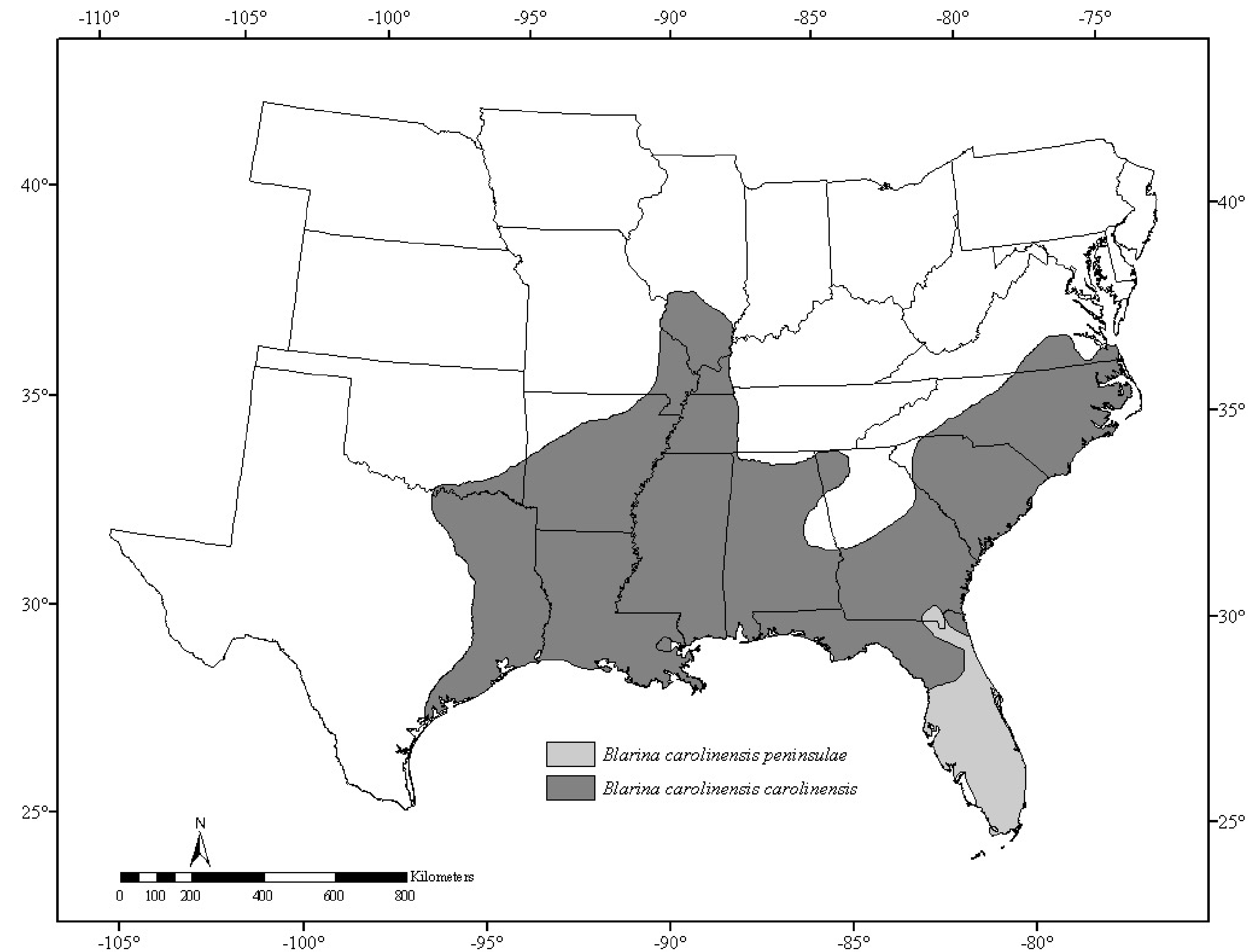

fxn 1
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-85.00
-84.50
-84.00
-83.50
-83.00
-82.50
-82.00
-81.50
-81.00
-80.50
-80.00
-79.50
Longitude
Group P
Group Q
Group R
Group S

Fig. 64 – Map of the distribution of *Blarina carolinensis*, with subspecies, created by using data from my study in addition to maps from Benedict et al. (2006) and McCay (2001). The basemap is from ESRI. 2006 ArcGIS 9, Media Kit: ESRI Data & Maps. ESRI, Redlands, CA.



-110°
-105°
-100°
-95°
-90°
-85°
-80°
-75°
40°
35°
30°
25°
Blarina carolinensis peninsulae
Blarina carolinensis carolinensis
N
Kilometers
0
100
200
400
600
800

Appendix I - Localities and the museum identification numbers for the specimens that were used in statistical analyses. Specimens were arranged alphabetically by subspecies, state, county, and reference location. Specimens with the same reference location were arranged from north to south, then west to east. The number of specimens collected from each locality was indicated prior to the museum acronym(s). Specimens with an asterisk (*) indicate instances where I could not determine the coordinates for the specific locality. In these cases, and in the cases where there was no specific locality given, I georeferenced the county instead of the specific locality.

Blarina carolinensis carolinensis

ALABAMA: AUTAUGUA COUNTY: Autaugaville (32.4354362 N, -86.6548767 W), 1 (USNM 222604). CALHOUN COUNTY: Choccolocco Wildlife Management Area (33.8099612 N, -85.5299377 W), 1 (UGAMNH 8060). CULLMAN COUNTY: Ardell (33.9953823 N, -87.0973594 W), 3 (USNM 207233, 207288, 207289). DE KALB COUNTY: Buck's Pocket (34.481199 N, -86.088034 W), 1 (USNM 222598); Mentone, AL 117 (34.573611 N, -85.597222 W), 3 (UGAMNH 22423-22425). ETOWAH COUNTY: Attalla (34.0217667 N, -86.0885773 W), 1 (USNM 202682). HALE COUNTY: Greensboro (32.7054291 N, -87.5958099 W), 1 (USNM 23175). JACKSON COUNTY: Blowing Wind, AL 72 at access road to Blowing Wind Cave National Wildlife Refuge, 34 37'5"N, 86 8'5"W (34.618056 N, -86.134722 W), 1 (UGAMNH 22467). RUSSELL COUNTY: Seale (32.297369 N, -85.1688271 W), 1 (USNM 203425). SUMTER COUNTY: York (32.4862499 N, -88.2964211 W), 2 (USNM 178267, 178268).

ARKANSAS: CLAY COUNTY: 2 mi E Boydsville on hwy 90 (36.322867 N, -90.359182 W), 1 (ASU 1948); Piggot (36.3486404 N, -90.4347001 W), 1 (ASU 15335); 3 mi N Pollard (36.449158 N, -90.2684364 W), 1 (ASU 2589); 3 mi N Rector (36.3080363 N, -90.2922821 W), 1 (ASU 4148); 2 mi S Rector (36.2356707 N, -90.2864617 W), 1 (ASU 1335); 1 mi S Reyno (36.3462232 N, -90.7396354 W), 1 (ASU 261); (T19N, R8E, Sec. 7) (36.29575 N, -90.25557 W), 1 (ASU 4151). COLUMBIA COUNTY: Columbia County fairgrounds (33.2670727 N, -93.2393303 W), 1 (ASU 10811); Magnolia (33.2670727 N, -93.2393303 W), 7 (ASU 12432, 12436, 12471, 12508, 12537, 12548, 12925); SAU campus (33.2670727 N, -93.2393303 W), 8 (ASU 8893-8898, 12615, 12658). CRAIGHEAD COUNTY: Aggie Rd extended, 0.5 miles east of Airport Rd. (35.8461695 N, -90.6414556 W), 1 (ASU 6621); South of ASU (35.8423004 N, -90.7042809 W), 1 (ASU 6611); 4 mi N Jonesboro (35.8925794 N, -90.7042809 W), 3 (ASU 1201, 11831, 11878); 3 mi N Jonesboro (35.8858134 N, -90.7042809 W), 1 (ASU 811); 3 mi NE Jonesboro (35.8730687 N, -90.6664923 W), 3 (ASU 906, 976, 2458); 2 mi N Jonesboro (35.8713091 N, -90.7042809 W), 1 (2903); Jonesboro (35.8423004 N, -90.7042809), 10 (ASU 3272, 3639, 6890, 8887, 8889-8892, 11872, 27838); S of TV 8 tower* (35.8486498 N, -90.6594317 W), 9 (ASU 970, 974, 975, 1007, 1009, 1010, 1012, 1142, 1205); (T12N, R6W, Sec. 22) (35.65901 N, -90.44999 W), 1 (ASU 2561); No specific locality (35.8486498 N, -90.6594317 W), 1 (ASU 633). GREENE COUNTY: Old field across from Beech Grove Cemetery on hwy 141 (36.1725947 N, -90.6173801 W), 1 (ASU 2399); 4 ½ mi N Paragould on hwy 135

(36.1236682 N, -90.4973259 W), 1 (ASU 1165); ½ mi N Paragould on hwy 135 (36.0552503 N, -90.5157928 W), 1 (ASU 1945); Paragould (36.0584011 N, -90.4973259 W), 1 (ASU 15402); 3 ½ mi W Rector (36.2382992 N, -90.3664323 W), 1 (ASU 798); Walcott, ASU fish ponds (36.0434017 N, -90.6712189 W), 25 (ASU 2523-2533, 2542, 2543, 2622, 2625-2628, 2630-2636). INDEPENDENCE COUNTY: (T12N, R4W, Sec. 4) (35.70261 N, -91.42997 W), 1 (ASU 1873); (T12N, R4W, Sec. 3) (35.702611 N, -91.430197 W), 1 (ASU 1896); (T13N, R6W, Sec. 8) (35.78632 N, -91.65934 W), 1 (ASU 2457). JACKSON COUNTY: ½ mi N of the mouth of Village Creek* (35.6221509 N, -91.3086776 W), 1 (ASU 2429); No specific locality (35.6221509 N, -91.3086776 W), 1 (ASU 573). JEFFERSON COUNTY: Pine Bluff (34.2284317 N, -92.0031929 W), 1 (UAMZC 583); No specific locality (34.2771054 N, -91.8357541 W), 2 (UMNH 14078, 14079). LAWRENCE COUNTY: 5.4 mi E Hoxie on hwy 63 (36.0503483 N, -90.8871045 W), 2 (ASU 1163, 1164); 1 ½ mi SE Portia (36.069833 N, -91.0555106 W), 1 (ASU 5166); 1.8 mi E Portia (36.0852165 N, -91.0422998 W), 1 (ASU 1996). MILLER COUNTY: Texarkana (33.4251178 N, -94.0190083 W), 1 (ASU 12884); ½ mi E Arkansas-Texas state line on I-30 (33.4703991 N, -94.0388488 W), 1 (ASU 12899). PIKE COUNTY: Delight (34.0315056 N, -93.5029831 W), 4 (MCZ 17398-17401). POLK COUNTY: 6 mi N Mena, Rich mtn. (34.6732524 N, -94.2396164 W), 1 (UAMZC 580); 3 ½ mi W Mena, Rock Creek (34.5862083 N, -94.3010114 W), 1 (UAMZC 585); 5 mi E Mena, Ransom Road (34.5862083 N, -94.1519093 W), 1 (UAMZC 590); 5 mi N Wickes (34.3022231 N, -94.3340277 W), 1 (ASU 12901); (T3S, R28W, Sec. 1) (34.51460 N, -93.94231 W), 1 (ASU 15174). PULASKI COUNTY: Camp Robinson (34.8802982 N, -92.2879028 W), 2 (TCWC 50112, 50117). RANDOLPH COUNTY: 1 mi NE Pocahontas (36.271709 N, -90.958574 W), 1 (ASU 1531).

FLORIDA: ALACHUA COUNTY: 7 mi N, 7 mi E Gainesville (29.7532763 N, -82.2084691 W), 1 (UF 19161); Gainesville, 11 mi W Newman's Lake (29.6516457 N, -82.3248215 W), 2 (UF 11082, 11083); Micanopy (29.5169806 N, -82.2798195 W), 1 (UF 28282). BAKER COUNTY: Glen St. Mary (30.2757912 N, -82.1606712 W), 1 (UMNH 262340). CITRUS COUNTY: Crystal River State Preserve (28.9130665 N, -82.6314353 W), 2 (UF 20965, 20966); Homosassa Springs (28.8037667 N, -82.544403 W), 2 (UF 20968, 23586). ESCAMBIA COUNTY: Pensacola (30.4723486 N, -87.2135925 W), 1 (UMNH 265050). LEON COUNTY: Holland (30.4206712 N, -84.5317704 W), 1 (CM 59687); 11 mi NE Tallahassee (30.57995 N, -84.126489 W), 1 (AMNH 131616); 10 mi SE Tallahassee, St. Mark's River (30.3643856 N, -84.1553704 W), 2 (AMNH 131587, 131589). MARION COUNTY: Dunnellon (29.0495669 N, -82.4496459 W), 1 (UF 16865); Fort McCoy (29.3649731 N, -81.9670296 W), 1 (UF 16861); Lynn (29.1738682 N, -81.8684196 W), 1 (UF 16862); Shady (29.0955343 N, -82.1689796 W), 1 (UF 16859). NASSAU COUNTY: Amelia Island (30.6077366 N, -81.472515 W), 2 (AMNH 240255, 240257). PUTNAM COUNTY: 3 mi E Melrose (29.6948715 N, -81.9862557 W), 1 (UF 23585); Ordway Preserve, One Shot Pond (29.7181721 N, -82.0005798 W), 1 (UF 28976); Welaka (29.4772203 N, -81.6699827 W), 2 (UF 2539, 2552). ST. JOHNS COUNTY: Anastasia Island (29.8260494 N, -81.3139576 W), 1 (USNM 269338). TAYLOR COUNTY:

Econfina River, 4 mi N of mouth (30.0403655 N, -83.9299097 W), 1 (UF 4732). WAKULLA COUNTY: St. Mark's National Wildlife Refuge (30.104928 N, -84.1851692 W), 1 (UMNH 527410); Spring Creek (30.0812819 N, -84.3278256 W), 1 (UF 5201).

GEORGIA: BALDWIN COUNTY: 2 ½ mi NW Milledgeville (33.1057968 N, -83.2625714 W), 3 (SBMNH 4297, 4298, 4300); 2 mi N, 0.3 mi E Milledgeville (33.1091667 N, -83.2269305 W), 2 (SBMNH 3013, 3015); 2.5 mi N, 0.85 mi E Milledgeville (33.1164221 N, -83.2174504 W), 14 (SBMNH 4081-4091, 4223, 4224, 4276); 4 mi E Milledgeville (33.080242 N, -83.163864 W), 1 (SBMNH 4299); Milledgeville (33.0801449 N, -83.231014 W), 3 (SBMNH 3014, 4301, 4863). BRYAN COUNTY: Fort Stewart, 1.4 mi N, 0.5 mi E Canoochee River & hwy 67 (31.862711 N, -81.5176125 W), 1 (UGAMNH 9392). BURKE COUNTY: Di-Lane Plantation Wildlife Management Area (32.9689234 N, -82.0541381 W), 13 (UGAMNH 22337, 23306, 23307, 23308, 23319-23327). CAMDEN COUNTY: Cumberland Island (30.8468264 N, -81.4574432 W), 1 (UGAMNH 7631). CHARLTON COUNTY: Floyd's Island National Wildlife Area (30.8616152 N, -82.2590141 W), 1 (UGAMNH 3931). CLINCH COUNTY: Fargo (30.6819172 N, -82.5665588 W), 1 (UGAMNH 3127). DADE COUNTY: Cloudland Canyon State Park, Daniel Creek, 0.1 mi S bridge over Daniel Creek (34.824408 N, -85.4908847 W), 1 (UGAMNH 22469); Cloudland Canyon State Park, 34 49'55"N, 85 28'50"W (34.831944 N, -85.480556 W), 1 (UGAMNH 22514); Cloudland Canyon State Park, Bridge Trail, 34 50'0"N, 85 29'10"W (34.833333 N, -85.486111 W), 2 (UGAMNH 22487, 22488); Cloudland Canyon State

Park (34.8356455 N, -85.4829025 W), 3 (UGAMNH 22483-22485). EMANUEL COUNTY: Blundale, 9 mi S Wadley, off GA hwy.s 1 & 4 (32.7482605 N, -82.3912506 W), 1 (UGAMNH 8390). GLYNN COUNTY: Jekyll Island (31.0695404 N, -81.4367826 W), 1 (UGAMNH 7641). GORDON COUNTY: 6 mi NW Oakman (34.592185 N, -84.7848367 W), 1 (UGAMNH 19733); 3 ½ mi NW Oostanaula, Hidden Creek Recreation Area campground (34.5173822 N, -85.0403789 W), 2 (UGAMNH 19699, 19700). JONES COUNTY: Upper River Road at Bibb county line near Macon (32.9285171 N, -83.64398 W), 1 (UGAMNH 2000). LIBERTY COUNTY: 1.2 mi E Long-Liberty county line and 1.3 mi S hwy 144 (31.914784 N, -81.72639 W), 1 (UGAMNH 9268). MC INTOSH COUNTY: Sapelo Island (31.4614682 N, -81.2603759 W), 3 (UGAMNH 22675, 22698, 22726). MURRAY COUNTY: 0.2 mi N Gordon-Murray county line on county road 70* (34.7871208 N, -84.7656331 W), 3 (UGAMNH 19741-19743); No specific locality (34.7871208 N, -84.7656331 W), 1 (UGAMNH 2705). RICHMOND COUNTY: Pinetucky (33.337715 N, -82.142288 W), 4 (MCZ 6192, 6195-6197). WALKER COUNTY: Allen Creek, 1 mi SE Rape Gap, Pigeon mtn. Wildlife Management Area (34.6337124 N, -85.3917129 W), 1 (UGAMNH 22516); Dick's Ridge, 1 ½ mi S Nickajack Gap (34.8827601 N, -85.3824577 W), 1 (UGAMNH 19715); Taylor's Ridge, 2 mi W Shilo Church, 11 ½ mi N jct 259C & 259 (34.638481 N, -85.220343 W), 3 (UGAMNH 19712-19714). WHITFIELD COUNTY: Snake Creek Gap, 3 ½ mi E Villanow (34.6814813 N, -85.0430285 W), 1 (UGAMNH 19692); Stover Creek, 4 ¾ mi ENE Villanow (34.6986732 N, -85.0388492 W), 4 (UGAMNH 19695-19698).

ILLINOIS: ALEXANDER COUNTY: Olive Branch (37.1686592 N, -89.3517532 W), 7 (FMNH 15410-15412, 15414, 15419-15421). MASSAC COUNTY: No specific locality (37.2005693 N, -88.7081681 W), 9 (SIUCM 3062, 3063, 3065, 3066, 3068, 3069, 3071, 3075, 3076). HARDIN COUNTY: Rosiclare (37.424038 N, -88.3471587 W), 4 (FMNH 15807-15809, 16058). JACKSON COUNTY: Carbondale, SIUC campus, "President's pond" (37.7074548 N, -89.2258071 W), 19 (SIUCM 3012-3017, 3019-3024, 3027-3031, 3038, 3051); Carbondale reservoir S of Carbondale (37.6992149 N, -89.2231407 W), 6 (SIUCM 3002, 3005, 3007, 3008, 3018, 3045); 1 mi N Pomona, Shawnee National Forest (37.6504215 N, -89.3367577 W), 5 (3001, 3006, 3009-3011); Pomona (37.6369325 N, -89.3367577 W), 2 (SIUCM 3047, 3053). JOHNSON COUNTY: Reevesville (37.3625861 N, -88.7419768 W), 3 (FMNH 15813, 15814, 15816); No specific locality (37.4487894 N, -88.8756331 W), 14 (SIUCM 3089, 3093, 3094, 3096-3103, 3105, 3106, 3108). MASSAC COUNTY: No specific locality (37.2005693 N, -88.7081681 W), 1 (SIUCM 3078). POPE COUNTY: 1 ½ mi S Glendale (37.4338559 N, -88.6537136 W), 2 (UMNH 27975, 27976); Golconda (37.3627548 N, -88.4874958 W), 2 (FMNH 15811, 16056); 1 mi NW Eddyville (37.5091928 N, -88.600695 W), 11 (SIUCM 3026, 3034, 3036, 3037, 3041, 3043, 3044, 3046, 3048-3050); No specific locality (37.3337248 N, -88.5587766 W), 6 (SIUCM 3032, 3056-3060). RANDOLPH COUNTY: No specific locality (38.0127698 N, -89.8997306 W), 1 (SIUCM 3064). ST. CLAIR COUNTY: 2 ½ mi SW Scott Air Force Base (38.517529 N, -89.8834857 W), 4 (MHP 27924-27927). UNION COUNTY: Jonesboro (37.4517155 N, -89.2681389 W), 1 (SIUCM 3035); Shawnee National Forest

(37.4659444 N, -89.2816046 W), 2 (SIUCM 3033, 3040); No specific locality (37.4659444 N, -89.2816046 W), 1 (UMNH 28533). WILLIAMSON COUNTY: Crab Orchard National Wildlife Refuge (37.7292156 N, -88.8042336 W), 1 (SIUCM 3003); No specific locality (37.7313253 N, -88.9299966 W), 13(SIUCM 3070, 3072-3074, 3079-3082, 3085-3087, 3091, 3092).

KENTUCKY: BALLARD COUNTY: Ballard County Wildlife Management Area (37.1055746 N, -88.9947509 W), 1 (USNM 566718). MC CRACKEN COUNTY: Paducha, Paducha Plant, AEC (37.0776401 N, -88.6169434 W), 1 (CUSC 2701).

LOUISIANA: CADDO PARISH: 3 mi S, 2 mi W Blanchard (32.5364122 N, -93.926866 W), 10 (LSUMZ 15146, 18160-18166, 18525, 19769); 5 mi NE Greenwood (32.4942411 N, -93.9124616 W), 2 (LSUMZ 17808, 17866); 3 ¾ mi N, ¾ mi W Greenwood (32.4973535 N, -93.9858047 W), 4 (LSUMZ 17904-17907). DE SOTO PARISH: 6 ½ mi N, 4 ½ mi E Pelican (31.9767269 N, -93.5094666 W), 1 (LSUMZ 17365).

MISSISSIPPI: ATTALA COUNTY: Unable to read specific locality* (33.0815449 N, -89.6432191 W), 1 (MMNS 2418). CHICKASAW COUNTY: Carpenter Graveyard area* (33.9080198 N, -88.9559096 W), 1 (MMNS 4896); Chookatonkehie Cr. Area*(33.9080198 N, -88.9559096 W), 1 (MMNS 5921). CHOCTAW COUNTY: 9 mi NW Ackerman (33.4033404 N, -89.281161 W), 1 (MMNS 6469). CLARKE COUNTY: Linton (32.034317 N, -88.5875359 W), 3 (MMNS 4976, 5027, 5030). JONES COUNTY: Boquehoma area* (T8N, R13W, Sec. 25, 26, 34, 35, 36) (31.6280103 N, -89.1734085 W), 4 (MMNS 2152, 2154, 3404, 4041).

LAUDERDALE COUNTY: Meridian Watershed (T6N, R16E, Sec. 9-16, 21-29) (32.3643456 N, -88.7036438 W), 1 (MMNS 4264). LEAKE COUNTY: Cole Refuge area* (32.7520009 N, -89.5255166 W), 3 (MMNS 5760, 5769, 5832). PRENTISS COUNTY: 20 Mile area* (34.6130104 N, -88.5332566 W), 1 (MMNS 4967). TIPPAH COUNTY: Gillard Farm* (34.7978553 N, -88.9035341 W), 3 (MMNS 2640, 2929, 4222). WAYNE COUNTY: Trigg area *(T7N, R7W, Sec. 9) (31.6624003 N, -88.6977086 W), 4 (MMNS 2778, 2779, 4160, 4553). WINSTON COUNTY: Tallahaga Creek (32.9169129 N, -88.9685063 W), 1 (MMNS 3770); Nanih Waiya (32.9416018 N, -88.9486888 W), 2 (MMNS 3767, 4643).

MISSOURI: BUTLER COUNTY: 3 mi W Ash Hill, by hwy 60 (36.7756081 N, -90.2874912 W), 1 (MHP 16016). MADISON COUNTY: 4 mi N Fredricktown (37.6036429 N, -90.2946167 W), 1 (ASU 1798).

NORTH CAROLINA: BLADEN COUNTY: Clarkton, hwy 701 & Burney Ford road (34.49223 N, -78.6561241 W), 2 (UNCW 2631, 2885). BRUNSWICK COUNTY: 2 km NW Rabontown (34.1859727 N, -78.1928331 W), 3 (UNCW 11626, 14030, 14033); 1 km NW Rabontown (34.1795981 N, -78.1851635 W), 3 (UNCW 11628, 11629, 14027); 1 km N Rabontown (34.1822386 N, -78.177494 W), 4 (UNCW 11625, 14031, 14035, 14036); ½ km N Rabontown (34.177731 N, -78.177494 W), 1 (UNCW 11627); 5.3 mi N Wilmington, hwy 17 (34.2242935 N, -77.9260253 W), 1 (UNCW 507); 5.3 mi W Wilmington (34.2257252 N, -78.0467801 W), 1 (UNCW 494); 1 mi W Wilmington (34.2209178 N, -77.9911896 W), 1 (UNCW 3514); 3 mi NW Winnabow (34.1801128 N, -78.1306195 W), 2 (UNCW 3513, 3967). CRAVEN COUNTY: New

Bern (35.1081167 N, -77.044075 W), 1 (MVZ 81253). CURRITUCK COUNTY: Near Moyock (36.5245514 N, -76.1782532 W), 1 (CM 70905); No specific locality (36.3382304 N, -76.0318377 W), 1 (CM 70909). FRANKLIN COUNTY: 2 km W Youngsville, hwy 2 (36.0335373 N, -78.4865024 W), 2 (UNCW 4778, 4779). GASTON COUNTY: Gastonia (35.2620811 N, -81.1873016 W), 1 (UNCW 2304). GUILFORD COUNTY: Greensboro (36.0726357 N, -79.7919731 W), 3 (UNCW 3624, 3964, 4127); 2 km W Jamestown (35.9943027 N, -79.9574945 W), 1 (UNCW 4513). HARNETT COUNTY: 6 km E Sport Spring* (35.3889543 N, -78.879257 W), 1 (UNCW 4327). HYDE COUNTY: 6 km N Scranton, hwy 264 (35.551189 N, -76.4472301 W), 3 (UNCW 4774, 4776, 4781); 4 km N Scranton (35.5331628 N, -76.4482471 W), 1 (UNCW 4780). MECKLENBERG COUNTY: Charlotte (35.2270889 N, -80.8431282 W), 3 (UNCW 2650, 2886, 3625). MONTGOMERY COUNTY: Mt. Gilead (35.2148705 N, -80.0022736 W), 1 (UNCW 641). MOORE COUNTY: 7 km SW Robbins, hwy 24/27 (35.3894194 N, -79.6414818 W), 4 (UNCW 4233, 4234, 4239, 4329). ONSLOW COUNTY: 10 km E Sneads Ferry, South Onslow beach (34.5793094 N, -77.2879299 W), 1 (UNCW 4129); Swansboro (34.6984914 N, -77.1380629 W), 3 (UNCW 2295, 2302, 2303). PITT COUNTY: 3 km WSW Dupree Crossroads, hwy 222 (35.6899876 N, -77.5689283 W), 1 (UNCW 4350). RANDOLPH COUNTY: Ahseboro (35.7003365 N, -79.8155594 W), 1 (UNCW 3519). STANLY COUNTY: 2 mi SE Badin (35.3890017 N, -80.0919855 W), 1 (UNCW 495). TYRRELL COUNTY: 4 km SE Creswell (35.8449482 N, -76.3452857 W), 1 (UNCW 5171). VANCE COUNTY: 16 mi S, 8 ½ mi E Clarksville (Virginia) (36.3919902 N,

-78.4040104 W), 2 (VMNH 131495, 131519). WAKE COUNTY: Raleigh (35.7720528 N, -78.6386261 W), 2 (MCZ 1293; MVZ 125645).

OKLAHOMA: MC CURTAIN COUNTY: Little River National Wildlife Refuge (34.0048332 N, -94.5668755 W), 1 (OMNH 19860).

SOUTH CAROLINA: ABBEVILLE COUNTY: Sumter National Forest (34.0189093 N, -82.2450336 W), 17 (CUSC 1947 -1955, 1957, 1959-1965). AIKEN COUNTY: 2 mi N, 1 ½ mi W Jackson (33.354443 N, -81.8138183 W), 2 (MHP 15253; CM 55226); Savannah River Plant (33.272738 N, -81.6599926 W), 74 (CM 92542-92546, MVZ 179686-179718, 179720-179728, 179730-179732, 179736, 179737, 179739, 179740 179743-179749, 179751-179754, 179756-179760, 179762, 179763; ROM 94400, 94402). BARNWELL COUNTY: 3 ½ mi S, 9 ½ mi W Barnwell (33.1956389 N, -81.5227679 W), 2 (MVZ 179764, 179765); Savannah River Plant (33.2380486 N, -81.6221313 W), 78 (CM 92547-92553, 92555-92566, 92568, 92569; CUSC 876 -894, 3143-3152, 3154-3158, 3160-3166, 3168-3172, 3184-3186, 3210, 3212, 3213, 3238-3242). CHARLESTON COUNTY: Dayton (32.8460254 N, -79.8659516 W), 1 (SBMNH 4225); 2 7/8 mi N, 8 mi W Mc Clellanville, Coffee Cr. Swamp (33.1305917 N, -79.6065255 W), 2 (CM 59688, 59689); Porcher's Bluff (32.8588251 N, -79.7642183 W), 3 (ROM 24581, 24582; SBMNH 4224); St Andrew's Parish (32.7901 N, -79.9999 W), 4 (MVZ 97170, 97172, 183391; UWBM 71619). EDGEFIELD COUNTY: Sumter National Forest (34.0189093 N, -82.2450336 W), 17 (CUSC 1916, 1918, 1919, 1921-1923, 1933, 1934, 1944-1946, 1966, 1967, 1980-1983). GEORGETOWN COUNTY: Georgetown, Belle Baruch Plantation (33.3740692 N,

-79.2899704 W), 2 (CUSC 2209, 2210). GREENVILLE COUNTY: Greenville (34.8526173 N, -82.3940086 W), 2 (CUSC 1321, 1322); Taylors (34.9139792 N, -82.3104759 W), 1 (CUSC 2747). GREENWOOD COUNTY: 4 mi S Bradley, Sumter National Forest (34.0219879 N, -82.234266 W), 3 (CUSC 1973, 1975, 1976); Sumter National Forest (34.0189093 N, -82.2450336 W), 12 (CUSC 1912-1914, 1969-1972, 1984-1988). HAMPTON COUNTY: 1 ½ mi SW Garnett (32.5908928 N, -81.2635655 W), 1 (CUSC 2845); Palachucola Wildlife Management Area (32.8859301 N, -81.0166168 W), 11 (CUSC 2796-2798, 2800-2804, 3032-3034). KERSHAW COUNTY: Columbia, mouth of Grumnie's Quarter Creek (34.0007114 N, -81.0348167 W), 1 (CUSC 2347). MC CORMICK COUNTY: Clark's Hill National Guard Training Site (33.848455 N, -82.2583143 W), 4 (CUSC 3078-3081); 2 ½ mi N Bordeaux, Sumter National Forest (33.9627822 N, -82.420681 W), 1 (CUSC 1990); 2.3 mi W Bordeaux, Sumter National Forest (33.9292629 N, -82.458808 W), 5 (CUSC 1927-1931); Sumter National Forest (34.0189093 N, -82.2450336 W), 9 (CUSC 1925, 1926, 1936-1942); 1.3 mi W Troy, Sumter National Forest (33.9875744 N, -82.3205439 W), 1 (CUSC 1924). PICKENS COUNTY: Traveler's Rest (34.9669442 N, -82.4384844 W), 1 (CUSC 2432). RICHLAND COUNTY: Fort Jackson (34.0546505 N, -80.8315658 W), 34 (CUSC 2348-2362, 2387-2391, 2976-2979, 3009; MHP 31870-31873, 31875, 31878-31881); Messer's Pond, Fort Jackson (34.0731374 N, -80.7907104 W), 2 (CUSC 3005, 3006). YORK COUNTY: York (34.9943027 N, -81.2420158 W), 1 (CUSC 2592).

TENNESSEE: CHESTER COUNTY: Henderson, 8 mi W Chickasaw State Forest (35.4392414 N, -88.6414337 W), 1 (USNM 462503). MADISON COUNTY: Jackson (35.6145172 N, -88.8139458 W), 5 (USNM 462501, 462502, 462504-462506).

TEXAS: HARRISON COUNTY: 1 mi N I-20 on hwy 31 (32.5054187 N, -94.3124771 W), 1 (DMNH 1363). NACOGDOCHES COUNTY: 1 mi E Nacogdoches (31.6031799 N, -94.6382461 W), 4 (TTU 93137, 93139-93141); Nacogdoches (31.6031799 N, -94.6552048 W), 2 (TTU 75, 76). RED RIVER COUNTY: 14 mi NE Clarksville (33.7416226 N, -94.8811216 W), 3 (DMNH 1412-1414). SHELBY COUNTY: 8 mi E Shelbyville (31.7615614 N, -93.9484485 W), 1 (TTU 93211).

VIRGINIA: CHESAPEAKE COUNTY: Stumpy Lake (36.756815 N, -76.1446571 W), 1 (UNCW 3517). HALIFAX COUNTY: 2 ½ mi 7 ½ mi W Clarksville (36.6642493 N, -78.6995005 W), 2 (VMNH 131499, 132024). MECKLENBURG COUNTY: 3 ½ mi N, 4 ½ mi W Clarksville (36.6743796 N, -78.6379058 W), 2 (VMNH 131506, 131906); 3 ½ mi N, 4 mi W Clarksville (36.6764293 N, -78.6253586 W), 1 (VMNH 131684); 2 mi S, 1 mi E Clarksville (36.5951226 N, -78.5389501 W), 5 (VMNH 131482, 131483, 131881, 131946, 132218); 2 ½ mi S, 1 mi E Clarksville (36.5896214 N, -78.5389501 W), 1 (VMNH 131605); 5 mi S, ½ mi E Clarksville (36.5714541 N, -78.547946 W), 1 (VMNH 131601). NORFOLK COUNTY: 7728 Newport Avenue (36.9184699 N, -76.2791061 W), 1 (CM 70925). SOUTHAMPTON COUNTY: Cypress Station* (36.7709234 N, -77.1607016 W), 1 (MVZ 81255). VIRGINIA BEACH COUNTY: Backbay Wildlife Refuge, 3 mi S of caretaker's house (36.6565437 N, -75.9340935 W), 1 (CM 70936); Oceana Naval Air Station (36.8117585 N,

-76.0307121 W), 22 (VMNH 138703-138705, 138708, 138712, 138717-138720, 138722, 138725, 138727, 138728, 138730, 138776, 138778, 138780, 138781, 138802, 138805-138807); Pendleton Navy Base, Lovett's Marsh (36.8121708 N, -75.9844493 W), 2 (VMNH 138733, 138734); 3 mi SW Princess Anne (36.7207737 N, -76.0912198 W), 1 (UNCW 3399); 2 mi E Princess Anne (36.7515373 N, -76.0184216 W), 1 (UNCW 3512); Seashore State Park (36.9084506 N, -76.0197257 W), 4 (VMNH 138789, 138803, 138809, 138814); 2 mi SE Stumpy Lake (36.7432068 N, -76.1137018 W), 1 (UNCW 3520).

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ARKANSAS: ASHLEY COUNTY: ½ mi S Crossett, off hwy 133 (33.1185552 N, -91.961525 W), 1 (ASU 6395). CROSS COUNTY: 3 mi S Birdeye, hwy 16 (35.3351781 N, -90.6873322 W), 4 (ASU 2508-2511); Cherry Valley (35.4007143 N, -90.75317 W), 10 (ASU 2479, 2480, 2487, 2488, 2492, 2493, 2507, 2582, 2672, 2673); (T7N, R4E, Sec. 4) (35.25828 N, -90.67559 W), 1 (ASU 2968). LEE COUNTY: 2 ½ mi N Felton (34.8400967 N, -90.7962189 W), 1 (ASU 3280). MISSISSIPPI COUNTY: ½ mi S Manila (35.8728214 N, -90.1669922 W), 1 (ASU 2136); 3 mi W Manila (35.8800735 N, -90.2204588 W), 19 (ASU 1221, 1247, 1248, 1268, 1297-1300, 1305, 1320, 1322, 1325, 1347, 1515, 1899, 1932, 2156, 2464, 2781). POINSETT COUNTY: ½ mi S Craighead County line on Ark 39 (35.9846738 N, -90.3378295 W), 2 (ASU 2590, 2780); Harrisburg (35.5642471 N, -90.7167778 W), 2 (ASU 593, 594); (T12N, R3E, Sec. 36) (35.62750 N, -90.72094 W), 1 (ASU 3217). PRAIRIE COUNTY: 4 mi E Des Arc (34.9765052 N, -91.4437275 W), 1 (ASU 1834); 1

½ mi W Little Dixie (35.0015295 N, -91.412698 W), 1 (ASU 1833). UNION COUNTY: El Dorado (33.2076263 N, -92.6662712 W), 2 (UAMZC 574, 581); (T17S, R16W, Sec. 25) (33.21582 N, -92.70597 W), 1 (ASU 19692). WOODRUFF COUNTY: 4 mi S Fair Oaks (35.1855169 N, -91.0856515 W), 1 (ASU 2930); 4 mi N Howell (35.1717272 N, -91.2454071 W), 3 (ASU 19768, 19769, 19786).

KENTUCKY: FULTON COUNTY: 4 ½ mi SW Hickman (36.5430131 N, -89.2433873 W), 1 (USNM 267739). HICKMAN COUNTY: Hickman (36.5711727 N, -89.1858159 W), 1 (USNM 71477).

LOUISIANA: ALLEN PARISH: ¼ mi NW Oakdale (30.8185604 N, -92.6634194 W), 1 (LSUMZ 29834). BEAUREGARD PARISH: 1 ½ mi E Edith (30.51633 N, -93.1642514 W), 1 (LSUMZ 6473). BIENVILLE PARISH: 6 mi N Mt. Olive (32.4068012 N, -92.8483543 W), 2 (LSUMZ 11391, 11392). CALCASIEU PARISH: 1 mi SW Maplewood (30.2207413 N, -93.3279762 W), 1 (LSUMZ 6142); ½ mi S Maplewood, 7 mi W Lake Charles (30.2175418 N, -93.3164978 W), 1 (LSUMZ 6143); 2 mi W Sulphur (30.2366066 N, -93.4107885 W), 1 (LSUMZ 13428). CALDWELL PARISH: Columbia (32.1051579 N, -92.0779152 W), 5 (FMNH 16533, 16535-16537, 16539). EAST BATON ROUGE PARISH: 2 mi S Baker (30.5589528 N, -91.1681061 W), 1 (LSUMZ 9048); 10 mi N Baton Rouge (30.5840527 N, -91.1541019 W), 1 (LSUMZ 18159); 4 ½ mi S Baton Rouge (30.3847225 N, -91.208496 W), 1 (LSUMZ 20754); 3 mi S, 2 mi E Baton Rouge (30.4071958 N, -91.121041 W), 1 (LSUMZ 15438); 3 mi SE Baton Rouge (30.4294512 N, -91.0759367 W), 2 (LSUMZ 17369, 17370); 4 mi SE Baton Rouge (30.4191862 N,

-91.0640875 W), 1 (LSUMZ 7867); 7 mi SE Baton Rouge (30.3888704 N, -91.0285397 W), 1 (LSUMZ 8706); Baton Rouge (30.4602454 N, -91.1114881 W), 4 (LSUMZ 7861, 7863, 9050, 9571); 5859 Chandler Drive (30.3971607 N, -91.1482429 W), 1 (LSUMZ 17368); ¾ mi NW Indian Mound, University (30.6103855 N, -90.9867552 W), 1 (LSUMZ 3301); 2 mi W Indian Mound (30.6026869 N, -91.0292188 W), 1 (LSUMZ 6757); Indian Mound, University (30.6026869 N, -90.9956551 W), 1 (LSUMZ 3300); 2 mi S Lindsay (30.685606 N, -91.218025 W), 2 (LSUMZ 2299, 2319); 4 mi S Lindsay (30.656854 N, -91.218262 W), 3 (LSUMZ 2315; USNM 274689, 284827); 2 mi S LSU (30.3882765 N, -91.1758804 W), 1 (LSUMZ 17985); 7 mi SE LSU (30.3290273 N, -91.0848999 W), 2 (LSUMZ 19774, 19775); 10 mi S LSU (30.2388999 N, -91.1672973 W), 2 (LSUMZ 8708, 31564); Port Hudson (30.6763359 N, -91.2645219 W), 1 (LSUMZ 2297); 5 mi N University (30.4786109 N, -91.1831255 W), 1 (LSUMZ 3305); 3 mi NE University (30.4368211 N, -91.150028 W), 1 (LSUMZ 7865); 3 mi W University (30.4060259 N, -91.236184W), 1 (ROM 21050); 1 mi SE University (30.3957608 N, -91.1739593 W), 1 (LSUMZ 8710); 2 mi ESE University (30.3949151 N, -91.1549933 W), 3 (LSUMZ 3303, 8707, 8714); 3 mi S University (30.3704121 N, -91.1810617 W), 2 (LSUMZ 2397; USNM 284828); 4 ½ mi S University (30.3610214 N, -91.1742972 W), 1 (LSUMZ 8709); 5 mi S University (30.3612671 N, -91.169833 W), 1 (LSUMZ 7872); 13 mi S University (30.3459473 N, -91.1411564 W), 1 (LSUMZ 8712); University (30.4060259 N, -91.1844655 W), 1 (LSUMZ 2478); 7 mi SW Zachary (30.5764957 N,

-91.2393783 W), 1 (LSUMZ 3304). EAST FELICIANA PARISH: 5 km SE Clinton, Idlewald Experiment Station (30.8335906 N, -90.9786418 W), 3 (LSUMZ 26718, 26720, 26823). EVANGELINE PARISH: 4 mi NNW Ville Platte (30.7414411 N, -92.297142 W), 1 (LSUMZ 11131). GRANT PARISH: 2 ½ mi N, 2 mi W Dry Prong (31.6178994 N, -92.5627182 W), 6 (LSUMZ 23962, 23964-23966, 23968, 23969); 1 mi S, 3 ½ mi W Dry Prong (31.5670992 N, -92.5881504 W), 5 (LSUMZ 23963, 23970-23973); 2 mi S, 4 mi W Dry Prong (31.5525848 N, -92.5966278 W), 5 (LSUMZ 23993-23997); 2 mi SW Montgomery Pond (31.6568294 N, -92.8986667 W), 1 (LSUMZ 18622); ½ mi N, ½ mi E Rock Hill (31.4543962 N, -92.5625148 W), 5 (LSUMZ 24001-24005); 1 mi W Pollock (31.5252781 N, -92.4240796 W), 1 (LSUMZ 29845). JACKSON PARISH: 2 mi SW Ansley (32.3751843 N, -92.7131628 W), 1 (CM 55228); Ansley (32.3957081 N, -92.6929283 W), 1 (CM 55227); ½ mi S Clay (32.41422 N, -92.6770973 W), 1 (MHP 15250). LAFAYETTE PARISH: 1 mi SSE Lafayette courthouse (30.2106773 N, -92.0142236 W), 1 (LSUMZ 29848); Vet Village on USL Campus, Lafayette (30.2240896 N, -92.0198441 W), 3 (LSUMZ 29825, 29826, 29849); W Flanders Road Bridge on LA. 3073 (30.1605 N, -92.0532 W), 1(LSUMZ 29830). LINCOLN PARISH: 2 mi S, 1 ½ mi W Ruston (32.498634 N, -92.663777 W), 1 (MHP 15251). LIVINGSTON PARISH: 3 mi NNE Denham Springs (30.5268248 N, -90.9302408 W), 2 (LSUMZ 15149, 15150). RAPIDES PARISH: 18 mi S Alexandria (31.0855052 N, -92.456849 S), 1 (LSUMZ 29837). RED RIVER PARISH: 5 mi N Coushatta (32.0984113 N, -93.3417664 W), 1 (LSUMZ 15961).SABINE PARISH: Bayou Negreet at the Sabine River (31.3943472 N, -93.6706728 W), 1 (LSUMZ 6475);

16 mi SW Florien (31.2845924 N, -93.6093307 W), 1 (LSUMZ 29842); 5 mi W Toledo Bend Dam (31.2103056 N, -93.5758781 W), 1 (LSUMZ 29827). ST. HELENA PARISH: 5 ½ mi NNW Chipola (30.9873887 N, -90.838539 W), 1 (LSUMZ 11132). ST. LANDRY PARISH: 3-5 mi NE Washington, vicinity of Thistlewaite Wildlife Refuge (30.6573662 N, -92.0095912 W), 1 (LSUMZ 29812). ST. TAMMANY PARISH: 3 mi S Covington Courthouse (30.4315414 N, -90.1007767 W), 2 (LSUMZ 33303, 33304); 2 km W Pearl River, 2 km N hwy 190 (30.3760252 N, -89.7692012 W), 2 (LSUMZ 26717, 26825). TANGIPAHOA PARISH: 3 mi W Fluker (30.8215733 N, -90.5225575 W), 1 (LSUMZ 10231); 4 mi NE Kentwood (30.9648797 N, -90.4672697 W), 1 (LSUMZ 6476); 6 mi N Roberts (30.6129399 N, -90.4068416 W), 1 (LSUMZ 6761). VERNON PARISH: 1 ½ km N, 11 km E Fort Polk (31.0601058 N, -93.0902063 W), 6 (LSUMZ 21910- 21914, 34142); Fort Polk (31.0465765 N, -93.2054405 W), 1 (LSUMZ 21991); 8 mi N Merryville (30.9204229 N, -93.495099 W), 1 (LSUMZ 29828); ¾ mi E Simpson (31.2457809 N, -93.0027863 W), 2 (LSUMZ 3297, 3298). WASHINGTON PARISH: 2 mi W Angie (30.9656861 N, -89.843169 W), 1 (TTU 77); 3 ½ mi ESE Angie (30.9467404 N, -89.7591399 W), 1 (LSUMZ 19779); Angie (30.9661827 N, -89.8094788 W), 1 (TTU 79); 2 mi S Enon (30.7028821 N, -90.0840836 W), 3 (LSUMZ 6758- 6760); Sheridan, Lee Memorial Forest (30.8685179 N, -90.0031395 W), 4 (LSUMZ 26716, 26719, 26822, 26826). WEST BATON ROUGE PARISH: 1mi S, 3 mi W Port Allen (30.4378785 N, -91.2609767 W), 2 (LSUMZ 28655, 28656); 6 mi W Port Allen on I-10 (30.4523954 N, -91.3112448 W), 1 (LSUMZ 20374); 1 mi W Mississippi River on I-10 (30.441718 N, -91.2205123 W), 1

(LSUMZ 20373). WEST FELICIANA PARISH: 5 ½ mi NE St. Francisville (30.836359 N, -91.3111138 W), 2 (LSUMZ 17890, 17891); 5 mi NE St Francisville (30.8312268 N, -91.3170579 W), 4 (LSUMZ 17901- 17903, 18468); 5 km N, 7 ½ km E St. Francisville (30.825004 N, -91.298148 W), 1 (LSUMZ 21915); St. Francisville (30.7797897 N, -91.3764114 W), 1 (LSUMZ 17327); 2 ½ mi N, 1 mi E Weyanoke (30.9669463 N, -91.4443857 W), 2 (LSUMZ 13425, 13427); 3.62 km W Weyanoke (30.9434211 N, -91.4991105 W), 1 (LSUMZ 21916).

MISSISSIPPI: ADAMS COUNTY: No specific locality (31.4669564 N, -91.4047741 W), 3 (MMNS 2950, 3223, 3227). BOLIVAR COUNTY: ⅓ mi N, 8 ½ mi W Benoit (33.6560329 N, -91.1561799 W), 1 (MHP 15252). CLAIBORNE COUNTY: 5 mi N, 4 mi W Port Gibson, Grand Gulf Nuclear Station (32.0311341 N, -91.0512843 W), 7 (MMNS 6575, 6579-6581, 6583-6585). COAHOMA COUNTY: Sunflower River Area (T27N, R3W, Sec. 10, 11, 14, 16) (34.2555259 N, -90.6801756 W), 2 (MMNS 5203, 5204). COPIAH COUNTY: Arista Ranch* (31.8681403 N, -90.4233856 W), 2 (MMNS 3098, 3099); Crystal Springs (31.9873781 N, -90.3570366 W), 1 (MMNS 5352). HANCOCK COUNTY: No specific locality (30.4121954 N, -89.5070457 W), 2 (MMNS 3531, 4503). HARRISON COUNTY: Naval park* (30.4324753 N, -89.073967 W), 1 (MMNS 5329); Saucier (30.6357918 N, -89.1350479 W), 2 (MMNS 1439, 1440); No specific locality (30.4324753 N, -89.073967 W), 2 (MMNS 1147, 1148). HINDS COUNTY: Jackson (32.2990466 N, -90.2229743 W), 2 (MMNS 839, 4768). LAMAR COUNTY: Lumberton (31.0147316 N, -89.4516344 W), 1 (MMNS 4477); Mixon Creek

(31.2093439 N, -89.4075661 W), 1 (MMNS 1972). LINCOLN COUNTY: Old Brook Area (T7N, R8E, Sec. 16, 17, 20, 21, 28, 27, 32, 33) (31.5311698 N, -90.4929125 W), 1 (MMNS 1254). MADISON COUNTY: No specific locality (32.6403103 N, -90.0914156 W), 4 (MMNS 868, 943, 1041, 1165). PEARL RIVER COUNTY: Poplarville (30.8393256 N, -89.5319112 W), 2 (MMNS 3673, 4395); No specific locality (30.7364948 N, -89.5955201 W), 1 (MMNS 2079). RANKIN COUNTY: Spear Farm* (32.3193054 N, -89.989952 W), 4 (MMNS 3003, 3634, 3637, 3636). SIMPSON COUNTY: Strong River (31.8493831 N, -90.1357457 W), 2 (MMNS 3855, 3856). WARREN COUNTY: Riley's area* (32.3507959 N, -90.8646126 W), 1 (MMNS 1083). WASHINGTON COUNTY: Park area* (33.2684593 N, -90.9568176 W), 1 (MMNS 4202); Washington (33.2684593 N, -90.9568176 W), 8 (USNM 33812, 34072-34078). WILKINSON COUNTY: Percy Creek (31.1587849 N, -91.5284538 W), 1 (MMNS 2314).

TENNESSEE: FAYETTE COUNTY: Hickory Withe (35.243988 N, -89.5886765 W), 1 (USNM 267159). HAYWOOD COUNTY: 8 mi N Brownsville (35.698186 N, -89.2628123 W), 1 (ASU 6492). OBION COUNTY: Reelfoot Lake (36.3614382 N, -89.3872971 W), 1 (FMNH 90516). SHELBY COUNTY: Meeman Biological Field Station, MSU (35.3333326 N, -90.0686645 W), 12 (CM 64740-64744, 106418-106422; MHP16052, 16054).

TEXAS: HARDIN COUNTY: 1 mi N, 5 ½ mi E Saratoga (30.2986159 N, -94.437365 W), 2 (TCWC 37442, 37820); 0.9 mi N, 4.5 mi E Saratoga (30.2971641 N, -94.4540924 W), 1 (TCWC 34956); 0.8 mi N, 2.6 mi E Saratoga (30.2957124 N,

-94.4858744 W), 3 (TCWC 34950, 34951, 34974); 4.6 mi E Saratoga (30.2840986 N, -94.4524196 W), 1 (TCWC 33337); Saratoga (30.2840986 N, -94.5293655 W), 2 (TCWC 33336, 33338); 10 ½ mi N, 3 mi E Silsbee (30.494345 N, -94.1221837 W), 1 (TCWC 37443); 1.8 mi S, 2.9 mi E Village Mills (30.4676871 N, -94.3488021 W), 4 (TCWC 34957-34960). JEFFERSON COUNTY: 5.1 mi N Hampshire* (29.8751354N, -94.1400492 W), 1 (LSUMZ 9572). LIBERTY COUNTY: 2.5 mi N, 3.8 mi E Moss Hill (30.2836786 N, -94.6895992 W), 2 (TCWC 33341, 33342). NEWTON COUNTY: 12 mi N Burkeville (31.0994492 N, -93.6906018 W), 14 (TCWC 37445, 37446, 37448, 37451-37456, 37838-37842); 11.4 mi N Burkeville (31.1003826 N, -93.6866334 W), 4 (TCWC 31465-31468); 10 ½ mi N Burkeville (31.1523334 N, -93.6822492 W), 1 (TCWC 31464); 10.4 mi N Burkeville (31.0984627 N, -93.6810793 W), 1 (TCWC 27624); 10 mi N Burkeville (31.0955007 N, -93.6805746 W), 4 (TCWC 27623, 28637, 31463, 37444); 9.3 mi N Burkeville (31.096302 N, -93.6750921 W), 4 (TCWC 31457-31460); 9.2 mi N Burkeville (31.0961064 N, -93.6744746 W), 1 (TCWC 31455); 9 mi N Burkeville (31.0934494 N, -93.6753459 W), 3 (TCWC 31451-31453); 7.4 mi N Burkeville (31.0889442 N, -93.6684739 W), 1 (TCWC 31450); Burkeville (30.9999189 N, -93.6679573 W), 2 (TCWC 27627, 27628). POLK COUNTY: 1.7 mi S, 2 mi E Camp Ruby (30.667746 N, -94.6857771 W), 1 (TCWC 33346); 1.4 mi N, 2.2 mi W Dallardsville (30.6488584 N, -94.6688002 W), 2 (TCWC 33343, 33345); 3.4 mi N, 0.4 mi W Sengo (30.626504 N, -94.6930246 W), 1 (TCWC 37457). SABINE COUNTY: 1 mi W Hemphill (31.3435698 N, -93.8715377 W), 1 (TTU 1698). TYLER

COUNTY: 3.1 mi N, 2.5 mi W Spurger (30.7377039 N, -94.2196821 W), 7 (TCWC 33350-33353, 33355-33357); 1.7 mi N, 1.6 mi W Spurger (30.717381 N, -94.2045644 W), 2 (TCWC 33347, 33349); 2.5 mi S, 4.4 mi E Spurger (30.654707 N, -94.1059773 W), 8 (TCWC 56912-56918, 57168); 1.9 mi S, 1.5 mi E Town Bluff (30.8029004 N, -94.1792066 W), 1 (TCWC 33358); 4.2 mi S, 1.6 mi W Warren (30.5630043 N, -94.4353778 W), 5 (TCWC 34961- 34965); 4.3 mi S, 1.4 mi W Warren (30.5622818 N, -94.4320211 W), 2 (TCWC 34968, 34970); 4.3 mi S, 1.1 mi W Warren (30.5622902 N, -94.4269859 W), 1 (TCWC 34967); 4.5 mi S, 0.5 mi W Warren (30.5623051 N, -94.4169156 W), 1 (TCWC 33360); 4.8 mi S, 0.7 mi W Warren (30.5586646 N, -94.4202723 W), 1 (TCWC 34972); 15 mi E Woodville (30.7700913 N, -94.2213259 W), 1 (TTU 2087). WALKER COUNTY: Fish hatchery trapping grid* (30.7818248 N, -95.5962446 W), 1 (SHSU 632); Gibb's Ranch (30.7235279 N, -95.5507774 W), 1 (SHSU 517); 5 mi N Huntsville (30.7961093 N, -95.5507774 W), 1 (SHSU 515); Huntsville (30.7235279 N, -95.5507774 W), 3 (SHSU 512, 514, 516); Phelps (30.6963062 N, -95.4443855 W), 1 (SHSU 859).

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FLORIDA: BREVARD COUNTY: East Peninsula opposite Micco, Oak Lodge (27.880765 N, -80.5006852 W), 3 (MCZ 3440-3442). DADE COUNTY: 1 mi W Chekkika State Recreation Area (25.6116 N, -80.679 W), 3 (MHP 15246-15248); 4 mi W Kendall (25.6792688 N, -80.3813971 W), 1 (KU 147085); 15 mi W Miami (25.7687923 N, -80.4343204 W), 1 (KU 147077). DESOTO COUNTY: 9 ¾ mi NW Arcadia (T37S, R23E, Sec. 13) (27.2930357 N, -81.9710022 W), 1 (AMNH 243137); 7

½ mi NW Arcadia (T37S, R23E, Sec. 13) (27.2861899 N, -81.9451558 W), 1 (AMNH 243138). HIGHLANDS COUNTY: 4 ½ mi NE Lake Placid (27.3393135 N, -81.311122 W), 1 (AMNH 250130); 6 mi S Lake Placid (27.1626256 N, -81.3664589 W), 1 (MHP 15249); 8 mi S Lake Placid (27.1367986 N, -81.3664589 W), 1 (AMNH 243176); Lake Placid (27.2747714 N, -81.3633728 W), 1 (CM 89367). HILLSBOROUGH COUNTY: No specific locality (27.8764614 N, -82.4000705 W), 4 (UF 26055, 26058, 26064, 26065). INDIAN RIVER COUNTY: 3 mi N Vero Beach (27.6821797 N, -80.4129176 W), 3 (UF 16311; AMNH 240248, 240249). MANATEE COUNTY: 9 ½ mi SE Myakka City (27.2698621 N, -82.0990249 W), 1 (AMNH 243184). MARTIN COUNTY: Jonathan Dickinson State Park (27.0061665 N, -80.1286507 W), 2 (UF 28964, 28968). ORANGE COUNTY: Christmas, Tosahatchee State Preserve (28.5363894 N, -81.0175591 W), 1 (UCF 568); Wekiwa Springs State Park (28.739667 N, -81.485939 W), 1 (UF 28461). OSCEOLA COUNTY: Kissimmee (28.2919569 N, -81.4075737 W), 1 (USNM 111196); Walt Disney World (28.4119 N, -81.582 W), (USNM 568086). PINELLAS COUNTY: No specific locality (27.8938749 N, -82.7102586 W), 3 (UF 26059, 26060, 26106). POLK COUNTY: Winter Haven (28.0222425 N, -81.7328568 W), 2 (CM 16492, 16493). SARASOTA COUNTY: Osprey (27.1918339 N, -82.4790801 W), 1 (UF 225).

Appendix II - Localities and museum identification numbers of specimens that had missing measurements and were not used in statistical analyses. Specimens were arranged alphabetically by subspecies, state, county, and reference location. Specimens with the same reference location were arranged from north to south, then west to east. The number of specimens collected from each locality was indicated prior to the museum acronym(s). Specimens with an asterisk (*) indicate instances where I could not determine the coordinates for the specific locality. In these cases, and in the cases where there was no specific locality given, I georeferenced the county instead of the specific locality.

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ALABAMA: AUTAUGA COUNTY: Autaugaville (32.4354362 N, -86.6548767 W), 4 (USNM 222600- 222603). CULLMAN COUNTY: Ardell (33.9953823 N, -87.0973594 W), 5 (USNM 207231, 207232, 207234, 207235, 207290). DE KALB COUNTY: Buck's Pocket (34.481199 N, -86.088034 W), 1 (USNM 222599). SUMTER COUNTY: 1 mi W Bellamy (32.4499359 N, -88.1510418 W), 1 (TCWC 6624).

ARKANSAS: CLAY COUNTY: ½ mi S Rector (36.2572747 N, -90.2922821 W), 1 (ASU 1336). COLUMBIA COUNTY: Columbia County fairgrounds (33.2670727 N, -93.2393303 W), 1 (ASU 10725); Magnolia (33.2670727 N, -93.2393303 W), 1 (ASU 12613); SAU campus (33.2670727 N, -93.2393303 W), 4 (ASU 10698, 10756, 10757, 12687). CRAIGHEAD COUNTY: Aggie Rd extended, 0.5

miles east of Airport Rd. (35.8461695 N, -90.6414556 W), 1 (ASU 6627); ASU campus (35.8423004 N, -90.7042809 W), 1 (ASU 98); 4 mi N Jonesboro (35.8925794 N, -90.7042809 W), 2 (ASU 11877, 11879); 3 mi NE Jonesboro (35.8730687 N, -90.6664923 W), 1 (ASU 1886); 2 mi NE Jonesboro (35.8628126 N, -90.6790885 W), 1 (ASU 2506); 1 mi N Jonesboro (35.8568047 N, -90.7042809 W), 1 (ASU 532); Jonesboro (35.8423004 N, -90.7042809 W), 6 (ASU 772, 6064, 6090, 8888, 11866, 27782); railroad tracks north of the airport (35.8380637 N, -90.6453609 W), 1 (ASU 6581); (T14N, R4E, NW ¼ SE ¼ Sec.10) (35.85523 N, -90.64764 W), 2 (ASU 15331, 15419). GREENE COUNTY: No specific locality (36.1147064 N, -90.5235061 W), 1 (ASU 508). JEFFERSON COUNTY: 10 mi S Pine Bluff (34.1431638 N, -92.0039853 W), 1 (UAMZC 579); Pine Bluff (34.2284317 N, -92.0031929 W), 1 (UAMZC 572). LAFAYETTE COUNTY: 6 miles north Spirit Lake Oil and Gas field* (33.2506963 N, -93.6142161 W), 2 (ASU 15182, 15183). LAWRENCE COUNTY: 4 mi W Lawrence (36.0702244 N, -91.053459 W), 2 (ASU 1161, 1162). MILLER COUNTY: Hwy 235 at Sulfer River* (33.3171559 N, -93.8556216 W), 1 (ASU 12950); (T15S, R28W, Sec. 28) (33.42271 N, -94.00327 W), 1 (ASU 19693); (T15S, R28W, Sec. 26) (33.42255 N, -93.97002 W), 1 (ASU 19704). MONTGOMERY COUNTY: (T2S, R23W, Sec. 24) (34.5512 N, -93.41339 W), 1 (ASU 16015). OUACHITA COUNTY: White Oak Lake State Park (33.701944 N, -93.090556 W), 4 (ASU 27911, 27915- 27917); 1 mi NE junction hwys 4 and 24 (33.594338 N, -92.911834 W), 2 (ASU 12614, 12625). PIKE COUNTY: 3 mi SW Murfreesboro (34.0378183 N, -93.7268876 W), 1 (ASU 12900). POLK COUNTY: 3 ½ mi W Mena, Rock Creek (34.5862083 N, -94.3010114 W), 1 (UAMZC 571); 2 mi W Rich Mountain, near Eagleton (34.690328 N, -94.337831 W), 1 (UAMZC 577). PULASKI COUNTY: Camp Robinson (34.8802982 N, -92.2879028 W), 4 (TCWC 50110, 50113, 50115, 50116). RANDOLPH COUNTY: 1 mi W Pocahontas (36.2614536 N, -90.9891456 W), 1 (ASU 1528). SALINE COUNTY: Saline River (T1S, R15W, NW ¼ NW ¼ Sec. 8) (34.65942 N, -92.63492 W), 1 (ASU 15192). SHARP COUNTY: 2 miles south Wirth (36.4202797 N, -91.3804165 W), 1 (ASU 21588).

GEORGIA: CHATHAM COUNTY: Montgomery (31.9414804 N, -81.1202086 W), 1 (MCZ 6205). COLUMBIA COUNTY: 3 mi S Little River, Dickey's Branch (33.6229103 N, -82.3255348 W), 1 (UGAMNH 1370). DADE COUNTY: Cloudland Canyon State Park, Bridge Trail, 34 50'0"N, 85 29'10"W (34.833333 N, -85.486111 W), 1 (UGAMNH 22486); Cloudland Canyon State Park, Daniel Creek, 0.1 mi S bridge over Daniel Creek (34.824408 N, -85.4908847 W), 1 (UGAMNH 22470). MC DUFFIE COUNTY: Thomson (33.4706955 N, -82.5045738 W), 1 (UGAMNH 1897). MC INTOSH COUNTY: Sapelo Island (31.4614682 N, -81.2603759 W), 2 (UGAMNH 22661, 22727). RICHMOND COUNTY: Pinetucky (33.337715 N, -82.142288 W), 2 (MCZ 6193, 6194); Hephzibah (33.3140411 N, -82.0967407 W), 1 (UWBM 71526). TIFT COUNTY: 1 mi E Tifton (31.4657364 N, -83.4973483 W), 1 (UGAMNH 464). WALKER COUNTY: 1 mi SE Rape Gap, Pigeon Mountain Wildlife Management Area (34.6337124 N, -85.3917129 W), 1(UGAMNH 22515).

ILLINOIS: ALEXANDER COUNTY: Olive Branch (37.1686592 N,

-89.3517532 W), 5 (FMNH 15413, 15415-15418). HARDIN COUNTY: Rosiclare (37.424038 N, -88.3471587 W), 2 (FMNH 15810, 16059). JACKSON COUNTY: Carbondale Reservoir S of Carbondale (37.6992149 N, -89.2231407 W), 1 (SIUCM 3004); Carbondale, SIUC campus, Thompson Woods (37.7074548 N, -89.2258071 W), 1 (SIUCM 3025); Pomona (37.6369325 N, -89.3367577 W), 2 (SIUCM 3042, 3052); SIU Touch of Nature area (37.7594053 N, -89.4155085 W), 1 (SIUCM 3054). JOHNSON COUNTY: Reevesville (37.3625861 N, -88.7419768 W), 2 (FMNH 15812, 15815); No specific locality (37.4487894 N, -88.8756331 W), 5 (SIUCM 3088, 3104, 3107, 3109, 3110). MASSAC COUNTY: No specific locality (37.2005693 N, -88.7081681 W), 2 (SIUCM 3067, 3077). POPE COUNTY: 2 ½ mi S Glendale (37.4193555 N, -88.6490325 W), 1 (UMNH 27977); Golconda (37.3627548 N, -88.4874958 W), 1 (FMNH 16057); 1 mi NW Eddyville (37.5091928 N, -88.600695 W), 2 (SIUCM 3039, 3055). WILLIAMSON COUNTY: No specific locality (37.7313253 N, -88.9299966 W), 3 (SIUCM 3083, 3084, 3090).

KENTUCKY: GRAVES COUNTY: 3 mi S, 3.1 mi E Boaz (36.8421071 N, -88.5785301 W), 1 (MHP 32222). MARSHALL COUNTY: 0.37 mi S, 1.37 mi W Iola (36.8944108 N, -88.433873 W), 2 (MHP 32348, 32816); 0.375 mi S, 1.37 mi W Iola (36.8944108 N, -88.433873 W), 1 (MHP 32379).

LOUISIANA: DE SOTO PARISH: Mansfield (32.0376644 N, -93.7001839 W), 1 (USNM 151459).

MISSISSIPPI: ATTALA COUNTY: Horseshoe Lake* (33.0815449 N,

-89.6432191 W), 1 (MMNS 2670). CHICKASAW COUNTY: Chookatonkehie Cr. Area* (33.9080198 N, -88.9559096 W), 2 (MMNS 5916, 5922). CLARKE COUNTY: Linton (32.034317 N, -88.5875359 W), 7 (MMNS 3291, 3347, 3348, 3825, 3957, 3959, 4975). CLAY COUNTY: Watkins* (33.6589948 N, -88.7573316 W), 7 (MMNS 3310-3313, 3678, 3685, 3687). JONES COUNTY: Boquehoma* (T8N, R13W, Sec. 25, 26, 34, 35, 36) (31.6280103 N, -89.1734085 W), 1 (MMNS 2153); Indian Springs* (T8N, R12W, Sec. 9) (31.6280103 N, -89.1734085 W), 3 (MMNS 694, 695, 698). LAUDERDALE COUNTY: Meridian (32.3643456 N, -88.7036438 W), 2 (MMNS 2339, 2549); Okatibbee (32.3981991 N, -88.6911583 W), 3 (MMNS 3669, 3670, 4531); Unable to read specific locality* (32.4018003 N, -88.6508981 W), 1 (MMNS 1864). LEAKE COUNTY: Cole Refuge area* (32.7520009 N, -89.5255166 W), 4 (MMNS 5745, 5751, 5759, 5831). LEE COUNTY: Stubbs area, Gower farm* (34.2945004 N, -88.6856536 W), 1 (MMNS 5858). LOWNDES COUNTY: Unable to read specific locality*, (T18N, R18W, Sec. 11, 14, 15) (33.5174198 N, -88.4614717 W), 1 (MMNS 1761). MONROE COUNTY: Cunningham Farm* (33.8704419 N, -88.4616736 W), 1 (MMNS 5552). OKTIBBEHA COUNTY: State College campus (33.4539301 N, -88.7947654 W), 1 (MMNS 4178). PONTOTOC COUNTY: Black Zion area (34.2466753 N, -89.0030183 W), 3 (MMNS 5876, 5879, 5887). PRENTISS COUNTY: 20 Mile area* (34.6130104 N, -88.5332566 W), 1 (MMNS 4968). TIPPAH COUNTY: Gillard farm* (34.7978553 N, -88.9035341 W), 7 (MMNS 2639, 2782, 2785, 2872, 3273, 3276, 5411). TISHOMINGO COUNTY: Dospey area* (34.7320403 N, -88.2321587 W), 1 (MMNS 4945). WAYNE COUNTY:

Trigg area* (T7N, R7W, Sec. 9) (31.6624003 N, -88.6977086 W), 6 (MMNS 2777, 2780, 2781, 4158, 4159, 4161). WEBSTER COUNTY: ¼ mi N Mathison (33.5623364 N, -89.1267874 W), 1 (MHP 5433). WINSTON COUNTY: Nanih Waiya (32.9416018 N, -88.9486888 W), 5 (MMNS 1709-1712, 3774); Tallahaga Creek (32.9169129 N, -88.9685063 W), 1 (MMNS 1725).

MISSOURI: BUTLER COUNTY: 1 ½ mi W Ash Hill (36.7756081 N, -90.2604515 W), 1 (CM 64707).

NORTH CAROLINA: CRAVEN COUNTY: New Bern (35.1081167 N, -77.044075 W), 1 (MVZ 81252). CURRITUCK COUNTY: No specific locality (36.3382304 N, -76.0318377 W), 3(CM 70906-70908). DUPLIN COUNTY: Warsaw (35.0001678 N, -78.0914078 W), 1 (MVZ 81254). WAKE COUNTY: Apex (35.7326508 N, -78.8503342 W), 1 (FMNH 7829); Raleigh (35.7720528 N, -78.6386261 W), 1 (MCZ 1292).

OKLAHOMA: MC CURTAIN COUNTY: 14 mi SE Broken Bow (33.8856474 N, -94.5846443 W), 1 (OMNH 3887).

SOUTH CAROLINA: ABBEVILLE COUNTY: Sumter National Forest (34.0189093 N, -82.2450336 W), 2 (CUSC 1956, 1958). AIKEN COUNTY: Savanna River Plant (33.272738 N, -81.6599926W), 6 (MVZ 179719, 179750, 179761; ROM 94398, 94399, 94401). BARNWELL COUNTY: Savanna River Plant (33.2380486 N, -81.6221313 W), 6 (CM 92554, 92567; CUSC 895, 3153, 3159, 3167). CHARLESTON COUNTY: St. Andrews Parish (32.7901 N, -79.9999 W), 1 (MVZ 97171). EDGEFIELD COUNTY: Sumter National Forest (34.0189093 N, -82.2450336 W), 7

(CUSC 1915, 1917, 1920, 1932, 1977-1979). GREENVILLE COUNTY: Bunched Arrowhead Heritage Preserve (34.9973787 N, -82.3919677 W), 1 (CUSC 2475); Greenville (34.8526173 N, -82.3940086 W), 1 (CUSC 1323). GREENWOOD COUNTY: Sumter National Forest (34.0189093 N, -82.2450336 W), 2 (CUSC 1968, 1974). HAMPTON COUNTY: Palachucola Wildlife Management area (32.8859301 N, -81.0166168 W), 1 (CUSC 2799). MC CORMICK COUNTY: 2 ½ mi N Bordeaux, Sumter National Forest (33.9627822 N, -82.420681 W), 1 (CUSC 1989); Sumter National Forest (34.0189093 N, -82.2450336 W), 2 (CUSC 1935, 1943). RICHLAND COUNTY: Fort Jackson (34.0546505 N, -80.8315658 W), 8 (CUSC 3010; MHP 31868, 31869, 31874, 31876, 31877, 31882, 31883).

TENNESSEE: MARION COUNTY: Nickajack Cave (35.0001911 N, -85.6226348 W), 1 (UGAMNH 1185). WEAKLY COUNTY: 2 mi N Martin (36.3724052 N, -88.850338 W), 1 (ASU 6385).

TEXAS: HARRISON COUNTY: 15 mi NE Marshall, Caddo Lake (32.6702117 N, -94.1861914 W), 1 (TTU 93088). HENDERSON COUNTY: 7 mi E Athens (32.204874 N, -95.7360325 W), 1 (UWBM 71622). NACOGDOCHES COUNTY: 1 mi E Nacogdoches (31.6031799 N, -94.6382461 W), 1 (TTU 93138).

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ARKANSAS: BRADLEY COUNTY: 1 mi E Warren (33.612606 N, -92.0471953 W), 1 (ASU 39). CROSS COUNTY: Cherry Valley (35.4007143 N,

-90.75317 W), 1 (ASU 2671). DREW COUNTY: T12S, R7W, NW ¼ NW ¼ Sec. 27) (33.64074 N, -91.81272 W), 1 (ASU 15288). MISSISSIPPI COUNTY: 3 mi N, 2 mi E Dell (35.8873346 N, -89.9977364 W), 1 (ASU 99); 3 mi W Manila (35.8800735 N, -90.2204588 W), 7 (ASU 1222, 1364, 1405, 1411, 1426, 1434, 2108). POINSETT COUNTY: 6 mi N Weiner (35.6688641 N, -90.9054445 W), 1 (ASU 1592). UNION COUNTY: El Dorado (33.2076263 N, -92.6662712 W), 1 (UAMZC 578).WOODRUFF COUNTY: (T7N, R1W, Sec. 24) (35.21500 N, -91.05077 W), 1 (ASU 11867).

KENTUCKY: FULTON COUNTY: 4 ½ mi SW Hickman (36.5430131 N, -89.2433873 W), 4 (USNM 267737, 267738, 267740, 267741). HICKMAN COUNTY: Hickman (36.5711727 N, -89.1858159 W), 2 (USNM 71478, 71480).

LOUISIANA: ASCENSION PARISH: 1 mile N junction of hwy 74 and 30* (30.2045903 N, -90.8696286W), 1 (ASU 6338). CALDWELL PARISH: Columbia (32.1051579 N, -92.0779152 W), 4 (FMNH 16534, 16538, 16540, 16541). EAST BATON ROUGE PARISH: 8 mi S, 1 mi E Baton Rouge (30.3501459 N, -91.1370311 W), 1 (LSUMZ 18454); Baton Rouge (30.4507465 N, -91.1502254 W), 1 (MVZ 70506); Kleinpeter (30.3497925 N, -91.0259018 W), 1 (LSUMZ 2479); 4 mi S Lindsay (30.656854 N, -91.218262 W), 2 (LSUMZ 2298; USNM 274688). LAFAYETTE PARISH: Vet Village on USL Campus, Lafayette (30.2240896 N, -92.0198441 W), 1 (LSUMZ 29843). NATCHITOCHES PARISH: Natchitoches (31.7607632 N, -93.0862579 W), 3 (USNM 151456-151458). TANGIPAHOA PARISH: Hammond (30.5043573 N, -90.4612007 W), 1 (LSUMZ 15442). WASHINGTON PARISH: Angie (30.9661827 N, -89.8094788 W), 1 (TTU 78); Hackley (30.9661462 N,

-90.0856438 W), 1 (FMNH 16409). WEST FELICIANA PARISH: 2 ½ mi N, 1 mi E Weyanoke (30.9669463 N, -91.4443857 W), 1 (LSUMZ 13426).

MISSISSIPPI: ADAMS COUNTY: No specific locality (31.4669564 N, -91.4047741 W), 5 (MMNS 3220, 3221, 3224, 3796, 3797). CLAIBORNE COUNTY: 5 mi N, 4 mi W Port Gibson (32.0311341 N, -91.0512843 W), 1 (MMNS 6578). COAHOMA COUNTY: Sunflower River* (T27N, R3W, Sec. 10, 11, 14, 16) (34.2555259 N, -90.6801756 W), 1 (MMNS 5225); No specific locality (34.2555259 N, -90.6801756 W), 3 (MMNS 5285- 5287). COPIAH COUNTY: Crystal Springs (31.9873781 N, -90.3570366 W), 6 (MMNS 3500, 3504, 3510, 3837, 5351, 5353). FORREST COUNTY: Burkett Creek* (T4N, R13W, Sec. 22) (31.1724253 N, -89.2945936 W), 5 (MMNS 2958, 3212, 3551, 3552, 3558); River Ane* (T4N, R13W, Sec. 11, 12, 14) (31.1724253 N, -89.2945936 W), 2 (MMNS 1442, 1443). HANCOCK COUNTY: No specific locality (30.4121954 N, -89.5070457 W), 2(MMNS 2989, 4502). HARRISON COUNTY: Biloxi (30.4054024 N, -88.8880538 W), 2 (USNM 206364, 210791); Saucier (30.6357918 N, -89.1350479 W), 3 (MMNS 697, 1438, 1441); No specific locality (30.4324753 N, -89.073967 W), 1 (MMNS 1146). HINDS COUNTY: Mays* (32.3130398 N, -90.4002876 W), 1 (MMNS 2577). HOLMES COUNTY: 2 ½ mi SE Goodman (32.952482 N, -89.910521 W), 1 (MMNS 2714); 3 ½ mi SE Goodman (32.9481982 N, -89.9086225 W), 1 (MMNS 2724); Jack Lake (32.8879014 N, -89.9569316 W), 2 (MMNH 2688, 2689); Mitchell* (33.1257019 N, -90.090538 W), 1 (MMNS 3724); Thomas* (33.1257019 N, -90.090538 W), 1(MMNS 3716); Unable to read specific locality* (T13N, R4E, SEC. 9, 16) (33.1257019 N, -90.090538 W), 1

(MMNS 2373). LAMAR COUNTY: Lumberton (31.0147316 N, -89.4516344 W), 1 (MMNS 4471); Mixon Creek (31.2093439 N, -89.4075661W), 1 (MMNS 1971). LINCOLN COUNTY: Brookhaven (31.5790586N, -90.4406471 W), 4 (MMNS 1585, 1588, 1591, 2476); Old Brook area* (T7N, R8E, Sec. 16, 17, 20, 21, 28, 27, 32, 33) (31.5311698 N, -90.4929125 W), 5 (MMNS 887, 895, 1255, 1326, 2119). MADISON COUNTY: Sharon (32.6584682 N, -89.9361916 W), 1 (MMNS 1096); No specific locality (32.6403103 N, -90.0914156 W), 4 (MMNS 944- 947). PIKE COUNTY: Unable to read specific locality* (T4N, R8E Sec. 31, 32) (31.1747243 N, -90.406914 W), 4 (MMNS 886, 893, 938, 939); Parsons* (T3N, R7E, Sec. 7) (31.1747243 N, -90.406914 W), 5 (MMNS 894, 908, 934-936). RANKIN COUNTY: Spear farm* (32.3193054 N, -89.989952 W), 4 (MMNS 3002, 3633, 3635, 3638); Spier farm* (32.3193054 N, -89.989952 W), 2 (MMNS 3001, 3300). SIMPSON COUNTY: Strong River (31.8493831 N, -90.1357457), 1 (MMNS 3854). WASHINGTON COUNTY: Perey Park area* (33.2684593 N, -90.9568176 W), 1 (MMNS 3713); Washington (33.2684593 N, -90.9568176 W), 1 (USNM 33997). WILKINSON COUNTY: Percy Creek (31.1587849 N, -91.5284538 W), 1 (MMNS 2313). YAZOO COUNTY: Phoenix (32.5812492 N, -90.5628777 W), 5 (MMNS 991, 1008, 1009, 2127, 2279).

TENNESSEE: FAYETTE COUNTY: Hickory Withe (35.243988 N, -89.5886765 W), 2 (USMN 267160, 267161); 6 mi N La Grange (35.1324038 N, -89.2776941 W), 1 (UWBM 71451). HAYWOOD COUNTY: 8 mi N Brownsville (35.698186 N, -89.2628123 W), 1 (ASU 6405). OBION COUNTY: Reelfoot Lake (36.3614382 N, -89.3872971 W), 1 (USNM 269988); Samburg (36.3821767 N,

-89.3533195 W), 1 (USNM 267175). SHELBY COUNTY: Meeman Biological Field Station, MSU (35.3333326 N, -90.0686645 W), 4 (MHP 16050, 16051, 16053, 16055).

TEXAS: HARDIN COUNTY: 0.8 mi N, 2.6 mi E Saratoga (30.2957124 N, -94.4858744 W), 8(TCWC 34946-34949, 34952- 34955); Saratoga (30.2840986 N, -94.5293655 W), 1 (TCWC 33339); 2 mi S, 3 ¼ mi E Village Mills (30.4647837 N, -94.342935 W), 1 (TCWC 33340). HARRIS COUNTY: Bayou Bend (29.8344599 N, -95.4361156 W), 1 (TCWC 31832); 7 mi W Houston (29.7632828 N, -95.4797509 W), 1 (LSUMZ 9564). NEWTON COUNTY: 12 mi N Burkeville (31.0994492 N, -93.6906018 W), 3 (TCWC 37447, 37449, 37450); 10 ½ mi N Burkeville (31.0977113 N, -93.6822492 W), 1 (TCWC 27625); 10 mi N Burkeville (31.0955007 N, -93.6805746 W), 1 (TCWC 27622); 9.9 mi N Burkeville (31.0974892 N, -93.6787817 W), 1 (TCWC 31462); 9 ½ mi N Burkeville (31.0957234 N, -93.6772627 W), 1 (TCWC 31461); 9.2 mi N Burkeville (31.0961064 N, -93.6744746 W), 1 (TCWC 31456); 9 mi N Burkeville (31.0934494 N, -93.6753459 W), 1(TCWC 31454); Burkeville (30.9999189 N, -93.6679573 W), 2 (TCWC 27626, 27975). POLK COUNTY: 1.4 mi N, 2.2 mi W Dallardsville (30.6488584 N, -94.6688002 W), 1 (TCWC 33344). SABINE COUNTY: 1 mi W Hemphill (31.3435698 N, -93.8715377 W), 1 (TTU 1773). SAN JACINTO COUNTY: 2.7 mi N Oakhurst (30.7763298 N, -95.3160515 W), 1 (SHSU 199); 3 mi NW Shepherd (30.5285313 N, -95.0321626 W), 1 (TCWC 6423). TYLER COUNTY: 3.1 mi N, 2.5 mi W Spurger (30.7377039 N, -94.2196821 W), 1 (TCWC 33354); 1.7 mi N, 1.6 mi W Spurger (30.717381 N, -94.2045644 W), 1 (TCWC 33348);

2.5 mi S, 4.2 mi E Spurger (30.6564123 N, -94.1071395 W), 1 (TCWC 57990); 4.2 mi S, 1.2 mi W Warren (30.5630156 N, -94.4286643 W), 1 (TCWC 34966); 4.3 mi S, 1.4 mi W Warren (30.5622818 N, -94.4320211 W), 2 (TCWC 34969, 34971); 4 ½ mi S, ½ mi W Warren (30.5623051 N, -94.4169156 W), 1 (TCWC 33359); 4.6 mi SE Warren (30.5756079 N, -94.3539307 W), 1 (TCWC 33361); 4.8 mi S, 0.7 mi W Warren (30.5586646 N, -94.4202723 W), 1 (TCWC 34973). WALKER COUNTY: 2 mi E Huntsville (30.7235279 N, -95.5171719 W), 1 (TCWC 16192); 3 mi E Huntsville (30.7235279 N, -95.5003692 W), 1 (SHSU 142).

Blarina carolinensis peninsulae

FLORIDA: DADE COUNTY: Miami (25.7777363 N, -80.19408 W), 1 (UMNH 70875, 70876). INDIAN RIVER COUNTY: Vero Beach (27.6386108 N, -80.3980014 W), 1 (UF 20688).

Appendix III - Identification and measurement data for all specimens used in analyses. The columns are as follows: Institution = acronym for the institution from which the specimen was borrowed; Cat. # = catalog number unique to that specimen at its home institution; Subspecies = nominal subspecies for that specimen, which I determined using the distribution map from McCay (2001), Fig. 4; Group = group which the specimens was sorted into for analysis, Fig. 6; OPLEN = occipito-premaxillary length measurement; P4-M3 = length of molariform toothrow measurement; CRNBR = cranial breadth measurement; MAXBR = maxillary breadth measurement; INOBR = interorbital breadth measurement; HEMAN = height of mandible measurement; COPBR = breadth of condyloid process measurement. For more information on the measurements that were recorded, consult Fig. 5.

Appendix III

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
AMNH	131587	*carolinensis*	Q	19.35	5.328	10.69	6.84	5.05	5.60	1.248
AMNH	131589	*carolinensis*	Q	18.65	5.232	10.30	6.66	5.05	5.32	1.152
AMNH	131616	*carolinensis*	Q	18.92	5.232	10.61	6.88	5.35	5.59	1.344
AMNH	240248	*peninsulae*	S	19.37	5.040	9.89	6.42	4.86	5.53	1.344
AMNH	240249	*peninsulae*	S	19.46	5.088	10.10	6.46	4.91	5.53	1.344
AMNH	240255	*carolinensis*	Q	18.42	4.944	9.98	6.67	4.92	5.33	1.344
AMNH	240257	*carolinensis*	Q	18.09	5.136	9.64	6.49	5.09	5.29	1.152
AMNH	243137	*peninsulae*	S	20.12	5.184	10.60	6.86	5.29	5.67	1.440
AMNH	243138	*peninsulae*	S	18.75	4.944	9.90	6.22	5.03	5.10	1.344
AMNH	243176	*peninsulae*	S	19.89	5.280	10.49	6.68	5.30	5.49	1.440
AMNH	243184	*peninsulae*	S	20.06	4.992	10.48	6.62	5.17	5.62	1.344
AMNH	250130	*peninsulae*	S	18.76	4.896	10.10	6.41	5.43	5.18	1.296
ASU	261	*carolinensis*	H	18.74	5.184	9.93	6.79	5.15	5.60	1.248
ASU	573	*carolinensis*	G	18.14	4.992	9.81	6.53	5.11	5.01	1.152
ASU	593	*minima*	H	19.32	5.280	10.15	7.07	5.27	5.62	1.296
ASU	594	*minima*	H	18.02	4.896	10.06	6.77	5.26	5.22	1.344
ASU	633	*carolinensis*	H	19.21	5.280	10.15	6.62	5.33	5.36	1.296
ASU	798	*carolinensis*	H	19.14	5.328	10.71	6.85	5.08	5.29	1.200
ASU	811	*carolinensis*	H	18.98	5.424	10.48	6.91	5.24	5.31	1.296
ASU	906	*carolinensis*	H	19.44	5.376	10.06	6.65	5.14	5.21	1.296
ASU	970	*carolinensis*	H	19.10	5.280	10.58	6.78	5.07	5.43	1.344
ASU	974	*carolinensis*	H	19.42	5.424	10.76	6.83	5.44	5.58	1.440

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
ASU	975	*carolinensis*	H	19.35	5.184	10.22	6.84	5.14	5.49	1.344
ASU	976	*carolinensis*	H	19.66	5.472	10.78	6.90	5.24	5.84	1.440
ASU	1007	*carolinensis*	H	19.24	5.280	10.40	6.35	5.13	5.53	1.488
ASU	1009	*carolinensis*	H	18.70	5.136	10.40	6.75	5.00	5.61	1.344
ASU	1010	*carolinensis*	H	18.99	5.424	9.83	6.73	5.10	5.56	1.296
ASU	1012	*carolinensis*	H	19.17	5.184	10.46	6.62	5.25	5.43	1.248
ASU	1142	*carolinensis*	H	19.05	5.184	10.25	6.27	5.10	5.41	1.344
ASU	1163	*carolinensis*	H	18.56	5.184	10.11	6.62	5.10	5.25	1.248
ASU	1164	*carolinensis*	H	18.65	5.040	10.08	6.59	5.01	5.26	1.248
ASU	1165	*carolinensis*	H	18.50	5.184	9.65	6.56	5.14	5.14	1.248
ASU	1201	*carolinensis*	H	18.95	5.184	10.29	6.72	4.88	5.46	1.296
ASU	1205	*carolinensis*	H	18.77	5.136	10.19	6.44	4.95	5.39	1.248
ASU	1221	*minima*	H	19.34	5.472	10.00	6.57	5.03	5.46	1.248
ASU	1247	*minima*	H	19.22	5.472	10.16	6.48	4.94	5.40	1.152
ASU	1248	*minima*	H	19.27	5.376	10.27	6.66	5.13	5.33	1.248
ASU	1268	*minima*	H	19.41	5.520	10.06	6.56	4.89	5.59	1.344
ASU	1297	*minima*	H	19.28	5.232	10.39	6.85	5.29	5.55	1.296
ASU	1298	*minima*	H	19.02	4.992	10.38	6.46	5.00	5.32	1.296
ASU	1299	*minima*	H	18.96	5.136	10.31	6.66	5.19	5.22	1.344
ASU	1300	*minima*	H	19.39	5.520	10.02	6.44	4.96	5.34	1.248
ASU	1305	*minima*	H	19.03	5.280	10.05	6.63	5.14	5.27	1.248
ASU	1320	*minima*	H	19.32	5.280	10.28	6.58	4.88	5.24	1.344
ASU	1322	*minima*	H	19.20	5.424	9.93	6.52	5.34	5.28	1.248

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
ASU	1325	*minima*	H	19.17	5.280	10.21	6.52	5.10	5.28	1.248
ASU	1335	*carolinensis*	H	19.19	5.280	10.43	6.84	5.24	5.32	1.248
ASU	1347	*minima*	H	19.16	5.472	10.12	6.65	5.28	5.40	1.248
ASU	1515	*minima*	H	18.41	5.136	9.92	6.45	5.03	5.27	1.248
ASU	1531	*carolinensis*	H	18.58	5.136	10.15	6.41	4.88	5.52	1.344
ASU	1798	*carolinensis*	H	20.09	5.664	11.21	7.17	5.66	6.16	1.248
ASU	1833	*minima*	G	19.37	5.472	10.26	6.78	5.23	5.75	1.440
ASU	1834	*minima*	G	19.38	5.184	10.50	6.61	5.20	5.61	1.344
ASU	1873	*carolinensis*	G	19.69	5.280	10.51	6.63	5.13	5.34	1.344
ASU	1896	*carolinensis*	G	19.70	5.232	10.59	6.60	5.12	5.44	1.344
ASU	1899	*minima*	H	19.00	5.184	10.39	6.73	4.93	5.26	1.248
ASU	1932	*minima*	H	19.44	5.376	10.29	6.72	5.00	5.38	1.152
ASU	1945	*carolinensis*	H	18.48	5.136	10.22	6.51	5.14	5.13	1.248
ASU	1948	*carolinensis*	H	19.05	5.280	10.22	6.45	5.12	5.38	1.152
ASU	1996	*carolinensis*	H	19.36	5.472	10.36	6.74	5.53	5.41	1.344
ASU	2136	*minima*	H	19.07	5.280	10.69	6.70	5.42	5.49	1.248
ASU	2156	*minima*	H	18.99	5.280	10.22	6.71	4.88	5.25	1.200
ASU	2399	*carolinensis*	H	18.60	5.088	9.87	6.35	5.22	5.28	1.248
ASU	2429	*carolinensis*	G	18.67	5.280	9.86	6.36	5.00	5.17	1.248
ASU	2457	*carolinensis*	G	19.91	5.376	10.83	6.96	5.20	5.59	1.248
ASU	2458	*carolinensis*	H	19.48	5.088	10.55	7.04	5.21	5.29	1.440
ASU	2464	*minima*	H	19.28	5.280	10.13	6.66	5.38	5.55	1.248
ASU	2479	*minima*	G	18.82	5.232	10.51	6.55	5.24	5.43	1.344

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
ASU	2480	*minima*	G	19.32	5.328	10.75	6.77	5.26	5.43	1.344
ASU	2487	*minima*	G	19.49	5.280	10.23	6.82	5.23	5.64	1.344
ASU	2488	*minima*	G	19.05	4.992	10.32	6.43	5.02	5.12	1.440
ASU	2492	*minima*	G	19.20	5.184	10.76	6.57	5.27	5.47	1.248
ASU	2493	*minima*	G	19.64	5.376	10.94	6.59	5.31	5.51	1.392
ASU	2507	*minima*	G	18.89	5.232	10.10	6.52	5.04	5.32	1.344
ASU	2508	*minima*	G	18.99	5.136	10.37	6.60	5.21	5.30	1.200
ASU	2509	*minima*	G	18.72	5.088	10.17	6.52	5.05	5.18	1.344
ASU	2510	*minima*	G	18.36	4.944	10.00	6.64	5.02	5.30	1.344
ASU	2511	*minima*	G	18.55	5.088	10.06	6.61	5.16	5.22	1.248
ASU	2523	*carolinensis*	H	18.80	5.232	10.30	6.71	5.23	5.38	1.248
ASU	2524	*carolinensis*	H	18.95	5.184	10.57	6.68	5.21	5.14	1.344
ASU	2525	*carolinensis*	H	19.07	5.136	10.11	6.49	4.96	5.32	1.248
ASU	2526	*carolinensis*	H	18.96	5.280	10.18	6.57	4.93	5.28	1.296
ASU	2527	*carolinensis*	H	18.88	5.280	10.31	6.62	5.08	5.31	1.344
ASU	2528	*carolinensis*	H	19.61	5.376	10.67	6.86	5.23	5.65	1.248
ASU	2529	*carolinensis*	H	19.35	5.280	10.55	6.80	5.09	5.38	1.440
ASU	2530	*carolinensis*	H	19.16	5.088	10.73	6.87	5.36	5.37	1.344
ASU	2531	*carolinensis*	H	18.45	5.040	10.37	6.51	5.05	5.18	1.344
ASU	2532	*carolinensis*	H	18.90	5.184	10.53	6.64	5.11	5.30	1.392
ASU	2533	*carolinensis*	H	19.42	5.280	10.47	6.61	5.25	5.37	1.440
ASU	2542	*carolinensis*	H	18.67	4.992	10.26	6.54	5.09	5.06	1.344
ASU	2543	*carolinensis*	H	18.83	5.136	10.62	6.60	5.11	5.27	1.344

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
ASU	2561	*carolinensis*	H	19.14	5.472	10.02	6.70	5.03	5.55	1.296
ASU	2582	*minima*	G	18.84	5.136	10.38	6.54	5.10	5.32	1.440
ASU	2589	*carolinensis*	H	18.96	5.472	9.79	6.66	5.05	5.47	1.344
ASU	2590	*minima*	H	19.75	5.280	10.44	6.87	5.24	5.70	1.344
ASU	2622	*carolinensis*	H	18.78	5.280	10.26	6.84	5.46	5.42	1.488
ASU	2625	*carolinensis*	H	19.52	5.376	10.51	6.88	5.18	5.44	1.344
ASU	2626	*carolinensis*	H	18.86	5.184	10.32	6.68	5.38	5.31	1.344
ASU	2627	*carolinensis*	H	19.61	5.424	10.24	6.69	5.15	5.34	1.248
ASU	2628	*carolinensis*	H	18.90	5.184	10.03	6.53	5.19	5.31	1.296
ASU	2630	*carolinensis*	H	19.10	5.232	9.93	6.61	5.11	5.23	1.248
ASU	2631	*carolinensis*	H	19.00	5.088	10.41	6.75	5.12	5.34	1.344
ASU	2632	*carolinensis*	H	19.25	5.280	10.78	6.70	5.32	5.49	1.296
ASU	2633	*carolinensis*	H	19.25	5.376	10.52	6.87	5.35	5.53	1.296
ASU	2634	*carolinensis*	H	19.30	5.280	10.27	6.55	5.30	5.39	1.344
ASU	2635	*carolinensis*	H	18.61	4.896	10.05	6.62	4.83	5.04	1.344
ASU	2636	*carolinensis*	H	19.40	5.232	10.74	6.72	4.98	5.28	1.440
ASU	2672	*minima*	G	18.93	5.424	10.41	6.59	5.23	5.42	1.248
ASU	2673	*minima*	G	19.02	5.280	10.38	6.66	4.73	5.23	1.104
ASU	2780	*minima*	H	19.09	5.424	10.35	6.88	5.06	5.51	1.248
ASU	2781	*minima*	H	19.21	5.472	10.09	6.51	5.24	5.25	1.152
ASU	2903	*carolinensis*	H	18.88	5.040	9.27	6.33	4.98	5.29	1.344
ASU	2930	*minima*	G	18.82	5.040	10.30	6.62	5.03	5.27	1.248
ASU	2968	*minima*	G	19.02	5.328	9.98	6.85	5.21	5.59	1.344

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
ASU	3217	*minima*	H	18.45	5.184	10.12	6.67	5.24	5.27	1.344
ASU	3272	*carolinensis*	H	19.71	5.280	10.62	6.79	5.22	5.56	1.248
ASU	3280	*minima*	G	18.86	5.280	10.14	6.68	5.04	5.26	1.344
ASU	3639	*carolinensis*	H	18.99	5.136	10.38	6.68	5.11	5.43	1.248
ASU	4148	*carolinensis*	H	19.57	5.376	10.61	6.98	5.50	5.46	1.248
ASU	4151	*carolinensis*	H	19.14	5.376	10.22	6.69	5.29	5.59	1.200
ASU	5166	*carolinensis*	H	18.99	5.280	10.08	6.68	5.22	5.28	1.344
ASU	6395	*minima*	F	18.00	5.088	10.07	6.57	4.99	5.12	1.344
ASU	6492	*minima*	L	19.14	5.328	10.55	6.84	5.30	5.49	1.200
ASU	6611	*carolinensis*	H	18.90	5.280	10.19	6.76	5.04	5.34	1.152
ASU	6621	*carolinensis*	H	19.19	5.328	10.30	6.75	5.08	5.38	1.248
ASU	6890	*carolinensis*	H	18.80	5.136	10.00	6.42	4.96	5.15	1.200
ASU	8887	*carolinensis*	H	19.59	5.376	10.43	6.88	5.12	5.58	1.248
ASU	8889	*carolinensis*	H	19.19	5.184	10.58	6.56	5.22	5.60	1.344
ASU	8890	*carolinensis*	H	18.58	4.992	10.33	6.52	4.97	5.28	1.248
ASU	8891	*carolinensis*	H	19.79	5.376	10.83	6.86	5.38	5.69	1.248
ASU	8892	*carolinensis*	H	19.16	5.184	10.62	6.89	5.31	5.55	1.344
ASU	8893	*carolinensis*	F	17.84	5.184	9.72	6.27	5.07	5.08	1.248
ASU	8894	*carolinensis*	F	18.08	5.328	9.72	6.36	4.92	5.04	1.200
ASU	8895	*carolinensis*	F	17.97	5.184	9.65	6.34	4.90	5.12	1.344
ASU	8896	*carolinensis*	F	18.34	5.088	9.97	6.44	4.98	5.42	1.248
ASU	8897	*carolinensis*	F	18.95	5.232	10.10	6.62	4.86	5.33	1.344
ASU	8898	*carolinensis*	F	17.65	5.088	9.78	6.48	5.09	5.08	1.296

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
ASU	10811	*carolinensis*	F	18.64	4.992	9.88	6.38	5.12	5.18	1.152
ASU	11831	*carolinensis*	H	18.99	5.376	10.10	6.71	5.25	5.47	1.344
ASU	11872	*carolinensis*	H	19.25	5.376	10.20	6.65	5.10	5.18	1.248
ASU	11878	*carolinensis*	H	18.74	5.088	10.32	6.65	5.20	5.43	1.344
ASU	12432	*carolinensis*	F	18.82	5.184	10.08	6.67	5.09	5.40	1.248
ASU	12436	*carolinensis*	F	19.18	5.184	10.23	6.51	5.26	5.39	1.248
ASU	12471	*carolinensis*	F	18.33	5.040	10.01	6.44	5.15	5.46	1.152
ASU	12508	*carolinensis*	F	18.50	5.088	10.36	6.62	5.09	5.35	1.344
ASU	12537	*carolinensis*	F	18.20	4.896	10.01	6.62	4.89	5.16	1.344
ASU	12548	*carolinensis*	F	18.17	5.184	10.15	6.60	5.11	5.38	1.296
ASU	12615	*carolinensis*	F	18.24	5.184	10.11	6.37	5.17	5.04	1.200
ASU	12658	*carolinensis*	F	18.24	4.944	9.78	6.33	4.91	5.04	1.344
ASU	12884	*carolinensis*	F	18.75	4.896	9.85	6.45	4.85	5.34	1.248
ASU	12899	*carolinensis*	F	18.25	5.040	9.62	6.32	5.01	5.21	1.344
ASU	12901	*carolinensis*	F	18.15	5.232	9.76	6.60	5.17	5.43	1.200
ASU	12925	*carolinensis*	F	19.06	5.280	10.21	6.75	5.12	5.42	1.200
ASU	15174	*carolinensis*	F	18.74	4.992	10.04	6.35	4.93	5.20	1.200
ASU	15335	*carolinensis*	H	18.96	5.280	9.88	6.95	5.19	5.42	1.248
ASU	15402	*carolinensis*	H	19.41	5.088	10.25	6.65	5.00	5.50	1.152
ASU	19692	*minima*	F	17.86	5.040	9.79	6.41	5.00	5.13	1.248
ASU	19768	*minima*	G	18.83	5.328	10.20	6.58	5.18	5.30	1.248
ASU	19769	*minima*	G	19.59	5.472	10.23	6.69	5.17	5.61	1.344
ASU	19786	*minima*	G	18.43	5.328	10.53	6.59	5.11	5.30	1.200

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
ASU	27838	*carolinensis*	H	18.82	5.040	10.03	6.56	5.08	5.39	1.344
CM	16492	*peninsulae*	R	19.60	5.040	10.29	6.29	5.15	5.45	1.392
CM	16493	*peninsulae*	R	20.02	5.376	10.39	6.46	5.15	5.65	1.536
CM	55226	*carolinensis*	AA	18.50	5.184	10.17	6.42	4.93	5.44	1.248
CM	55227	*minima*	C	18.37	5.088	9.71	6.71	5.02	5.31	1.152
CM	55228	*minima*	C	17.98	4.992	9.72	6.40	4.75	5.11	1.152
CM	59687	*carolinensis*	Q	19.10	5.136	11.14	6.96	5.55	5.56	1.248
CM	59688	*carolinensis*	U	19.36	5.424	10.22	6.55	4.89	5.20	1.440
CM	59689	*carolinensis*	U	18.86	5.280	10.42	6.66	5.03	5.44	1.248
CM	64740	*minima*	L	18.98	5.424	10.19	6.50	5.01	5.46	1.248
CM	64741	*minima*	L	19.39	5.616	9.91	6.72	5.25	5.54	1.200
CM	64742	*minima*	L	18.74	5.280	9.77	6.41	5.04	5.47	1.248
CM	64743	*minima*	L	19.21	5.280	10.37	6.34	4.95	5.42	1.152
CM	64744	*minima*	L	18.80	5.328	9.97	6.43	5.07	5.38	1.344
CM	70905	*carolinensis*	W	18.87	5.040	9.58	6.16	5.11	5.27	1.152
CM	70909	*carolinensis*	W	19.20	5.136	10.26	6.48	5.16	5.20	1.248
CM	70925	*carolinensis*	W	17.32	4.608	9.39	5.93	4.76	5.05	1.152
CM	70936	*carolinensis*	W	18.80	5.376	10.61	6.75	5.40	5.74	1.440
CM	89367	*peninsulae*	S	20.13	5.232	10.31	6.45	5.33	5.46	1.296
CM	92542	*carolinensis*	AA	18.92	4.896	10.61	6.37	4.87	5.52	1.440
CM	92543	*carolinensis*	AA	18.16	4.992	10.02	6.42	4.87	5.36	1.344
CM	92544	*carolinensis*	AA	18.45	5.184	10.11	6.52	4.93	5.25	1.392
CM	92545	*carolinensis*	AA	19.10	5.280	10.38	6.53	5.07	5.24	1.248

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
CM	92546	*carolinensis*	AA	18.86	4.992	10.51	6.70	5.17	5.32	1.344
CM	92547	*carolinensis*	AA	19.05	5.184	10.41	6.77	5.11	5.47	1.440
CM	92548	*carolinensis*	AA	19.15	5.280	10.04	6.50	4.88	5.30	1.344
CM	92549	*carolinensis*	AA	18.59	4.944	10.31	6.66	4.82	5.39	1.344
CM	92550	*carolinensis*	AA	18.95	5.280	10.31	6.62	5.11	5.54	1.296
CM	92551	*carolinensis*	AA	18.57	5.088	10.15	6.43	4.94	5.33	1.344
CM	92552	*carolinensis*	AA	19.10	5.280	10.41	6.55	4.83	5.26	1.344
CM	92553	*carolinensis*	AA	19.28	5.328	10.38	6.69	5.07	5.59	1.296
CM	92555	*carolinensis*	AA	18.37	4.896	9.88	6.07	4.86	5.22	1.248
CM	92556	*carolinensis*	AA	18.99	5.232	10.20	6.58	4.92	5.35	1.344
CM	92557	*carolinensis*	AA	19.09	5.328	10.30	6.55	4.90	5.30	1.296
CM	92558	*carolinensis*	AA	19.03	5.184	10.24	6.49	4.89	5.19	1.248
CM	92559	*carolinensis*	AA	19.08	5.184	10.38	6.68	5.10	5.10	1.344
CM	92560	*carolinensis*	AA	19.22	5.328	10.52	6.50	5.07	5.31	1.344
CM	92561	*carolinensis*	AA	18.91	5.088	10.72	6.61	4.85	5.43	1.344
CM	92562	*carolinensis*	AA	18.36	5.184	10.20	6.66	5.05	5.15	1.344
CM	92563	*carolinensis*	AA	19.70	5.136	10.49	6.55	5.13	5.61	1.344
CM	92564	*carolinensis*	AA	18.71	5.280	9.94	6.50	5.08	5.28	1.248
CM	92565	*carolinensis*	AA	18.62	5.040	10.24	6.59	4.98	5.31	1.248
CM	92566	*carolinensis*	AA	19.06	5.184	10.63	6.62	5.30	5.58	1.344
CM	92568	*carolinensis*	AA	19.05	5.136	10.32	6.25	4.85	5.20	1.344
CM	92569	*carolinensis*	AA	18.98	5.184	10.20	6.48	4.74	5.33	1.440
CM	106418	*minima*	L	19.71	5.472	10.64	6.95	5.36	5.61	1.392

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
CM	106419	*minima*	L	19.88	5.616	10.52	7.14	5.19	5.71	1.392
CM	106420	*minima*	L	19.62	5.184	10.76	7.02	5.32	5.78	1.248
CM	106421	*minima*	L	18.77	5.280	10.06	6.50	5.10	5.39	1.344
CM	106422	*minima*	L	19.09	5.328	10.10	6.58	5.03	5.66	1.392
CUSC	876	*carolinensis*	AA	19.43	5.328	9.84	6.10	4.88	5.32	1.440
CUSC	877	*carolinensis*	AA	19.01	4.992	10.69	6.79	5.40	5.53	1.248
CUSC	878	*carolinensis*	AA	18.82	5.088	9.90	6.47	4.87	5.37	1.248
CUSC	879	*carolinensis*	AA	18.89	5.280	9.72	6.46	5.04	5.43	1.344
CUSC	880	*carolinensis*	AA	19.12	5.280	10.23	6.67	5.26	5.54	1.152
CUSC	881	*carolinensis*	AA	18.50	5.136	9.67	6.23	4.61	5.33	1.056
CUSC	882	*carolinensis*	AA	17.92	5.280	9.84	6.51	4.93	5.14	1.200
CUSC	883	*carolinensis*	AA	17.94	4.896	9.96	6.35	5.00	4.99	1.344
CUSC	884	*carolinensis*	AA	19.14	5.232	10.07	6.23	4.95	5.36	1.200
CUSC	885	*carolinensis*	AA	19.34	5.424	10.13	6.40	5.04	5.27	1.296
CUSC	886	*carolinensis*	AA	19.86	5.472	10.95	6.53	5.21	5.73	1.200
CUSC	887	*carolinensis*	AA	18.63	5.280	9.77	5.98	4.80	5.28	1.056
CUSC	888	*carolinensis*	AA	19.56	5.472	9.78	6.44	5.07	5.41	1.056
CUSC	889	*carolinensis*	AA	19.11	5.280	10.10	6.44	4.83	5.44	1.152
CUSC	890	*carolinensis*	AA	18.48	5.280	10.41	6.61	5.14	5.40	1.248
CUSC	891	*carolinensis*	AA	18.87	5.280	9.88	6.06	4.72	5.38	1.152
CUSC	892	*carolinensis*	AA	18.38	5.184	9.50	5.79	4.58	5.24	1.056
CUSC	893	*carolinensis*	AA	18.41	5.040	9.88	6.23	4.93	5.25	1.104
CUSC	894	*carolinensis*	AA	18.02	4.896	9.63	6.08	4.98	5.00	1.248

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
CUSC	1321	*carolinensis*	Z	18.29	5.088	9.76	6.33	5.12	5.24	1.200
CUSC	1322	*carolinensis*	Z	18.51	5.280	9.96	6.52	5.31	4.79	1.248
CUSC	1912	*carolinensis*	AB	18.79	5.040	10.68	6.64	5.26	5.35	1.200
CUSC	1913	*carolinensis*	AB	18.73	5.088	10.37	6.61	5.34	5.41	1.296
CUSC	1914	*carolinensis*	AB	18.71	5.088	10.26	6.51	5.07	5.41	1.248
CUSC	1916	*carolinensis*	AB	18.33	5.232	9.92	6.48	5.38	5.36	1.152
CUSC	1918	*carolinensis*	AB	18.99	5.232	10.28	6.60	5.19	5.19	1.344
CUSC	1919	*carolinensis*	AB	18.83	4.992	10.19	6.67	4.97	5.39	1.296
CUSC	1921	*carolinensis*	AB	19.07	5.376	10.88	6.71	5.44	5.50	1.296
CUSC	1922	*carolinensis*	AB	18.75	5.232	10.04	6.41	5.10	5.30	1.200
CUSC	1923	*carolinensis*	AB	18.81	5.280	9.83	6.50	5.00	5.50	1.248
CUSC	1924	*carolinensis*	AB	17.87	4.896	9.72	6.20	4.71	5.07	1.248
CUSC	1925	*carolinensis*	AB	18.50	5.232	9.95	6.44	4.78	5.33	1.248
CUSC	1926	*carolinensis*	AB	19.34	5.520	10.38	6.66	5.16	5.52	1.248
CUSC	1927	*carolinensis*	AB	18.63	5.376	10.18	6.69	4.86	5.57	1.248
CUSC	1928	*carolinensis*	AB	18.33	5.040	9.96	6.44	5.14	5.14	1.200
CUSC	1929	*carolinensis*	AB	18.91	5.136	10.48	6.29	5.19	5.44	1.200
CUSC	1930	*carolinensis*	AB	18.63	5.136	9.91	6.18	5.18	5.33	1.152
CUSC	1931	*carolinensis*	AB	19.07	5.280	10.09	6.74	5.19	5.29	1.200
CUSC	1933	*carolinensis*	AB	18.43	4.992	10.22	6.58	5.02	5.41	1.248
CUSC	1934	*carolinensis*	AB	18.90	5.280	9.88	6.55	5.16	5.23	1.248
CUSC	1936	*carolinensis*	AB	17.88	5.088	9.95	6.65	5.05	5.22	1.344
CUSC	1937	*carolinensis*	AB	18.72	5.28	10.56	6.86	5.19	5.56	1.248

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
CUSC	1938	*carolinensis*	AB	18.71	5.280	9.94	6.63	5.13	5.51	1.248
CUSC	1939	*carolinensis*	AB	18.76	5.280	9.68	6.55	5.18	5.45	1.200
CUSC	1940	*carolinensis*	AB	18.84	5.184	10.38	6.54	5.02	5.33	1.296
CUSC	1941	*carolinensis*	AB	18.59	5.280	10.28	6.60	4.91	5.47	1.152
CUSC	1942	*carolinensis*	AB	19.04	5.328	10.16	6.48	5.18	5.36	1.104
CUSC	1944	*carolinensis*	AB	18.90	5.136	10.07	6.53	4.91	5.53	1.248
CUSC	1945	*carolinensis*	AB	18.62	5.184	10.01	6.70	5.28	5.61	1.344
CUSC	1946	*carolinensis*	AB	17.77	4.944	9.82	6.57	4.83	5.04	1.248
CUSC	1947	*carolinensis*	AB	17.83	4.992	9.66	6.34	5.08	4.97	0.960
CUSC	1948	*carolinensis*	AB	18.42	4.896	9.95	6.45	4.98	5.19	1.200
CUSC	1949	*carolinensis*	AB	18.52	4.992	9.72	6.74	5.04	5.08	1.152
CUSC	1950	*carolinensis*	AB	18.71	5.376	10.51	6.79	5.39	5.52	1.392
CUSC	1951	*carolinensis*	AB	18.12	4.944	9.92	6.51	4.98	5.31	1.248
CUSC	1952	*carolinensis*	AB	18.62	5.280	9.84	6.40	5.01	5.10	1.152
CUSC	1953	*carolinensis*	AB	19.13	5.376	10.24	6.73	5.37	5.44	1.248
CUSC	1954	*carolinensis*	AB	19.03	5.280	10.69	6.46	5.09	5.31	1.248
CUSC	1955	*carolinensis*	AB	18.45	4.992	10.10	6.59	5.00	5.32	1.344
CUSC	1957	*carolinensis*	AB	19.28	5.088	10.44	6.59	4.98	5.50	1.440
CUSC	1959	*carolinensis*	AB	18.74	5.232	10.16	6.44	4.78	5.15	1.296
CUSC	1960	*carolinensis*	AB	18.39	4.992	10.11	6.34	4.92	5.07	1.248
CUSC	1961	*carolinensis*	AB	18.35	5.136	10.26	6.74	4.97	5.36	1.344
CUSC	1962	*carolinensis*	AB	18.69	5.088	10.38	6.63	4.98	5.57	1.248
CUSC	1963	*carolinensis*	AB	18.08	4.992	9.82	6.19	4.81	5.02	1.344

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
CUSC	1964	*carolinensis*	AB	19.16	5.184	10.59	6.63	5.25	5.52	1.248
CUSC	1965	*carolinensis*	AB	17.98	5.280	9.70	6.49	5.02	5.19	1.104
CUSC	1966	*carolinensis*	AB	18.08	5.088	9.79	6.41	4.88	5.21	1.296
CUSC	1967	*carolinensis*	AB	18.94	5.472	10.28	6.64	4.97	5.34	1.248
CUSC	1969	*carolinensis*	AB	18.84	5.328	10.25	6.46	4.97	5.30	1.296
CUSC	1970	*carolinensis*	AB	18.90	5.328	9.90	6.64	4.81	5.14	1.056
CUSC	1971	*carolinensis*	AB	18.89	5.232	10.26	6.70	5.11	5.51	1.296
CUSC	1972	*carolinensis*	AB	18.86	4.896	10.31	6.64	5.23	5.41	1.344
CUSC	1973	*carolinensis*	AB	19.41	5.376	10.74	6.95	5.49	5.65	1.248
CUSC	1975	*carolinensis*	AB	18.85	5.136	10.44	6.65	5.11	5.40	1.200
CUSC	1976	*carolinensis*	AB	18.73	5.136	10.15	6.60	4.97	5.32	1.056
CUSC	1980	*carolinensis*	AB	18.31	4.944	10.27	6.32	5.08	5.19	1.152
CUSC	1981	*carolinensis*	AB	18.81	5.184	10.35	6.61	5.08	5.24	1.200
CUSC	1982	*carolinensis*	AB	18.83	5.424	10.32	6.83	5.26	5.42	1.200
CUSC	1983	*carolinensis*	AB	17.86	4.848	10.01	6.32	4.57	5.31	1.200
CUSC	1984	*carolinensis*	AB	19.02	5.088	10.22	6.62	5.10	5.30	1.248
CUSC	1985	*carolinensis*	AB	18.63	5.376	9.85	6.40	5.09	5.21	1.200
CUSC	1986	*carolinensis*	AB	18.57	5.328	9.98	6.49	4.98	5.28	1.104
CUSC	1987	*carolinensis*	AB	18.33	5.232	9.86	6.55	4.99	5.15	1.344
CUSC	1988	*carolinensis*	AB	17.86	4.992	9.76	6.24	4.96	4.91	1.152
CUSC	1990	*carolinensis*	AB	18.77	5.088	10.08	6.32	4.92	5.58	1.248
CUSC	2209	*carolinensis*	U	21.17	5.856	11.20	7.33	5.45	6.19	1.440
CUSC	2210	*carolinensis*	U	22.15	5.952	12.36	7.85	5.78	7.11	1.824

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
CUSC	2347	*carolinensis*	Z	18.87	5.136	10.34	6.65	5.03	5.59	1.344
CUSC	2348	*carolinensis*	Z	18.59	5.088	10.26	6.55	4.84	5.42	1.248
CUSC	2349	*carolinensis*	Z	18.71	5.184	9.87	6.28	4.83	5.33	1.152
CUSC	2350	*carolinensis*	Z	19.07	5.232	10.14	6.42	4.88	5.39	1.344
CUSC	2351	*carolinensis*	Z	19.21	5.376	10.27	6.90	5.16	5.44	1.248
CUSC	2352	*carolinensis*	Z	19.35	5.376	10.70	6.94	5.25	5.50	1.344
CUSC	2353	*carolinensis*	Z	18.52	4.992	9.81	6.21	4.69	5.02	1.200
CUSC	2354	*carolinensis*	Z	18.88	4.992	10.67	6.66	5.30	5.52	1.296
CUSC	2355	*carolinensis*	Z	19.05	5.280	10.36	6.45	4.99	5.30	1.152
CUSC	2356	*carolinensis*	Z	18.73	5.280	10.37	6.92	5.10	5.37	1.248
CUSC	2357	*carolinensis*	Z	18.74	5.184	10.31	6.63	5.03	5.21	1.200
CUSC	2358	*carolinensis*	Z	18.82	4.896	10.10	6.77	5.04	5.35	1.248
CUSC	2359	*carolinensis*	Z	18.95	5.280	10.13	6.36	4.83	5.44	1.296
CUSC	2360	*carolinensis*	Z	18.56	5.232	10.13	6.67	4.91	5.21	1.152
CUSC	2361	*carolinensis*	Z	18.94	4.992	10.35	6.66	4.94	5.43	1.248
CUSC	2362	*carolinensis*	Z	18.53	5.184	10.11	6.30	4.83	5.47	1.248
CUSC	2387	*carolinensis*	Z	18.92	5.280	10.15	6.52	5.05	5.45	1.200
CUSC	2388	*carolinensis*	Z	18.82	5.328	10.37	6.67	5.17	5.47	1.248
CUSC	2389	*carolinensis*	Z	18.92	5.280	10.12	6.50	5.15	5.11	1.344
CUSC	2390	*carolinensis*	Z	18.54	5.424	10.31	6.41	5.00	5.16	1.152
CUSC	2391	*carolinensis*	Z	18.79	5.040	10.56	6.93	5.32	5.51	1.248
CUSC	2432	*carolinensis*	Z	18.99	5.136	10.51	6.63	5.14	5.52	1.344
CUSC	2592	*carolinensis*	Z	19.45	5.472	10.51	6.87	5.20	5.40	1.248

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
CUSC	2701	*carolinensis*	K	19.34	5.376	10.29	6.83	5.20	5.23	1.248
CUSC	2747	*carolinensis*	Z	17.97	4.848	9.71	6.12	4.76	4.94	1.200
CUSC	2796	*carolinensis*	P	19.20	5.088	10.50	6.48	5.08	5.50	1.200
CUSC	2797	*carolinensis*	P	18.75	5.184	10.02	6.34	4.84	5.03	1.152
CUSC	2798	*carolinensis*	P	18.67	5.136	10.31	6.57	5.13	5.20	1.344
CUSC	2800	*carolinensis*	P	19.06	5.232	10.48	6.64	4.95	5.53	1.440
CUSC	2801	*carolinensis*	P	19.09	5.088	10.68	6.79	5.15	5.23	1.344
CUSC	2802	*carolinensis*	P	18.10	4.896	9.89	6.30	4.82	5.10	1.248
CUSC	2803	*carolinensis*	P	18.58	5.040	9.98	6.22	5.04	4.95	1.248
CUSC	2804	*carolinensis*	P	18.46	4.944	9.99	6.25	4.88	5.21	1.248
CUSC	2845	*carolinensis*	P	18.50	4.944	10.17	6.46	4.95	5.26	1.440
CUSC	2976	*carolinensis*	Z	18.38	5.232	10.18	6.53	5.05	5.15	1.200
CUSC	2977	*carolinensis*	Z	18.81	5.184	10.46	6.62	5.07	5.60	1.344
CUSC	2978	*carolinensis*	Z	19.31	5.232	10.38	6.91	5.28	5.58	1.440
CUSC	2979	*carolinensis*	Z	18.58	5.088	10.00	6.59	4.95	5.19	1.344
CUSC	3005	*carolinensis*	Z	18.88	5.184	9.86	6.45	5.04	5.35	1.392
CUSC	3006	*carolinensis*	Z	19.07	5.040	10.37	6.58	4.77	5.27	1.344
CUSC	3009	*carolinensis*	Z	18.97	5.232	10.60	6.56	5.05	5.34	1.344
CUSC	3032	*carolinensis*	P	19.06	5.376	10.23	6.49	4.69	5.27	1.440
CUSC	3033	*carolinensis*	P	18.26	5.328	10.22	6.45	4.99	5.40	1.344
CUSC	3034	*carolinensis*	P	19.03	5.376	10.46	6.81	5.44	5.38	1.344
CUSC	3078	*carolinensis*	AB	18.04	4.896	10.05	6.34	4.85	5.14	1.200
CUSC	3079	*carolinensis*	AB	18.77	5.040	10.22	6.45	5.07	5.43	1.296

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
CUSC	3080	*carolinensis*	AB	18.32	5.184	10.29	6.80	4.84	5.44	1.248
CUSC	3081	*carolinensis*	AB	17.62	5.088	9.55	6.07	4.83	5.11	1.152
CUSC	3143	*carolinensis*	AA	18.97	5.328	10.25	6.64	5.21	5.30	1.200
CUSC	3144	*carolinensis*	AA	18.65	5.184	10.45	6.68	5.15	5.32	1.152
CUSC	3145	*carolinensis*	AA	18.84	5.088	9.93	6.46	4.96	5.34	1.248
CUSC	3146	*carolinensis*	AA	18.33	4.992	10.22	6.58	4.96	5.27	1.392
CUSC	3147	*carolinensis*	AA	19.17	5.328	10.19	6.53	4.90	5.62	1.248
CUSC	3148	*carolinensis*	AA	18.73	5.088	10.14	6.59	4.97	5.34	1.440
CUSC	3149	*carolinensis*	AA	19.04	5.232	10.35	6.72	5.31	5.27	1.296
CUSC	3150	*carolinensis*	AA	18.99	5.184	10.43	6.52	4.87	5.34	1.392
CUSC	3151	*carolinensis*	AA	18.89	5.376	10.26	6.70	5.28	5.77	1.440
CUSC	3152	*carolinensis*	AA	19.34	5.280	10.45	6.60	4.97	5.33	1.440
CUSC	3154	*carolinensis*	AA	18.50	5.136	10.08	6.27	4.83	4.95	1.152
CUSC	3155	*carolinensis*	AA	18.53	5.328	10.32	6.25	5.16	5.30	1.344
CUSC	3156	*carolinensis*	AA	18.43	4.992	9.84	6.30	4.79	5.03	1.152
CUSC	3157	*carolinensis*	AA	18.99	5.184	10.65	6.40	4.96	5.37	1.440
CUSC	3158	*carolinensis*	AA	18.47	5.088	9.73	6.10	4.81	5.28	1.104
CUSC	3160	*carolinensis*	AA	19.27	5.376	10.11	6.63	5.05	5.37	1.344
CUSC	3161	*carolinensis*	AA	18.83	4.992	9.75	6.27	4.88	5.18	1.248
CUSC	3162	*carolinensis*	AA	18.77	5.088	10.13	6.39	5.13	5.41	1.248
CUSC	3163	*carolinensis*	AA	18.49	5.088	10.10	6.38	5.07	5.24	1.248
CUSC	3164	*carolinensis*	AA	18.82	5.088	10.38	6.39	5.06	5.38	1.152
CUSC	3165	*carolinensis*	AA	18.59	4.896	10.10	6.46	4.92	5.40	1.344

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
CUSC	3166	*carolinensis*	AA	19.51	5.184	10.92	7.03	5.30	5.47	1.344
CUSC	3168	*carolinensis*	AA	19.08	5.232	10.30	6.68	5.15	5.42	1.152
CUSC	3169	*carolinensis*	AA	18.49	5.136	10.00	6.46	4.88	5.25	1.344
CUSC	3170	*carolinensis*	AA	19.08	5.328	10.24	6.62	5.10	5.40	1.296
CUSC	3171	*carolinensis*	AA	19.37	5.184	10.26	6.30	5.13	5.16	1.248
CUSC	3172	*carolinensis*	AA	18.18	4.752	9.69	5.98	4.70	5.20	1.152
CUSC	3184	*carolinensis*	AA	18.95	5.088	10.05	6.33	4.81	5.13	1.152
CUSC	3185	*carolinensis*	AA	19.06	5.184	10.37	6.37	4.99	5.25	1.344
CUSC	3186	*carolinensis*	AA	18.55	5.088	10.10	6.45	4.62	5.17	1.248
CUSC	3210	*carolinensis*	AA	18.88	4.992	10.11	6.29	4.98	5.34	1.248
CUSC	3212	*carolinensis*	AA	18.97	5.184	10.68	6.82	5.16	5.56	1.248
CUSC	3213	*carolinensis*	AA	18.88	5.232	10.11	6.59	4.90	5.44	1.296
CUSC	3238	*carolinensis*	AA	19.20	5.184	10.20	6.66	4.90	5.14	1.536
CUSC	3239	*carolinensis*	AA	19.11	5.088	10.40	6.56	5.02	5.48	1.344
CUSC	3240	*carolinensis*	AA	18.89	4.992	10.06	6.49	4.84	5.27	1.344
CUSC	3241	*carolinensis*	AA	18.88	5.184	10.09	6.55	4.93	5.31	1.248
CUSC	3242	*carolinensis*	AA	18.56	5.040	9.88	6.34	4.89	5.47	1.248
DMNH	1363	*carolinensis*	C	18.91	5.280	10.19	6.80	5.14	5.13	1.248
DMNH	1412	*carolinensis*	F	18.24	5.088	10.03	6.35	5.03	5.17	1.104
DMNH	1413	*carolinensis*	F	18.99	5.184	10.24	6.56	5.13	4.98	1.248
DMNH	1414	*carolinensis*	F	17.18	4.992	9.53	6.12	4.73	5.41	1.440
FMNH	15410	*carolinensis*	I	19.62	5.472	10.39	6.81	5.28	5.52	1.392
FMNH	15411	*carolinensis*	I	19.67	5.568	10.81	6.74	5.26	5.76	1.440

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
FMNH	15412	*carolinensis*	I	18.68	5.232	10.25	6.53	5.17	5.31	1.440
FMNH	15414	*carolinensis*	I	19.23	5.184	10.37	6.78	5.22	5.54	1.344
FMNH	15419	*carolinensis*	I	18.67	5.088	9.59	6.31	4.82	5.22	1.248
FMNH	15420	*carolinensis*	I	19.24	5.424	10.35	6.50	5.26	5.52	1.344
FMNH	15421	*carolinensis*	I	19.02	5.376	10.32	6.48	4.98	5.28	1.296
FMNH	15807	*carolinensis*	J	18.92	5.184	10.55	6.72	5.17	5.34	1.344
FMNH	15808	*carolinensis*	J	18.76	5.472	10.00	6.52	5.02	5.29	1.152
FMNH	15809	*carolinensis*	J	19.24	5.376	10.85	7.04	5.40	5.50	1.440
FMNH	15811	*carolinensis*	J	19.30	5.472	10.56	6.90	5.33	5.64	1.344
FMNH	15813	*carolinensis*	J	19.64	5.088	10.66	6.92	5.20	5.65	1.344
FMNH	15814	*carolinensis*	J	19.67	5.520	10.75	6.68	5.16	5.64	1.440
FMNH	15816	*carolinensis*	J	18.95	5.232	10.38	6.40	5.13	5.26	1.440
FMNH	16056	*carolinensis*	J	19.27	5.088	10.39	6.01	5.13	5.27	1.488
FMNH	16058	*carolinensis*	J	18.21	4.992	10.10	6.58	5.19	5.08	1.200
FMNH	16533	*minima*	C	18.77	5.184	9.97	6.38	4.91	5.51	1.344
FMNH	16535	*minima*	C	19.10	5.280	10.20	6.81	5.10	5.40	1.440
FMNH	16536	*minima*	C	18.47	5.088	9.78	6.54	4.99	5.23	1.200
FMNH	16537	*minima*	C	18.18	4.944	9.66	6.27	4.80	5.15	1.248
FMNH	16539	*minima*	C	18.52	5.088	10.01	6.55	5.32	5.28	1.344
FMNH	90516	*minima*	L	19.21	5.472	10.41	6.93	5.44	5.55	1.440
KU	147077	*peninsulae*	T	20.13	5.424	10.40	6.81	4.97	5.88	1.344
KU	147085	*peninsulae*	T	19.34	5.088	10.73	6.30	5.15	5.93	1.200
LSUMZ	2297	*minima*	D	18.18	5.088	9.74	6.29	4.85	5.12	1.200

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
LSUMZ	2299	*minima*	D	19.43	5.184	10.31	6.78	5.14	5.24	1.248
LSUMZ	2315	*minima*	D	17.34	4.896	9.77	6.31	4.88	4.75	1.200
LSUMZ	2319	*minima*	D	18.49	5.184	9.92	6.62	5.11	5.16	1.392
LSUMZ	2397	*minima*	D	19.02	5.136	10.41	6.45	5.04	5.20	1.248
LSUMZ	2478	*minima*	D	19.07	5.376	10.24	6.64	5.23	5.33	1.344
LSUMZ	3297	*minima*	C	18.70	4.944	10.48	6.70	5.31	5.33	1.248
LSUMZ	3298	*minima*	C	18.68	5.328	9.82	6.31	4.88	4.97	1.152
LSUMZ	3300	*minima*	D	17.96	4.992	9.90	6.40	4.77	5.24	1.296
LSUMZ	3301	*minima*	D	18.54	5.088	9.99	6.49	5.00	5.30	1.200
LSUMZ	3303	*minima*	D	18.37	5.280	10.13	6.78	5.25	5.26	1.248
LSUMZ	3304	*minima*	D	18.08	4.896	9.82	6.25	4.91	5.20	1.248
LSUMZ	3305	*minima*	D	18.63	4.992	10.04	6.45	5.11	5.06	1.248
LSUMZ	6142	*minima*	C	18.58	5.088	10.35	6.62	5.02	5.21	1.296
LSUMZ	6143	*minima*	C	18.53	5.040	10.09	6.24	4.95	5.13	1.200
LSUMZ	6473	*minima*	C	18.90	5.136	10.10	6.53	5.21	5.47	1.344
LSUMZ	6475	*minima*	C	18.49	4.992	10.12	6.54	4.89	5.33	1.248
LSUMZ	6476	*minima*	D	18.87	5.040	9.78	6.56	5.09	5.30	1.344
LSUMZ	6757	*minima*	D	18.71	4.992	9.84	6.23	5.08	5.29	1.344
LSUMZ	6758	*minima*	D	18.54	5.136	10.08	6.54	5.02	5.29	1.344
LSUMZ	6759	*minima*	D	18.61	5.088	10.11	6.66	5.16	5.30	1.44
LSUMZ	6760	*minima*	D	18.71	5.184	10.25	6.75	5.22	5.26	1.296
LSUMZ	6761	*minima*	D	19.01	5.088	9.88	6.60	5.00	5.32	1.200
LSUMZ	7861	*minima*	D	18.17	5.088	9.91	6.75	5.23	5.39	1.296

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
LSUMZ	7863	*minima*	D	18.64	5.232	10.28	6.67	5.19	5.30	1.440
LSUMZ	7865	*minima*	D	18.93	5.184	10.16	6.74	5.11	5.28	1.152
LSUMZ	7867	*minima*	D	19.20	5.184	10.50	6.78	5.43	5.55	1.344
LSUMZ	7872	*minima*	D	19.02	5.136	10.26	6.70	4.93	5.35	1.344
LSUMZ	8706	*minima*	D	18.47	5.184	10.43	6.81	5.36	5.36	1.344
LSUMZ	8707	*minima*	D	18.89	5.184	10.32	6.39	5.24	5.19	1.248
LSUMZ	8708	*minima*	D	18.43	5.232	10.17	6.74	5.01	5.01	1.152
LSUMZ	8709	*minima*	D	18.68	5.280	9.73	6.31	5.08	5.02	1.344
LSUMZ	8710	*minima*	D	19.08	5.376	10.31	6.61	5.23	5.55	1.344
LSUMZ	8712	*minima*	D	18.48	5.280	9.91	6.52	4.98	5.28	1.248
LSUMZ	8714	*minima*	D	18.35	5.088	10.04	6.73	4.92	5.26	1.248
LSUMZ	9048	*minima*	D	18.36	4.992	10.36	6.57	5.08	5.24	1.344
LSUMZ	9050	*minima*	D	19.06	5.222	10.33	6.74	5.14	5.53	1.440
LSUMZ	9571	*minima*	D	18.61	5.088	9.96	6.42	5.00	5.13	1.296
LSUMZ	9572	*minima*	A	18.09	5.040	10.04	6.25	4.97	5.22	1.248
LSUMZ	10231	*minima*	D	18.82	5.184	9.71	6.61	4.93	5.33	1.344
LSUMZ	11131	*minima*	C	18.77	5.280	10.24	6.67	5.09	5.24	1.296
LSUMZ	11132	*minima*	D	19.17	5.184	10.53	6.91	5.19	5.41	1.344
LSUMZ	11391	*minima*	C	18.92	5.232	10.16	6.53	4.96	5.34	1.248
LSUMZ	11392	*minima*	C	18.72	5.472	9.94	6.65	5.00	5.40	1.392
LSUMZ	13425	*minima*	D	18.33	4.992	9.91	6.25	4.82	5.08	1.248
LSUMZ	13427	*minima*	D	19.21	5.424	10.33	6.77	5.09	5.58	1.344
LSUMZ	13428	*minima*	C	18.82	5.136	10.05	6.44	5.13	5.37	1.248

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
LSUMZ	15146	*carolinensis*	C	18.61	5.088	9.80	6.43	4.98	5.15	1.248
LSUMZ	15149	*minima*	D	18.93	5.184	10.09	6.62	4.97	5.27	1.248
LSUMZ	15150	*minima*	D	18.48	5.232	9.83	6.40	5.06	5.02	1.104
LSUMZ	15438	*minima*	D	19.09	5.472	10.13	6.54	5.13	5.29	1.440
LSUMZ	15961	*minima*	C	18.77	5.184	10.31	6.57	4.93	5.39	1.344
LSUMZ	17327	*minima*	D	18.59	5.376	10.1	6.74	5.26	5.28	1.344
LSUMZ	17365	*carolinensis*	C	17.85	4.800	9.97	6.33	5.01	5.29	1.296
LSUMZ	17368	*minima*	D	18.06	4.848	10.00	6.23	5.10	5.07	1.248
LSUMZ	17369	*minima*	D	18.58	5.088	9.90	6.32	5.02	5.22	1.344
LSUMZ	17370	*minima*	D	18.55	5.136	9.90	6.33	5.06	4.82	1.248
LSUMZ	17808	*carolinensis*	C	20.74	5.472	11.28	7.36	5.56	6.12	1.344
LSUMZ	17866	*carolinensis*	C	19.66	5.424	10.43	7.02	5.16	5.99	1.392
LSUMZ	17890	*minima*	D	19.23	5.184	10.05	6.68	5.25	5.43	1.344
LSUMZ	17891	*minima*	D	18.34	5.184	9.41	6.34	5.03	5.00	1.200
LSUMZ	17901	*minima*	D	18.48	5.136	10.05	6.64	5.14	5.15	1.344
LSUMZ	17902	*minima*	D	18.73	5.184	10.29	6.86	5.20	5.37	1.344
LSUMZ	17903	*minima*	D	19.00	5.184	10.38	6.59	5.17	5.22	1.200
LSUMZ	17904	*carolinensis*	C	19.47	5.472	10.82	6.99	5.31	5.74	1.296
LSUMZ	17905	*carolinensis*	C	19.90	5.184	10.89	7.22	5.54	5.68	1.296
LSUMZ	17906	*carolinensis*	C	19.92	5.376	10.57	7.10	5.34	5.91	1.440
LSUMZ	17907	*carolinensis*	C	19.66	5.376	10.81	7.30	5.50	5.95	1.344
LSUMZ	17985	*minima*	D	19.07	5.376	10.35	6.85	5.36	5.33	1.296
LSUMZ	18159	*minima*	D	18.83	5.136	9.98	6.42	5.01	5.38	1.152

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
LSUMZ	18160	*carolinensis*	C	18.71	5.280	9.84	6.51	4.93	5.34	1.248
LSUMZ	18161	*carolinensis*	C	17.44	4.752	9.66	6.09	4.69	4.97	1.104
LSUMZ	18162	*carolinensis*	C	18.51	5.232	9.89	6.46	4.88	5.20	1.248
LSUMZ	18163	*carolinensis*	C	19.59	5.472	10.31	6.76	4.98	5.80	1.296
LSUMZ	18164	*carolinensis*	C	19.87	5.472	10.85	7.15	5.40	5.86	1.440
LSUMZ	18165	*carolinensis*	C	19.64	5.232	10.42	7.06	5.37	5.88	1.344
LSUMZ	18166	*carolinensis*	C	20.09	5.568	10.43	6.92	5.30	5.74	1.536
LSUMZ	18468	*minima*	D	18.61	5.136	10.43	6.63	5.17	5.14	1.248
LSUMZ	18525	*carolinensis*	C	18.83	5.136	9.92	6.53	4.97	5.73	1.296
LSUMZ	18622	*minima*	C	18.33	4.896	9.71	6.28	4.72	5.19	1.152
LSUMZ	19769	*carolinensis*	C	18.67	5.280	9.95	6.40	4.99	5.56	1.344
LSUMZ	19774	*minima*	D	19.08	5.328	10.22	6.52	5.04	5.25	1.344
LSUMZ	19775	*minima*	D	18.51	5.136	9.93	6.59	5.15	5.17	1.248
LSUMZ	19779	*minima*	D	18.29	4.944	9.80	6.56	4.90	5.22	1.248
LSUMZ	20373	*minima*	C	18.44	5.040	10.29	6.34	4.86	5.25	1.344
LSUMZ	20374	*minima*	C	18.02	4.944	9.97	6.49	5.00	5.14	1.248
LSUMZ	20754	*minima*	D	19.24	5.376	10.29	6.78	5.17	5.33	1.344
LSUMZ	21910	*minima*	C	19.04	5.136	10.34	6.65	5.01	5.26	1.344
LSUMZ	21911	*minima*	C	18.38	5.136	9.99	6.31	4.82	5.13	1.248
LSUMZ	21912	*minima*	C	18.47	5.088	10.30	6.54	5.07	5.18	1.344
LSUMZ	21913	*minima*	C	18.99	5.280	9.89	6.65	5.09	5.38	1.152
LSUMZ	21914	*minima*	C	18.87	5.184	10.29	6.48	5.06	5.32	1.344
LSUMZ	21915	*minima*	D	19.12	5.472	10.37	6.99	5.23	5.68	1.344

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
LSUMZ	21916	*minima*	D	18.54	5.232	9.72	6.20	4.87	4.99	1.248
LSUMZ	21991	*minima*	C	18.35	5.136	9.93	6.69	5.02	5.40	1.344
LSUMZ	23962	*minima*	C	18.04	4.944	10.27	6.67	4.90	5.23	1.248
LSUMZ	23963	*minima*	C	18.66	5.232	9.95	6.28	5.04	5.11	1.248
LSUMZ	23964	*minima*	C	18.43	5.088	9.90	6.32	4.89	5.03	1.296
LSUMZ	23965	*minima*	C	18.50	5.184	9.86	6.46	5.12	5.25	1.248
LSUMZ	23966	*minima*	C	18.17	4.944	9.77	6.13	4.77	5.19	1.200
LSUMZ	23968	*minima*	C	18.42	5.040	10.20	6.43	4.86	5.29	1.248
LSUMZ	23969	*minima*	C	18.62	5.328	9.77	6.27	5.10	5.25	1.248
LSUMZ	23970	*minima*	C	18.47	5.088	9.44	6.30	4.88	5.32	1.248
LSUMZ	23971	*minima*	C	18.92	5.136	10.04	6.46	4.78	5.28	1.344
LSUMZ	23972	*minima*	C	18.16	4.992	9.89	6.32	4.98	5.23	1.296
LSUMZ	23973	*minima*	C	18.85	5.136	10.04	6.59	5.10	5.36	1.344
LSUMZ	23993	*minima*	C	18.77	5.088	10.22	6.79	4.86	5.43	1.296
LSUMZ	23994	*minima*	C	17.80	4.608	9.75	6.07	4.73	4.94	1.152
LSUMZ	23995	*minima*	C	18.77	5.280	10.15	6.35	4.87	5.23	1.296
LSUMZ	23996	*minima*	C	18.16	4.992	9.88	6.44	5.37	5.18	1.200
LSUMZ	23997	*minima*	C	18.87	5.232	10.37	6.68	5.24	5.41	1.440
LSUMZ	24001	*minima*	C	18.14	5.088	10.03	6.50	4.91	5.25	1.248
LSUMZ	24002	*minima*	C	18.19	5.136	9.94	6.50	5.03	4.97	1.152
LSUMZ	24003	*minima*	C	18.24	5.040	9.91	6.34	4.88	5.20	1.344
LSUMZ	24004	*minima*	C	18.53	5.328	9.98	6.51	5.24	5.38	1.296
LSUMZ	24005	*minima*	C	18.05	5.040	9.82	6.21	4.96	5.23	1.200

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
LSUMZ	26716	*minima*	D	18.90	5.280	9.93	6.65	5.21	5.26	1.296
LSUMZ	26717	*minima*	D	19.14	5.184	10.30	6.79	5.27	5.53	1.344
LSUMZ	26718	*minima*	D	18.23	5.088	9.91	6.49	4.96	5.13	1.248
LSUMZ	26719	*minima*	D	18.77	5.232	10.05	6.80	5.00	5.15	1.200
LSUMZ	26720	*minima*	D	17.56	5.040	9.73	6.15	4.86	4.88	1.200
LSUMZ	26822	*minima*	D	18.44	4.944	10.38	6.52	5.08	5.10	1.392
LSUMZ	26823	*minima*	D	18.38	5.376	10.10	6.64	5.06	5.13	1.296
LSUMZ	26825	*minima*	D	18.70	5.136	9.95	6.83	5.13	5.34	1.344
LSUMZ	26826	*minima*	D	18.22	4.992	10.25	6.60	4.91	5.23	1.200
LSUMZ	28655	*minima*	C	18.15	5.088	10.05	6.41	4.91	5.20	1.248
LSUMZ	28656	*minima*	C	18.41	5.088	10.12	6.35	5.14	5.18	1.248
LSUMZ	29812	*minima*	C	18.41	5.040	10.22	6.53	5.02	5.13	1.392
LSUMZ	29825	*minima*	C	18.60	5.376	9.95	6.74	5.25	5.39	1.344
LSUMZ	29826	*minima*	C	18.33	5.232	9.42	6.32	4.88	5.09	1.248
LSUMZ	29827	*minima*	C	18.40	5.040	10.13	6.38	4.86	5.27	1.248
LSUMZ	29828	*minima*	C	18.90	5.136	10.20	6.70	5.09	5.25	1.248
LSUMZ	29830	*minima*	C	18.36	5.184	9.70	6.46	4.82	5.10	1.248
LSUMZ	29834	*minima*	C	18.83	5.232	10.30	6.71	4.96	5.37	1.296
LSUMZ	29848	*minima*	C	18.30	5.328	9.96	6.41	4.83	5.16	1.296
LSUMZ	29849	*minima*	C	18.98	5.424	10.01	6.56	4.93	5.49	1.248
LSUMZ	31564	*minima*	D	18.67	5.280	9.92	6.59	5.21	5.30	1.200
LSUMZ	33303	*minima*	D	19.16	5.136	10.43	7.00	5.28	5.49	1.392
LSUMZ	33304	*minima*	D	18.78	5.136	10.36	6.48	5.02	4.97	1.296

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
LSUMZ	34142	*minima*	C	18.57	5.040	10.14	6.40	5.18	5.21	1.296
MCZ	1293	*carolinensis*	X	18.24	5.088	10.31	6.48	4.95	5.09	1.248
MCZ	3440	*peninsulae*	S	19.29	5.088	9.67	6.49	5.10	5.51	1.344
MCZ	3441	*peninsulae*	S	19.34	4.896	10.15	6.79	5.19	6.08	1.344
MCZ	3442	*peninsulae*	S	19.75	5.088	10.18	6.66	5.34	5.11	1.344
MCZ	6192	*carolinensis*	P	18.56	5.088	10.36	6.62	5.15	5.41	1.200
MCZ	6195	*carolinensis*	P	17.66	5.088	9.72	6.37	5.08	4.69	1.152
MCZ	6196	*carolinensis*	P	19.00	5.376	10.19	6.60	5.21	5.41	1.296
MCZ	6197	*carolinensis*	P	19.08	5.184	9.79	6.09	4.98	5.51	1.152
MCZ	17398	*carolinensis*	F	18.35	5.040	9.92	6.35	4.90	5.16	1.296
MCZ	17399	*carolinensis*	F	18.14	5.088	9.85	6.44	5.05	5.24	1.248
MCZ	17400	*carolinensis*	F	18.12	4.944	10.00	6.50	5.10	5.14	1.200
MCZ	17401	*carolinensis*	F	18.45	5.088	10.19	6.50	4.94	5.40	1.200
MHP	15246	*peninsulae*	T	19.44	5.232	10.39	5.67	5.08	5.96	1.296
MHP	15247	*peninsulae*	T	20.01	5.184	10.37	6.74	5.35	5.43	1.440
MHP	15248	*peninsulae*	T	19.76	5.280	10.54	6.97	5.45	5.64	1.296
MHP	15249	*peninsulae*	S	20.14	5.289	10.51	6.77	5.45	5.45	1.248
MHP	15250	*minima*	C	18.70	5.088	10.52	6.40	5.09	5.39	1.056
MHP	15251	*minima*	C	18.63	5.193	9.97	6.55	5.17	5.33	1.257
MHP	15252	*minima*	L	18.93	5.097	9.51	6.78	4.63	5.27	1.152
MHP	15253	*carolinensis*	AA	19.90	5.472	10.54	7.13	4.99	5.57	1.440
MHP	16016	*carolinensis*	H	19.67	5.289	10.41	6.47	4.99	5.36	1.353
MHP	16052	*minima*	L	19.03	5.001	10.16	6.75	5.39	5.30	1.161

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
MHP	16054	*minima*	L	18.91	5.193	9.24	6.68	5.13	5.49	1.161
MHP	27924	*carolinensis*	I	19.22	5.376	10.94	6.83	5.29	5.57	1.248
MHP	27925	*carolinensis*	I	20.40	5.558	11.36	6.67	5.28	5.52	1.344
MHP	27926	*carolinensis*	I	19.53	5.462	10.72	7.06	5.33	5.22	1.344
MHP	27927	*carolinensis*	I	19.10	5.184	10.84	7.22	5.45	5.24	1.344
MHP	31870	*carolinensis*	Z	18.72	5.232	9.89	6.45	5.14	5.47	1.257
MHP	31871	*carolinensis*	Z	18.63	5.088	10.22	6.70	5.16	5.40	1.152
MHP	31872	*carolinensis*	Z	18.82	5.424	10.37	6.67	5.51	5.41	1.238
MHP	31873	*carolinensis*	Z	17.52	4.896	9.95	6.39	5.25	5.02	1.161
MHP	31875	*carolinensis*	Z	18.98	4.982	10.49	6.42	5.39	5.63	1.248
MHP	31878	*carolinensis*	Z	18.36	5.088	9.77	6.69	5.11	5.38	1.056
MHP	31879	*carolinensis*	Z	18.11	5.001	9.76	6.24	5.15	5.01	1.248
MHP	31880	*carolinensis*	Z	18.80	5.280	10.57	6.87	5.21	5.65	1.152
MHP	31881	*carolinensis*	Z	18.91	5.289	10.47	6.62	5.24	5.58	1.344
MMNS	839	*minima*	M	18.52	5.328	9.87	6.50	4.93	5.20	1.152
MMNS	868	*minima*	M	18.77	5.280	10.44	6.47	5.01	5.06	1.248
MMNS	943	*minima*	M	18.96	5.376	10.16	6.45	4.99	5.26	1.248
MMNS	1041	*minima*	M	18.13	5.088	10.00	6.50	4.87	5.23	1.344
MMNS	1083	*minima*	D	19.12	5.232	10.38	6.62	4.99	5.17	1.344
MMNS	1147	*minima*	E	18.84	5.184	10.20	6.40	4.98	5.22	1.200
MMNS	1148	*minima*	E	18.92	5.328	9.71	6.64	5.05	5.26	1.248
MMNS	1165	*minima*	M	19.51	5.376	10.43	6.57	5.18	5.47	1.392
MMNS	1254	*minima*	M	18.59	5.280	9.84	6.46	4.96	5.07	1.200

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
MMNS	1439	*minima*	E	18.59	5.040	9.64	6.27	4.63	5.30	1.248
MMNS	1440	*minima*	E	19.25	5.040	10.31	6.67	5.12	5.33	1.296
MMNS	1972	*minima*	E	19.29	5.376	10.26	6.62	5.08	5.37	1.152
MMNS	2079	*minima*	E	18.73	5.232	10.23	6.67	5.23	5.16	1.344
MMNS	2152	*carolinensis*	E	18.20	5.184	10.21	6.39	5.11	4.96	1.392
MMNS	2154	*carolinensis*	E	18.12	5.040	9.89	6.27	4.77	5.17	1.152
MMNS	2314	*minima*	D	19.13	5.232	10.40	6.63	5.30	5.27	1.248
MMNS	2418	*carolinensis*	M	19.72	5.424	10.47	6.65	5.16	5.52	1.344
MMNS	2640	*carolinensis*	M	19.04	5.280	9.67	6.27	4.99	5.23	1.344
MMNS	2778	*carolinensis*	E	19.01	4.896	10.00	6.44	5.12	5.26	1.344
MMNS	2779	*carolinensis*	E	18.75	5.184	10.12	6.88	5.11	5.45	1.200
MMNS	2929	*carolinensis*	M	19.33	5.376	10.23	6.63	5.11	5.19	1.344
MMNS	2950	*minima*	D	17.97	5.136	9.70	6.43	5.10	5.12	1.104
MMNS	3003	*minima*	M	19.09	5.088	10.06	6.43	4.99	5.38	1.344
MMNS	3098	*minima*	M	18.64	5.328	9.92	6.58	5.05	5.12	1.248
MMNS	3099	*minima*	M	18.79	5.232	10.21	6.80	5.19	5.28	1.344
MMNS	3223	*minima*	D	19.08	5.280	10.42	6.83	5.14	5.50	1.392
MMNS	3227	*minima*	D	18.99	5.328	9.75	6.63	5.07	5.06	1.248
MMNS	3404	*carolinensis*	E	18.77	5.136	10.24	6.64	5.08	5.44	1.344
MMNS	3531	*minima*	E	18.75	5.184	9.88	6.51	4.97	5.39	1.200
MMNS	3634	*minima*	M	18.97	5.328	10.37	6.60	5.03	5.36	1.248
MMNS	3636	*minima*	M	18.51	4.992	9.83	6.44	4.83	5.23	1.056
MMNS	3637	*minima*	M	18.15	5.184	9.48	6.34	5.15	5.15	1.248

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
MMNS	3673	*minima*	E	18.48	5.136	9.91	6.26	5.12	5.16	1.200
MMNS	3767	*carolinensis*	M	19.31	5.184	10.54	6.77	5.21	5.43	1.392
MMNS	3770	*carolinensis*	M	18.94	4.992	10.06	6.29	5.09	5.27	1.248
MMNS	3855	*minima*	M	18.32	5.184	9.80	6.44	5.00	5.17	1.392
MMNS	3856	*minima*	M	18.71	5.088	10.39	6.68	5.11	5.40	1.296
MMNS	4041	*carolinensis*	E	19.64	5.328	10.42	6.77	5.03	5.47	1.440
MMNS	4160	*carolinensis*	E	18.67	5.040	9.72	6.43	4.94	5.07	1.296
MMNS	4202	*minima*	M	18.65	5.184	10.24	6.46	4.98	5.21	1.440
MMNS	4222	*carolinensis*	M	19.14	5.328	10.17	6.90	5.20	5.22	1.056
MMNS	4264	*carolinensis*	E	18.52	5.088	9.91	6.58	4.99	5.23	1.152
MMNS	4395	*minima*	E	18.04	5.088	9.69	6.33	4.92	5.10	1.344
MMNS	4477	*minima*	E	18.91	5.280	10.25	6.57	5.11	5.32	1.296
MMNS	4503	*minima*	E	18.64	5.184	9.78	6.74	4.96	5.62	1.392
MMNS	4553	*carolinensis*	E	18.08	4.992	9.67	6.43	4.72	5.12	1.200
MMNS	4643	*carolinensis*	M	18.88	5.184	10.15	6.38	5.23	5.11	1.248
MMNS	4768	*minima*	M	18.82	5.376	10.13	6.64	5.12	5.62	1.296
MMNS	4896	*carolinensis*	M	18.92	5.280	9.58	6.44	5.20	5.06	1.344
MMNS	4967	*carolinensis*	M	18.77	5.088	10.21	6.68	5.10	5.27	1.440
MMNS	4976	*carolinensis*	E	19.10	5.232	10.37	6.73	5.34	5.68	1.392
MMNS	5027	*carolinensis*	E	18.83	5.280	10.01	6.69	5.00	5.43	1.392
MMNS	5030	*carolinensis*	E	18.70	4.944	10.41	6.74	5.06	5.47	1.344
MMNS	5203	*minima*	M	19.70	5.328	10.12	6.68	5.25	5.51	1.392
MMNS	5204	*minima*	M	18.36	5.088	10.17	6.36	4.68	5.33	1.344

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
MMNS	5329	*minima*	E	18.47	5.088	10.05	6.57	4.69	5.02	1.392
MMNS	5352	*minima*	M	18.65	5.232	10.25	6.47	4.77	5.38	1.248
MMNS	5760	*carolinensis*	M	19.18	5.280	10.51	6.73	5.15	5.55	1.248
MMNS	5769	*carolinensis*	M	18.76	4.992	10.25	6.27	5.04	5.20	1.296
MMNS	5832	*carolinensis*	M	18.64	5.088	10.01	6.42	4.98	5.44	1.296
MMNS	5921	*carolinensis*	M	19.03	5.184	10.35	6.61	5.19	5.39	1.296
MMNS	6469	*carolinensis*	M	18.85	5.280	10.26	6.71	5.05	5.49	1.392
MMNS	6575	*minima*	D	18.70	5.232	9.53	6.69	5.15	5.35	1.248
MMNS	6579	*minima*	D	18.21	5.184	9.89	6.63	4.93	5.17	1.248
MMNS	6580	*minima*	D	18.31	5.136	10.25	6.51	5.14	5.18	1.248
MMNS	6581	*minima*	D	19.11	5.376	10.10	6.70	5.27	5.34	1.344
MMNS	6583	*minima*	D	19.47	5.328	10.62	6.55	5.02	5.27	1.296
MMNS	6584	*minima*	D	19.02	5.424	10.15	6.72	5.33	5.47	1.344
MMNS	6585	*minima*	D	19.15	5.184	10.35	6.58	5.15	5.50	1.344
MVZ	81253	*carolinensis*	W	19.53	5.280	10.15	6.45	5.35	5.33	1.344
MVZ	81255	*carolinensis*	W	22.26	6.144	12.01	7.42	5.77	6.68	1.680
MVZ	97170	*carolinensis*	U	18.75	5.472	9.99	6.67	5.07	5.49	1.200
MVZ	97172	*carolinensis*	U	19.26	5.280	10.59	6.75	5.21	5.61	1.248
MVZ	125645	*carolinensis*	X	19.13	5.280	10.27	6.66	4.92	5.21	1.440
MVZ	179686	*carolinensis*	AA	18.76	5.184	10.26	6.75	5.13	5.47	1.200
MVZ	179687	*carolinensis*	AA	23.32	5.472	11.44	7.32	5.05	5.54	1.248
MVZ	179688	*carolinensis*	AA	18.46	5.136	10.32	6.81	5.25	5.41	1.440
MVZ	179689	*carolinensis*	AA	18.86	5.232	10.11	6.68	4.98	5.42	1.344

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
MVZ	179690	*carolinensis*	AA	18.48	4.896	10.03	6.35	4.78	5.18	1.344
MVZ	179691	*carolinensis*	AA	18.41	4.992	9.99	6.48	5.11	5.42	1.200
MVZ	179692	*carolinensis*	AA	18.75	5.184	10.49	6.60	5.03	5.55	1.248
MVZ	179693	*carolinensis*	AA	18.57	5.232	10.29	6.87	5.06	5.26	1.104
MVZ	179694	*carolinensis*	AA	18.36	5.040	10.24	6.36	4.87	5.53	1.152
MVZ	179695	*carolinensis*	AA	18.25	4.896	9.98	6.49	5.17	5.50	1.152
MVZ	179696	*carolinensis*	AA	18.34	4.752	10.18	6.18	4.97	5.40	1.392
MVZ	179697	*carolinensis*	AA	18.19	4.944	10.05	6.32	4.71	5.27	1.296
MVZ	179698	*carolinensis*	AA	18.97	5.184	10.68	6.67	5.10	5.59	1.392
MVZ	179699	*carolinensis*	AA	19.28	5.136	10.37	6.63	5.22	5.76	1.392
MVZ	179700	*carolinensis*	AA	19.09	5.184	10.27	6.75	5.26	5.30	1.296
MVZ	179701	*carolinensis*	AA	18.40	5.040	10.36	6.70	5.08	4.88	1.344
MVZ	179702	*carolinensis*	AA	19.20	5.424	10.66	6.71	5.46	5.44	1.248
MVZ	179703	*carolinensis*	AA	18.83	5.136	10.12	6.73	5.32	5.46	1.392
MVZ	179704	*carolinensis*	AA	19.01	5.088	10.12	6.35	4.97	5.57	1.152
MVZ	179705	*carolinensis*	AA	18.62	5.184	9.96	6.56	5.05	5.45	1.200
MVZ	179706	*carolinensis*	AA	18.40	5.184	10.00	6.51	5.04	5.67	1.248
MVZ	179707	*carolinensis*	AA	18.81	5.280	10.20	6.58	5.18	5.49	1.248
MVZ	179708	*carolinensis*	AA	18.72	4.944	10.32	6.72	4.99	5.45	1.344
MVZ	179709	*carolinensis*	AA	19.10	5.136	10.53	6.59	5.05	5.60	1.344
MVZ	179710	*carolinensis*	AA	18.15	5.088	10.44	6.62	5.11	5.32	1.488
MVZ	179711	*carolinensis*	AA	19.09	5.280	10.28	6.61	5.12	5.58	1.344
MVZ	179712	*carolinensis*	AA	19.27	5.520	10.50	6.88	5.31	5.51	1.392

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
MVZ	179713	*carolinensis*	AA	18.45	4.992	9.98	6.35	4.88	5.40	1.248
MVZ	179714	*carolinensis*	AA	18.90	5.088	10.37	6.93	5.25	5.51	1.200
MVZ	179715	*carolinensis*	AA	19.50	5.376	10.63	7.13	5.21	5.49	1.296
MVZ	179716	*carolinensis*	AA	18.82	5.136	10.39	6.68	5.12	5.51	1.296
MVZ	179717	*carolinensis*	AA	18.68	5.232	10.14	6.41	4.92	5.36	1.200
MVZ	179718	*carolinensis*	AA	18.08	5.184	10.30	6.40	5.14	5.32	1.152
MVZ	179720	*carolinensis*	AA	18.43	5.136	10.73	6.67	5.13	5.42	1.344
MVZ	179721	*carolinensis*	AA	18.68	5.376	10.07	6.69	5.31	5.24	1.296
MVZ	179722	*carolinensis*	AA	18.47	5.184	10.33	6.55	5.11	5.19	1.248
MVZ	179723	*carolinensis*	AA	19.56	5.376	12.49	6.53	5.00	5.31	1.392
MVZ	179724	*carolinensis*	AA	18.90	4.992	10.08	6.56	5.14	5.37	1.200
MVZ	179725	*carolinensis*	AA	19.19	5.040	10.19	6.83	4.96	5.66	1.488
MVZ	179726	*carolinensis*	AA	18.51	5.088	10.38	6.48	5.04	5.13	1.296
MVZ	179727	*carolinensis*	AA	19.40	5.232	10.51	6.59	5.17	5.36	1.344
MVZ	179728	*carolinensis*	AA	18.91	5.232	10.19	6.55	5.21	5.25	1.200
MVZ	179730	*carolinensis*	AA	17.67	4.800	9.92	6.45	4.82	5.19	1.200
MVZ	179731	*carolinensis*	AA	19.14	5.232	10.39	6.72	5.13	5.63	1.296
MVZ	179732	*carolinensis*	AA	19.50	5.280	10.61	6.76	5.19	5.50	1.248
MVZ	179736	*carolinensis*	AA	18.50	5.040	9.83	6.73	4.91	5.41	1.296
MVZ	179737	*carolinensis*	AA	18.65	5.280	10.07	6.84	5.21	5.35	1.248
MVZ	179739	*carolinensis*	AA	18.44	4.992	10.31	6.47	4.98	5.47	1.344
MVZ	179740	*carolinensis*	AA	18.55	4.896	10.45	6.71	5.12	5.40	1.344
MVZ	179743	*carolinensis*	AA	18.66	5.280	10.23	6.76	5.26	5.25	1.344

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
MVZ	179744	*carolinensis*	AA	18.68	5.088	10.46	6.85	4.91	5.46	1.248
MVZ	179745	*carolinensis*	AA	18.87	5.136	10.04	6.59	5.06	5.50	1.392
MVZ	179746	*carolinensis*	AA	18.23	4.992	10.14	6.30	4.92	5.40	1.296
MVZ	179747	*carolinensis*	AA	18.12	5.088	10.04	6.44	5.06	5.36	1.296
MVZ	179748	*carolinensis*	AA	19.22	5.088	10.90	7.09	5.39	5.56	1.440
MVZ	179749	*carolinensis*	AA	18.92	4.992	10.61	6.69	5.14	5.51	1.344
MVZ	179751	*carolinensis*	AA	19.15	5.184	10.52	6.49	5.18	5.37	1.344
MVZ	179752	*carolinensis*	AA	18.90	5.136	10.19	6.62	4.91	5.42	1.152
MVZ	179753	*carolinensis*	AA	19.06	5.280	10.37	6.54	5.10	5.58	1.248
MVZ	179754	*carolinensis*	AA	18.31	4.896	10.00	6.36	5.25	5.33	1.248
MVZ	179756	*carolinensis*	AA	18.99	5.184	10.45	6.74	5.22	5.39	1.440
MVZ	179757	*carolinensis*	AA	18.99	5.280	10.42	6.77	5.39	5.78	1.248
MVZ	179758	*carolinensis*	AA	18.79	5.040	10.35	6.66	4.91	5.77	1.344
MVZ	179759	*carolinensis*	AA	18.57	5.088	9.90	6.33	4.93	5.27	1.344
MVZ	179760	*carolinensis*	AA	18.35	4.992	9.61	6.38	4.88	5.32	1.248
MVZ	179762	*carolinensis*	AA	18.03	4.944	9.35	6.03	4.98	4.95	1.248
MVZ	179763	*carolinensis*	AA	18.63	5.280	10.78	6.99	5.17	5.60	1.344
MVZ	179764	*carolinensis*	AA	19.24	5.184	10.34	6.54	5.02	5.27	1.200
MVZ	179765	*carolinensis*	AA	19.06	5.280	10.09	6.66	5.12	5.49	1.392
MVZ	183391	*carolinensis*	U	19.07	5.232	10.55	6.77	5.37	5.37	1.296
OMHN	19860	*carolinensis*	F	19.15	5.088	9.95	6.49	5.08	5.39	1.344
ROM	21050	*minima*	D	18.17	4.944	9.81	6.05	5.03	5.13	1.152
ROM	24581	*carolinensis*	U	18.23	5.040	10.13	6.28	5.00	5.33	1.152

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
ROM	24582	*carolinensis*	U	18.32	5.040	10.14	6.45	5.10	5.63	1.392
ROM	94400	*carolinensis*	AA	18.79	5.232	9.98	6.23	4.89	5.42	1.152
ROM	94402	*carolinensis*	AA	18.62	4.992	10.30	6.67	5.00	5.08	1.248
SBMNH	3013	*carolinensis*	O	18.48	5.136	10.44	6.81	5.29	5.53	1.200
SBMNH	3014	*carolinensis*	O	17.40	5.184	9.70	6.30	5.30	5.02	1.200
SBMNH	3015	*carolinensis*	O	18.43	5.088	10.16	6.58	5.09	5.24	1.056
SBMNH	4081	*carolinensis*	O	19.32	5.232	10.98	6.88	5.41	5.68	1.152
SBMNH	4082	*carolinensis*	O	19.30	5.376	10.18	6.69	5.25	5.64	1.344
SBMNH	4083	*carolinensis*	O	18.51	5.040	10.23	6.80	5.10	5.16	1.248
SBMNH	4084	*carolinensis*	O	18.71	5.232	10.21	6.37	5.11	5.15	1.200
SBMNH	4085	*carolinensis*	O	18.63	5.280	9.95	6.67	4.95	5.14	1.152
SBMNH	4086	*carolinensis*	O	18.48	5.184	9.92	6.34	4.98	5.03	1.296
SBMNH	4087	*carolinensis*	O	19.17	5.280	10.55	6.95	5.31	5.46	1.152
SBMNH	4088	*carolinensis*	O	19.09	5.232	10.20	6.61	5.12	5.37	1.248
SBMNH	4089	*carolinensis*	O	18.56	5.040	10.11	6.64	4.93	4.99	1.248
SBMNH	4090	*carolinensis*	O	19.10	5.376	10.01	6.69	5.09	5.38	1.248
SBMNH	4091	*carolinensis*	O	18.11	5.136	9.99	6.17	4.91	5.23	1.056
SBMNH	4223	*carolinensis*	O	18.86	5.232	10.03	6.35	4.98	5.89	1.296
SBMNH	4224	*carolinensis*	O	18.83	5.088	10.95	6.64	5.11	5.40	1.248
SBMNH	4224	*carolinensis*	U	18.49	4.896	9.72	6.51	5.25	5.12	1.200
SBMNH	4225	*carolinensis*	U	18.05	4.992	10.21	6.54	5.28	5.35	1.104
SBMNH	4276	*carolinensis*	O	18.93	4.944	10.17	6.36	4.99	5.64	1.152
SBMNH	4297	*carolinensis*	O	19.34	5.280	10.16	6.52	5.61	5.30	1.152

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
SBMNH	4298	*carolinensis*	O	18.42	5.376	9.42	6.11	4.69	4.80	1.248
SBMNH	4299	*carolinensis*	O	18.95	5.232	10.69	6.85	5.18	5.49	1.248
SBMNH	4300	*carolinensis*	O	17.78	5.088	9.68	6.08	4.89	5.08	1.248
SBMNH	4301	*carolinensis*	O	18.50	5.184	10.05	6.49	4.87	5.34	1.200
SBMNH	4863	*carolinensis*	O	19.33	5.280	10.22	6.74	5.13	5.77	1.248
SHSU	512	*minima*	A	19.66	5.376	11.00	7.13	5.14	5.60	1.440
SHSU	514	*minima*	A	19.60	5.568	10.47	6.87	5.21	5.53	1.152
SHSU	515	*minima*	A	20.23	5.472	10.84	7.22	5.47	5.86	1.200
SHSU	516	*minima*	A	20.44	5.472	10.59	6.99	5.52	5.57	1.296
SHSU	517	*minima*	A	19.98	5.568	10.41	7.14	5.24	5.90	1.296
SHSU	632	*minima*	A	19.17	5.376	10.64	6.92	5.33	5.39	1.296
SHSU	859	*minima*	A	20.18	5.664	10.78	7.35	5.35	5.68	1.296
SIUCM	3001	*carolinensis*	I	19.56	5.376	10.74	6.91	5.19	5.57	1.392
SIUCM	3002	*carolinensis*	I	19.87	5.616	10.55	7.00	5.21	5.80	1.392
SIUCM	3003	*carolinensis*	J	19.26	5.376	10.48	6.89	5.22	5.49	1.392
SIUCM	3005	*carolinensis*	I	18.99	5.280	10.48	6.70	5.44	5.47	1.248
SIUCM	3006	*carolinensis*	I	18.77	5.232	10.59	6.70	5.14	5.48	1.296
SIUCM	3007	*carolinensis*	I	20.12	5.472	10.53	7.03	5.40	5.53	1.344
SIUCM	3008	*carolinensis*	I	19.84	5.520	10.80	7.11	5.44	5.72	1.344
SIUCM	3009	*carolinensis*	I	19.87	5.376	10.54	6.83	5.33	5.56	1.440
SIUCM	3010	*carolinensis*	I	19.43	5.280	10.53	6.57	5.18	5.44	1.392
SIUCM	3011	*carolinensis*	I	18.75	5.232	10.26	6.52	5.11	5.24	1.248
SIUCM	3012	*carolinensis*	I	18.94	5.376	10.18	6.50	5.26	5.54	1.296

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
SIUCM	3013	*carolinensis*	I	19.41	5.376	10.60	6.88	5.41	5.41	1.344
SIUCM	3014	*carolinensis*	I	19.29	5.280	10.11	6.35	4.98	5.31	1.296
SIUCM	3015	*carolinensis*	I	19.33	5.424	10.72	7.03	5.38	5.45	1.344
SIUCM	3016	*carolinensis*	I	19.35	5.424	10.51	6.67	5.08	5.52	1.392
SIUCM	3017	*carolinensis*	I	19.80	5.280	10.67	6.87	5.33	5.56	1.344
SIUCM	3018	*carolinensis*	I	18.62	5.568	10.19	6.74	4.96	5.31	1.344
SIUCM	3019	*carolinensis*	I	19.45	5.232	10.68	7.15	5.37	5.57	1.440
SIUCM	3020	*carolinensis*	I	19.24	5.376	10.34	6.46	5.26	5.44	1.344
SIUCM	3021	*carolinensis*	I	19.01	5.376	10.25	6.79	5.26	5.26	1.248
SIUCM	3022	*carolinensis*	I	19.50	5.520	10.36	6.73	5.28	5.38	1.296
SIUCM	3023	*carolinensis*	I	18.94	5.088	10.37	6.47	5.23	5.63	1.344
SIUCM	3024	*carolinensis*	I	19.92	5.568	10.70	7.22	5.53	5.67	1.440
SIUCM	3026	*carolinensis*	J	19.43	5.472	10.35	6.65	5.31	5.44	1.344
SIUCM	3027	*carolinensis*	I	19.26	5.376	10.41	6.74	5.11	5.53	1.344
SIUCM	3028	*carolinensis*	I	18.79	5.376	10.34	6.75	5.18	5.31	1.344
SIUCM	3029	*carolinensis*	I	19.11	5.280	10.27	6.80	5.43	5.48	1.392
SIUCM	3030	*carolinensis*	I	19.76	5.568	10.31	6.88	5.33	5.64	1.392
SIUCM	3031	*carolinensis*	I	19.40	5.472	10.27	6.60	5.12	5.18	1.344
SIUCM	3032	*carolinensis*	J	19.10	5.280	10.65	6.99	5.31	5.62	1.344
SIUCM	3033	*carolinensis*	I	19.86	5.472	10.45	6.77	5.37	5.36	1.344
SIUCM	3034	*carolinensis*	J	18.18	5.088	10.03	6.56	4.98	5.16	1.344
SIUCM	3035	*carolinensis*	I	19.07	5.424	10.31	6.84	5.19	5.51	1.392
SIUCM	3036	*carolinensis*	J	18.80	5.040	10.21	6.44	4.89	5.18	1.344

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
SIUCM	3037	*carolinensis*	J	18.99	5.472	10.31	6.86	5.29	5.36	1.440
SIUCM	3038	*carolinensis*	I	19.26	5.376	10.29	6.58	5.23	5.50	1.296
SIUCM	3040	*carolinensis*	I	18.97	5.280	10.34	6.63	5.19	5.47	1.392
SIUCM	3041	*carolinensis*	J	18.89	5.376	10.21	6.56	5.09	5.11	1.344
SIUCM	3043	*carolinensis*	J	19.47	5.376	10.35	6.94	5.18	5.30	1.440
SIUCM	3044	*carolinensis*	J	19.88	5.376	10.81	6.78	5.33	5.65	1.296
SIUCM	3045	*carolinensis*	I	18.75	5.328	10.40	6.84	5.11	5.39	1.440
SIUCM	3046	*carolinensis*	J	19.22	5.376	10.85	6.74	5.24	5.49	1.344
SIUCM	3047	*carolinensis*	I	19.41	5.520	10.40	6.60	5.21	5.35	1.440
SIUCM	3048	*carolinensis*	J	18.81	5.184	10.19	6.47	5.04	5.66	1.344
SIUCM	3049	*carolinensis*	J	19.46	5.472	10.86	7.10	5.33	5.69	1.344
SIUCM	3050	*carolinensis*	J	18.85	5.280	10.46	6.68	5.04	5.50	1.392
SIUCM	3051	*carolinensis*	I	19.04	5.136	10.83	7.01	5.43	5.66	1.440
SIUCM	3053	*carolinensis*	I	19.79	5.568	10.73	6.98	5.65	5.47	1.440
SIUCM	3056	*carolinensis*	J	18.84	5.472	9.67	6.49	5.03	5.38	1.392
SIUCM	3057	*carolinensis*	J	18.88	5.280	10.39	6.66	5.26	5.45	1.248
SIUCM	3058	*carolinensis*	J	18.69	5.280	10.39	6.23	5.04	5.42	1.344
SIUCM	3059	*carolinensis*	J	19.07	5.328	10.20	6.56	5.25	5.26	1.296
SIUCM	3060	*carolinensis*	J	18.58	5.088	10.50	6.65	5.16	5.40	1.344
SIUCM	3062	*carolinensis*	J	18.72	5.184	10.06	6.76	5.20	5.40	1.392
SIUCM	3063	*carolinensis*	J	19.24	5.472	10.45	6.84	5.20	5.34	1.440
SIUCM	3064	*carolinensis*	I	19.28	5.376	10.34	6.63	5.04	5.51	1.392
SIUCM	3065	*carolinensis*	J	19.23	5.424	10.50	6.81	5.26	5.65	1.344

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
SIUCM	3066	*carolinensis*	J	18.90	5.376	10.22	6.88	5.05	5.24	1.296
SIUCM	3068	*carolinensis*	J	19.67	5.568	10.23	6.70	5.18	5.53	1.440
SIUCM	3069	*carolinensis*	J	19.18	5.280	10.46	6.80	5.14	5.57	1.440
SIUCM	3070	*carolinensis*	J	19.28	5.328	10.66	6.46	5.18	5.25	1.248
SIUCM	3071	*carolinensis*	J	19.47	5.280	10.37	6.71	5.32	5.54	1.296
SIUCM	3072	*carolinensis*	J	19.95	5.568	10.75	6.84	5.54	5.62	1.440
SIUCM	3073	*carolinensis*	J	18.99	5.088	10.78	6.53	5.31	5.52	1.440
SIUCM	3074	*carolinensis*	J	19.38	5.424	10.65	6.98	5.23	5.51	1.440
SIUCM	3075	*carolinensis*	J	20.30	5.568	10.59	6.75	5.24	5.92	1.440
SIUCM	3076	*carolinensis*	J	19.37	5.328	10.70	6.71	5.04	5.60	1.248
SIUCM	3078	*carolinensis*	J	18.95	5.328	10.81	6.84	5.29	5.49	1.392
SIUCM	3079	*carolinensis*	J	19.20	5.376	10.33	6.51	4.93	5.46	1.344
SIUCM	3080	*carolinensis*	J	19.59	5.616	10.38	6.63	5.14	5.49	1.440
SIUCM	3081	*carolinensis*	J	19.12	5.328	10.09	6.59	5.05	5.61	1.344
SIUCM	3082	*carolinensis*	J	19.38	5.376	10.12	6.54	5.10	5.34	1.296
SIUCM	3085	*carolinensis*	J	19.36	5.280	10.57	6.84	5.19	5.60	1.536
SIUCM	3086	*carolinensis*	J	19.38	5.328	10.46	6.71	5.27	5.40	1.296
SIUCM	3087	*carolinensis*	J	19.44	5.328	10.41	6.79	5.28	5.46	1.344
SIUCM	3089	*carolinensis*	J	19.22	5.424	10.69	6.76	5.02	5.48	1.440
SIUCM	3091	*carolinensis*	J	20.31	5.568	11.17	7.16	5.40	5.78	1.536
SIUCM	3092	*carolinensis*	J	19.70	5.520	10.57	6.54	5.39	5.69	1.392
SIUCM	3093	*carolinensis*	J	19.45	5.232	10.79	6.69	5.41	5.66	1.392
SIUCM	3094	*carolinensis*	J	19.37	5.568	10.49	6.70	5.27	5.49	1.248

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
SIUCM	3096	*carolinensis*	J	19.72	5.568	10.15	6.62	4.92	5.56	1.296
SIUCM	3097	*carolinensis*	J	19.01	5.376	10.40	6.92	5.34	5.54	1.344
SIUCM	3098	*carolinensis*	J	18.74	5.280	10.40	6.73	5.26	5.53	1.440
SIUCM	3099	*carolinensis*	J	19.24	5.568	10.38	6.67	5.33	5.32	1.344
SIUCM	3100	*carolinensis*	J	19.25	5.280	10.61	6.74	5.05	5.69	1.344
SIUCM	3101	*carolinensis*	J	19.61	5.568	10.69	6.90	5.29	5.40	1.296
SIUCM	3102	*carolinensis*	J	19.13	5.184	10.39	6.47	4.99	5.35	1.296
SIUCM	3103	*carolinensis*	J	18.39	5.280	10.25	6.46	5.05	5.12	1.248
SIUCM	3105	*carolinensis*	J	19.01	5.280	10.64	6.70	5.28	5.59	1.248
SIUCM	3106	*carolinensis*	J	19.50	5.280	10.74	6.78	5.25	5.68	1.344
SIUCM	3108	*carolinensis*	J	19.12	5.280	10.48	6.64	5.14	5.49	1.296
TCWC	27623	*minima*	B	18.54	4.848	10.21	6.59	5.29	5.62	1.248
TCWC	27624	*minima*	B	18.14	4.848	9.99	6.55	5.09	5.22	1.248
TCWC	27627	*minima*	B	18.20	4.944	10.01	6.37	5.03	5.02	1.152
TCWC	27628	*minima*	B	19.12	5.376	10.49	6.65	5.05	5.54	1.248
TCWC	28637	*minima*	B	18.74	4.992	9.95	6.47	4.99	5.29	1.296
TCWC	31450	*minima*	B	17.93	4.896	9.93	6.11	4.98	5.29	1.152
TCWC	31451	*minima*	B	18.55	5.280	9.84	6.01	5.12	5.32	1.200
TCWC	31452	*minima*	B	18.55	5.328	9.84	6.47	4.85	5.29	1.296
TCWC	31453	*minima*	B	19.20	5.232	10.41	6.52	5.18	5.43	1.296
TCWC	31455	*minima*	B	18.64	5.088	9.94	6.49	5.04	5.53	1.248
TCWC	31457	*minima*	B	18.00	4.848	9.97	6.44	5.20	5.34	1.056
TCWC	31458	*minima*	B	18.55	5.280	10.26	6.42	4.96	5.54	1.344

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
TCWC	31459	*minima*	B	18.18	5.088	9.90	6.43	4.83	5.48	1.248
TCWC	31460	*minima*	B	18.67	5.088	9.93	6.45	5.08	5.22	1.248
TCWC	31463	*minima*	B	18.61	5.184	10.36	6.61	5.16	5.34	1.296
TCWC	31464	*minima*	B	17.93	5.040	10.06	6.47	4.76	5.30	1.248
TCWC	31465	*minima*	B	18.47	5.280	9.59	5.44	5.22	5.52	1.248
TCWC	31466	*minima*	B	18.60	5.088	10.06	6.49	5.25	5.42	1.344
TCWC	31467	*minima*	B	18.37	5.040	9.62	6.52	4.96	5.34	1.200
TCWC	31468	*minima*	B	17.77	4.944	9.51	6.04	5.03	5.01	1.152
TCWC	33336	*minima*	A	18.44	4.944	10.50	6.83	5.07	5.49	1.248
TCWC	33337	*minima*	A	18.89	5.232	10.29	6.42	5.09	5.15	1.200
TCWC	33338	*minima*	A	19.01	5.376	10.45	6.76	5.25	5.58	1.200
TCWC	33341	*minima*	A	18.72	5.280	10.36	6.73	5.19	5.43	1.152
TCWC	33342	*minima*	A	18.40	4.992	10.48	6.48	5.16	5.35	1.344
TCWC	33343	*minima*	A	18.65	5.184	9.88	6.31	5.13	5.44	1.248
TCWC	33345	*minima*	A	18.06	4.896	10.36	6.54	5.05	5.14	1.248
TCWC	33346	*minima*	A	18.23	4.896	10.05	6.45	5.05	5.20	1.200
TCWC	33347	*minima*	A	18.37	5.184	9.87	6.09	4.81	5.11	1.248
TCWC	33349	*minima*	A	18.26	5.040	9.96	6.40	4.98	5.47	1.152
TCWC	33350	*minima*	A	18.79	5.232	10.39	6.55	5.03	5.39	1.248
TCWC	33351	*minima*	A	18.69	5.088	10.50	6.52	5.06	5.27	1.248
TCWC	33352	*minima*	A	18.99	5.280	10.18	6.55	4.88	5.33	1.344
TCWC	33353	*minima*	A	18.80	5.136	10.24	6.56	5.02	5.40	1.152
TCWC	33355	*minima*	A	18.28	4.848	10.13	6.31	4.92	5.12	1.248

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
TCWC	33356	*minima*	A	18.99	5.280	10.50	6.70	5.17	5.37	1.296
TCWC	33357	*minima*	A	18.14	4.896	10.06	6.32	4.84	5.13	1.344
TCWC	33358	*minima*	A	18.51	4.896	10.11	6.35	5.00	5.26	1.152
TCWC	33360	*minima*	A	19.08	5.280	10.18	6.59	5.21	5.24	1.296
TCWC	34950	*minima*	A	19.61	5.376	10.55	6.80	5.47	5.60	1.248
TCWC	34951	*minima*	A	18.72	5.376	10.54	6.79	5.28	5.36	1.152
TCWC	34956	*minima*	A	18.86	5.376	10.18	6.66	5.01	5.40	1.248
TCWC	34957	*minima*	A	18.57	5.136	10.11	6.65	5.08	5.22	1.296
TCWC	34958	*minima*	A	18.32	5.136	10.11	6.60	5.16	5.33	1.200
TCWC	34959	*minima*	A	18.86	5.280	10.10	6.59	5.19	5.18	1.152
TCWC	34960	*minima*	A	18.93	5.328	11.13	6.59	5.01	5.36	1.296
TCWC	34961	*minima*	A	18.86	5.184	10.58	6.61	5.32	5.42	1.248
TCWC	34962	*minima*	A	18.86	5.136	10.33	6.58	5.16	5.50	1.248
TCWC	34963	*minima*	A	18.83	5.088	10.50	6.68	5.05	5.41	1.248
TCWC	34964	*minima*	A	18.74	5.280	10.00	6.51	5.07	5.42	1.200
TCWC	34965	*minima*	A	18.56	4.992	10.18	6.24	5.03	5.10	1.152
TCWC	34967	*minima*	A	18.48	5.136	10.03	6.53	5.02	5.55	1.200
TCWC	34968	*minima*	A	18.25	4.992	9.98	6.33	4.95	5.37	1.248
TCWC	34970	*minima*	A	18.40	5.040	10.33	6.59	5.16	5.29	1.392
TCWC	34972	*minima*	A	18.62	4.992	10.27	6.36	5.22	5.21	1.248
TCWC	34974	*minima*	A	17.97	4.896	10.21	6.42	4.98	5.28	1.056
TCWC	37442	*minima*	A	18.71	5.040	10.15	6.60	5.10	5.02	1.248
TCWC	37443	*minima*	A	18.61	4.992	9.81	6.38	4.91	5.36	1.152

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
TCWC	37444	*minima*	B	18.92	5.184	10.05	6.65	5.16	4.98	1.248
TCWC	37445	*minima*	B	19.16	5.136	10.11	6.80	5.28	5.50	1.344
TCWC	37446	*minima*	B	18.06	4.992	9.94	6.09	4.80	5.16	1.248
TCWC	37448	*minima*	B	18.11	5.088	10.08	6.62	4.90	5.43	1.152
TCWC	37451	*minima*	B	18.62	5.280	10.06	6.83	5.05	5.48	1.296
TCWC	37452	*minima*	B	18.79	5.088	10.36	6.74	5.09	5.57	1.200
TCWC	37453	*minima*	B	18.65	5.136	10.05	6.74	5.01	5.21	1.248
TCWC	37454	*minima*	B	18.97	5.232	10.22	6.55	5.00	5.46	1.248
TCWC	37455	*minima*	B	19.01	5.232	10.46	6.53	5.20	5.44	1.344
TCWC	37456	*minima*	B	19.39	5.472	10.47	6.87	5.24	5.57	1.248
TCWC	37457	*minima*	A	18.69	5.184	10.12	6.63	5.15	5.20	1.248
TCWC	37820	*minima*	A	18.76	5.040	10.19	6.49	5.17	5.26	1.248
TCWC	37838	*minima*	B	18.87	5.328	10.04	6.80	5.26	5.71	1.200
TCWC	37839	*minima*	B	18.56	5.184	10.45	6.62	5.03	5.47	1.344
TCWC	37840	*minima*	B	18.90	5.184	10.14	6.83	4.93	5.50	1.248
TCWC	37841	*minima*	B	18.72	5.232	10.21	6.46	5.10	5.10	1.248
TCWC	37842	*minima*	B	17.90	4.992	9.70	6.32	4.92	5.08	1.344
TCWC	50112	*carolinensis*	F	18.95	5.184	10.61	6.68	4.92	5.47	1.344
TCWC	50117	*carolinensis*	F	18.81	5.280	10.07	6.51	5.18	5.42	1.296
TCWC	56912	*minima*	A	18.88	5.088	10.38	6.58	5.22	5.33	1.200
TCWC	56913	*minima*	A	18.59	5.136	10.05	6.32	4.97	5.17	1.152
TCWC	56914	*minima*	A	19.07	5.232	10.11	6.69	5.08	5.45	1.344
TCWC	56915	*minima*	A	18.71	4.992	10.45	6.57	5.00	5.40	1.200

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
TCWC	56916	*minima*	A	18.48	5.232	10.24	6.47	5.12	5.15	1.152
TCWC	56917	*minima*	A	18.65	5.280	10.14	6.58	5.11	5.48	1.152
TCWC	56918	*minima*	A	18.53	5.088	9.78	6.53	5.10	5.25	1.200
TCWC	57168	*minima*	A	18.92	5.232	9.87	6.27	4.95	5.12	1.248
TTU	75	*carolinensis*	A	19.80	5.424	10.72	6.84	5.12	5.81	1.536
TTU	76	*carolinensis*	A	19.67	5.424	10.44	7.00	5.28	5.81	1.296
TTU	77	*minima*	D	18.60	5.184	10.21	6.55	5.14	5.15	1.248
TTU	79	*minima*	D	18.31	4.992	9.57	6.36	4.83	5.26	1.152
TTU	1698	*carolinensis*	B	17.89	5.040	9.63	6.07	4.90	4.70	1.152
TTU	2087	*minima*	A	18.30	4.704	9.98	6.51	4.63	5.17	1.344
TTU	93137	*carolinensis*	A	20.37	5.328	11.05	7.32	5.50	6.08	1.632
TTU	93139	*carolinensis*	A	19.13	5.280	10.86	6.89	5.38	5.51	1.344
TTU	93140	*carolinensis*	A	19.09	5.376	10.48	6.95	5.07	5.71	1.248
TTU	93141	*carolinensis*	A	18.86	5.280	10.34	6.90	5.47	5.56	1.536
TTU	93211	*carolinensis*	B	18.51	5.088	10.30	6.63	4.87	5.48	1.344
UAMZC	574	*minima*	F	18.88	5.136	10.21	6.40	5.04	5.42	1.344
UAMZC	580	*carolinensis*	F	18.42	5.232	9.84	6.57	5.04	5.18	1.248
UAMZC	581	*minima*	F	18.37	5.088	9.83	6.48	5.08	5.21	1.200
UAMZC	583	*carolinensis*	F	18.11	4.992	9.74	6.10	4.94	5.03	1.056
UAMZC	585	*carolinensis*	F	18.93	5.232	10.37	6.70	5.22	5.32	1.248
UAMZC	590	*carolinensis*	F	18.31	4.080	9.77	6.24	5.12	5.33	1.296
UCF	568	*peninsulae*	R	19.58	5.040	10.84	6.72	5.27	5.76	1.296
UF	225	*carolinensis*	S	20.27	5.376	10.44	6.63	5.16	5.59	1.440

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
UF	2539	*carolinensis*	R	19.69	5.184	10.48	6.75	5.17	5.54	1.440
UF	2552	*carolinensis*	R	19.69	5.232	10.25	6.34	5.11	5.49	1.392
UF	4732	*carolinensis*	Q	19.29	5.328	10.65	6.81	4.99	5.55	1.344
UF	5201	*carolinensis*	Q	19.07	5.184	9.98	6.44	5.19	5.22	1.152
UF	11082	*carolinensis*	R	19.16	5.184	10.24	6.51	5.21	5.42	1.344
UF	11083	*carolinensis*	R	18.51	4.992	9.70	6.34	4.86	5.13	1.344
UF	16311	*peninsulae*	S	19.50	5.088	10.39	6.63	5.22	5.30	1.200
UF	16859	*carolinensis*	Q	17.67	4.704	9.26	5.92	4.71	4.96	1.152
UF	16861	*carolinensis*	R	19.14	4.944	9.81	6.46	4.94	5.33	1.344
UF	16862	*carolinensis*	R	18.22	4.800	8.77	5.93	4.83	5.05	1.248
UF	16865	*carolinensis*	Q	18.47	4.944	9.74	6.03	4.75	4.88	1.248
UF	19161	*carolinensis*	R	19.25	5.088	9.84	6.61	5.04	5.21	1.200
UF	20965	*carolinensis*	Q	18.40	5.040	9.73	6.38	5.04	5.27	1.200
UF	20966	*carolinensis*	R	19.13	4.896	10.00	6.16	4.82	5.40	1.248
UF	20968	*carolinensis*	R	19.03	4.992	9.80	6.21	4.73	5.29	1.296
UF	23585	*carolinensis*	R	19.09	5.040	9.70	6.18	4.84	5.20	1.152
UF	23586	*carolinensis*	R	19.50	4.992	10.52	6.36	4.74	5.37	1.392
UF	26055	*peninsulae*	S	19.40	5.184	10.31	6.80	5.33	5.49	1.200
UF	26058	*peninsulae*	S	18.81	4.944	9.99	6.08	4.83	4.89	1.248
UF	26059	*peninsulae*	S	19.17	4.992	10.00	6.40	5.05	5.17	1.296
UF	26060	*peninsulae*	S	21.14	5.520	10.95	6.99	5.42	6.12	1.440
UF	26064	*peninsulae*	S	19.65	5.232	10.16	6.55	5.12	5.58	1.440
UF	26065	*peninsulae*	S	19.03	5.088	9.84	6.13	4.73	5.16	1.248

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
UF	26106	*peninsulae*	S	19.25	5.136	9.83	6.28	5.01	5.47	1.344
UF	28282	*carolinensis*	R	19.58	5.184	9.85	6.43	5.12	5.36	1.392
UF	28461	*peninsulae*	R	19.98	5.376	10.07	6.40	4.92	5.19	1.392
UF	28964	*peninsulae*	S	19.45	5.184	10.34	6.62	5.09	5.48	1.440
UF	28968	*peninsulae*	S	19.86	5.280	9.96	6.63	4.92	5.68	1.296
UF	28976	*carolinensis*	R	18.80	5.088	9.47	6.33	4.95	5.16	1.248
UGAMNH	2000	*carolinensis*	O	18.41	5.184	9.09	6.40	4.80	5.17	1.344
UGAMNH	2705	*carolinensis*	N	18.96	5.328	10.28	6.59	5.25	5.18	1.248
UGAMNH	3127	*carolinensis*	Q	20.22	5.184	10.42	6.75	5.00	5.68	1.440
UGAMNH	3931	*carolinensis*	Q	20.12	5.232	10.36	6.37	5.09	5.22	1.536
UGAMNH	7631	*carolinensis*	Q	18.72	4.992	10.37	6.34	5.01	5.67	1.248
UGAMNH	7641	*carolinensis*	Q	19.28	5.376	10.56	6.88	5.22	5.55	1.488
UGAMNH	8060	*carolinensis*	O	19.09	5.472	10.34	6.76	5.30	5.35	1.392
UGAMNH	8390	*carolinensis*	P	18.89	5.232	10.14	6.50	4.83	5.36	1.344
UGAMNH	9268	*carolinensis*	P	19.42	5.184	10.53	6.60	5.04	5.63	1.344
UGAMNH	9392	*carolinensis*	P	18.75	5.040	10.10	6.29	4.96	5.24	1.152
UGAMNH	19692	*carolinensis*	N	18.94	5.280	9.91	6.63	5.16	5.33	1.344
UGAMNH	19695	*carolinensis*	N	18.47	5.088	9.97	6.40	5.19	5.23	1.344
UGAMNH	19696	*carolinensis*	N	18.48	5.232	9.80	6.18	4.98	4.99	1.152
UGAMNH	19697	*carolinensis*	N	18.03	5.088	9.88	6.19	4.81	5.05	1.344
UGAMNH	19698	*carolinensis*	N	18.48	5.088	9.83	6.34	4.98	5.13	1.152
UGAMNH	19699	*carolinensis*	N	18.24	5.280	9.56	6.27	4.91	5.34	1.344
UGAMNH	19700	*carolinensis*	N	18.57	5.184	9.69	6.69	5.25	5.24	1.296

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
UGAMNH	19712	*carolinensis*	N	18.29	5.184	10.04	6.50	5.16	5.26	1.488
UGAMNH	19713	*carolinensis*	N	18.86	5.184	9.92	6.58	5.31	5.26	1.152
UGAMNH	19714	*carolinensis*	N	17.99	5.088	9.51	6.43	5.04	5.41	1.296
UGAMNH	19715	*carolinensis*	N	18.05	5.136	10.31	6.12	4.87	5.44	1.152
UGAMNH	19733	*carolinensis*	N	18.33	4.896	9.92	6.16	4.87	5.30	1.344
UGAMNH	19741	*carolinensis*	N	18.89	5.184	10.21	6.75	5.26	5.23	1.248
UGAMNH	19742	*carolinensis*	N	17.65	4.896	9.59	6.01	4.87	5.03	1.200
UGAMNH	19743	*carolinensis*	N	17.84	4.800	9.43	6.13	4.97	4.84	1.152
UGAMNH	22337	*carolinensis*	P	18.53	4.992	9.80	6.35	5.06	5.31	1.248
UGAMNH	22423	*carolinensis*	N	18.85	5.232	10.56	6.69	5.35	5.46	1.248
UGAMNH	22424	*carolinensis*	N	18.73	5.088	10.51	6.45	5.42	5.44	1.248
UGAMNH	22425	*carolinensis*	N	18.48	5.088	10.27	6.48	5.11	5.40	1.248
UGAMNH	22467	*carolinensis*	E	18.98	5.088	11.03	6.98	4.99	5.90	1.248
UGAMNH	22469	*carolinensis*	N	19.00	5.520	10.03	6.73	5.22	5.36	1.344
UGAMNH	22483	*carolinensis*	N	19.11	5.232	10.25	6.87	5.35	5.51	1.440
UGAMNH	22484	*carolinensis*	N	19.35	5.328	9.65	6.40	5.13	5.48	1.248
UGAMNH	22485	*carolinensis*	N	18.80	5.184	8.75	6.32	4.97	4.97	1.152
UGAMNH	22487	*carolinensis*	N	19.24	5.280	10.11	6.41	5.10	5.26	1.344
UGAMNH	22488	*carolinensis*	N	19.29	5.184	10.47	6.59	5.53	5.39	1.344
UGAMNH	22514	*carolinensis*	N	17.92	4.848	9.16	6.19	4.83	5.00	1.200
UGAMNH	22516	*carolinensis*	N	19.35	5.280	10.33	6.67	5.12	5.55	1.440
UGAMNH	22675	*carolinensis*	P	18.54	5.040	10.38	6.65	5.25	5.43	1.248
UGAMNH	22698	*carolinensis*	P	18.80	4.992	10.45	6.79	5.34	5.48	1.296

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
UGAMNH	22726	*carolinensis*	P	19.06	5.136	10.37	6.42	5.28	5.80	1.392
UGAMNH	23306	*carolinensis*	P	18.77	5.184	10.16	6.67	5.33	5.32	1.344
UGAMNH	23307	*carolinensis*	P	18.56	5.088	10.06	6.28	5.29	5.29	1.344
UGAMNH	23308	*carolinensis*	P	18.60	5.088	9.40	6.27	4.96	5.22	1.152
UGAMNH	23319	*carolinensis*	P	17.72	5.184	9.94	6.53	5.03	5.27	1.344
UGAMNH	23320	*carolinensis*	P	18.98	4.896	10.11	6.74	5.22	5.41	1.248
UGAMNH	23321	*carolinensis*	P	18.75	5.376	9.69	6.55	5.01	5.29	1.344
UGAMNH	23322	*carolinensis*	P	18.28	5.232	9.81	6.50	5.22	5.42	1.248
UGAMNH	23323	*carolinensis*	P	18.31	5.088	9.86	6.17	4.73	5.10	1.152
UGAMNH	23324	*carolinensis*	P	18.41	4.992	9.90	6.56	4.90	5.18	1.152
UGAMNH	23325	*carolinensis*	P	18.37	5.088	10.26	6.38	4.86	5.19	1.248
UGAMNH	23326	*carolinensis*	P	18.66	5.184	10.07	6.24	4.96	5.26	1.344
UGAMNH	23327	*carolinensis*	P	18.76	5.232	9.50	6.20	4.67	5.28	1.248
UMNH	14078	*carolinensis*	F	17.60	4.944	9.69	6.34	5.28	5.18	1.248
UMNH	14079	*carolinensis*	F	19.15	5.280	10.61	6.88	5.52	5.51	1.152
UMNH	27975	*carolinensis*	J	19.47	5.328	10.55	6.92	5.39	5.39	1.344
UMNH	27976	*carolinensis*	J	18.62	5.376	10.30	6.87	5.24	5.43	1.152
UMNH	28533	*carolinensis*	I	19.05	5.424	10.07	6.71	5.11	5.11	1.200
UNCW	494	*carolinensis*	V	18.83	5.184	10.23	6.40	4.95	5.25	1.248
UNCW	495	*carolinensis*	Y	18.76	5.088	10.17	6.31	5.02	5.41	1.296
UNCW	507	*carolinensis*	V	18.20	4.992	10.48	6.60	5.18	5.03	1.248
UNCW	641	*carolinensis*	Y	19.07	5.328	10.47	6.84	5.32	5.30	1.248
UNCW	2295	*carolinensis*	W	19.49	5.088	9.96	6.53	5.17	5.57	1.344

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
UNCW	2302	*carolinensis*	W	18.64	4.896	10.24	6.64	5.18	5.39	1.248
UNCW	2303	*carolinensis*	W	18.71	4.992	10.11	6.50	5.20	5.28	1.248
UNCW	2304	*carolinensis*	Z	19.49	5.376	10.62	6.80	5.15	5.51	1.392
UNCW	2631	*carolinensis*	V	18.63	5.136	9.89	6.43	4.93	5.4	1.344
UNCW	2650	*carolinensis*	Z	18.56	5.136	10.29	6.71	5.18	5.22	1.344
UNCW	2885	*carolinensis*	V	19.35	5.136	10.77	6.85	5.19	5.64	1.440
UNCW	2886	*carolinensis*	Z	18.97	5.184	10.22	6.71	5.00	5.44	1.248
UNCW	3399	*carolinensis*	W	18.78	5.184	10.29	6.43	5.08	5.12	1.344
UNCW	3512	*carolinensis*	W	18.34	5.088	9.93	6.34	5.10	5.13	1.248
UNCW	3513	*carolinensis*	V	19.17	5.328	10.29	6.61	4.95	5.44	1.344
UNCW	3514	*carolinensis*	V	19.85	5.568	10.49	7.03	5.47	5.78	1.344
UNCW	3517	*carolinensis*	W	19.30	5.232	10.38	7.04	5.15	5.52	1.488
UNCW	3519	*carolinensis*	Y	18.84	5.376	10.21	6.76	5.09	5.27	1.248
UNCW	3520	*carolinensis*	W	18.67	5.184	10.57	6.73	4.95	5.23	1.248
UNCW	3624	*carolinensis*	Y	19.18	5.328	10.42	6.84	5.32	5.52	1.344
UNCW	3625	*carolinensis*	Z	18.88	5.088	10.68	6.86	5.26	5.56	1.152
UNCW	3964	*carolinensis*	Y	19.24	5.568	10.39	6.73	5.26	5.61	1.344
UNCW	3967	*carolinensis*	V	18.72	5.328	9.95	6.33	4.92	4.88	1.344
UNCW	4127	*carolinensis*	Y	18.36	5.136	9.93	6.94	5.04	5.37	1.200
UNCW	4129	*carolinensis*	W	19.14	5.376	10.19	6.47	5.28	5.24	1.248
UNCW	4233	*carolinensis*	Y	17.68	4.992	9.84	6.46	4.89	5.08	1.104
UNCW	4234	*carolinensis*	Y	19.10	5.472	10.23	6.79	5.22	5.43	1.344
UNCW	4239	*carolinensis*	Y	19.37	5.376	10.32	7.03	5.10	5.65	1.344

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
UNCW	4327	*carolinensis*	X	18.32	4.992	9.74	6.42	5.04	5.47	1.200
UNCW	4329	*carolinensis*	Y	18.45	5.280	10.04	6.48	4.88	5.25	1.200
UNCW	4350	*carolinensis*	W	18.46	5.136	9.96	6.84	4.86	5.21	1.248
UNCW	4513	*carolinensis*	Y	18.71	5.328	10.30	6.75	5.10	5.34	1.152
UNCW	4774	*carolinensis*	W	19.04	5.280	10.47	6.61	5.21	5.57	1.248
UNCW	4776	*carolinensis*	W	18.58	5.040	10.52	6.47	4.93	5.56	1.344
UNCW	4778	*carolinensis*	X	19.03	5.136	9.96	6.70	5.30	5.49	1.488
UNCW	4779	*carolinensis*	X	18.79	5.136	10.47	6.72	4.96	5.20	1.344
UNCW	4780	*carolinensis*	W	19.11	5.376	10.24	6.51	5.16	5.21	1.248
UNCW	4781	*carolinensis*	W	18.19	5.040	10.33	6.42	4.95	5.34	1.344
UNCW	5171	*carolinensis*	W	19.56	5.232	10.39	6.74	5.06	5.39	1.296
UNCW	11625	*carolinensis*	V	19.14	5.328	10.19	6.70	5.32	5.40	1.440
UNCW	11626	*carolinensis*	V	18.72	5.136	9.85	6.36	5.07	5.17	1.248
UNCW	11627	*carolinensis*	V	18.54	4.944	9.72	6.26	4.93	5.14	1.200
UNCW	11628	*carolinensis*	V	18.62	5.040	10.28	6.57	4.86	5.25	1.248
UNCW	11629	*carolinensis*	V	19.94	5.424	10.49	6.74	5.25	5.37	1.392
UNCW	14027	*carolinensis*	V	18.69	5.136	9.30	6.17	4.84	4.99	1.008
UNCW	14030	*carolinensis*	V	19.08	5.232	9.75	6.26	4.98	5.08	1.152
UNCW	14031	*carolinensis*	V	18.54	5.136	9.87	6.24	4.86	5.26	1.248
UNCW	14033	*carolinensis*	V	18.17	4.992	9.94	6.13	4.84	5.09	1.200
UNCW	14035	*carolinensis*	V	19.04	5.136	9.87	6.41	5.04	5.33	1.248
UNCW	14036	*carolinensis*	V	18.94	5.136	10.20	6.55	5.13	5.45	1.152
USNM	23175	*carolinensis*	E	18.69	4.944	10.06	6.63	5.21	5.27	1.392

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
USNM	33812	*minima*	M	19.47	5.232	10.63	6.99	5.23	5.54	1.344
USNM	34072	*minima*	M	18.94	5.376	10.27	6.89	5.29	5.19	1.200
USNM	34073	*minima*	M	18.50	5.232	9.88	6.53	4.92	5.18	1.296
USNM	34074	*minima*	M	19.29	5.472	9.91	6.75	5.22	5.26	1.248
USNM	34075	*minima*	M	18.06	5.136	9.83	6.48	4.84	5.19	1.344
USNM	34076	*minima*	M	18.39	4.992	9.55	6.17	4.93	5.00	1.152
USNM	34077	*minima*	M	18.67	5.184	10.08	6.25	5.11	5.08	1.248
USNM	34078	*minima*	M	18.12	5.136	9.73	6.30	4.77	5.09	1.152
USNM	71477	*minima*	K	18.86	5.184	10.34	6.91	5.07	5.58	1.344
USNM	111196	*peninsulae*	R	19.91	5.280	10.17	6.43	5.06	5.44	1.344
USNM	178267	*carolinensis*	E	18.59	5.088	10.15	6.41	4.84	5.34	1.248
USNM	178268	*carolinensis*	E	17.81	4.992	10.11	6.38	5.07	5.27	1.248
USNM	202682	*carolinensis*	E	18.19	5.184	10.26	6.50	5.11	5.48	1.248
USNM	203425	*carolinensis*	O	18.99	5.376	9.96	6.82	5.14	5.53	1.296
USNM	207233	*carolinensis*	E	18.78	4.992	10.23	6.79	5.16	5.65	1.200
USNM	207288	*carolinensis*	E	18.49	4.992	9.98	6.53	4.97	5.07	1.344
USNM	207289	*carolinensis*	E	17.81	4.992	10.20	6.56	5.08	5.13	1.248
USNM	222598	*carolinensis*	E	17.93	4.944	9.76	6.33	4.86	5.14	1.200
USNM	222604	*carolinensis*	E	19.43	5.232	10.66	7.13	5.48	5.82	1.440
USNM	262340	*carolinensis*	R	19.63	5.232	9.90	6.59	4.72	5.63	1.440
USNM	267159	*minima*	L	17.98	5.280	9.57	6.52	4.94	5.20	1.296
USNM	267739	*minima*	K	19.20	5.376	10.30	6.41	4.98	5.32	1.344
USNM	269338	*carolinensis*	R	18.91	5.088	9.92	6.54	5.01	5.48	1.344

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
USNM	274689	*minima*	D	18.37	5.184	9.95	6.43	5.13	5.09	1.248
USNM	284827	*minima*	D	18.87	5.232	10.10	6.73	5.08	5.17	1.248
USNM	284828	*minima*	D	17.88	5.136	9.85	6.26	4.95	5.17	1.248
USNM	462501	*carolinensis*	L	19.44	5.280	10.69	7.10	5.20	5.54	1.344
USNM	462502	*carolinensis*	L	19.88	5.280	10.53	6.68	5.36	5.62	1.488
USNM	462503	*carolinensis*	L	19.03	4.992	10.20	6.37	4.95	5.44	1.200
USNM	462504	*carolinensis*	L	19.14	5.232	10.06	6.45	5.19	5.25	1.296
USNM	462505	*carolinensis*	L	18.39	4.176	10.07	6.48	4.91	5.17	1.344
USNM	462506	*carolinensis*	L	19.25	5.184	10.46	6.80	5.28	5.44	1.344
USNM	527410	*carolinensis*	Q	18.73	5.088	9.80	6.44	4.97	5.41	1.344
USNM	566718	*carolinensis*	K	18.97	5.280	10.39	6.53	5.16	5.45	1.392
USNM	568086	*peninsulae*	R	19.25	5.136	10.27	6.88	5.21	5.21	1.440
UWBM	71619	*carolinensis*	U	18.82	5.280	10.42	6.84	5.14	5.16	1.392
VMNH	131482	*carolinensis*	X	18.54	5.232	9.84	6.43	5.04	5.18	1.248
VMNH	131483	*carolinensis*	X	19.16	5.472	10.26	6.71	5.17	5.17	1.248
VMNH	131495	*carolinensis*	X	18.50	5.328	10.20	6.68	4.90	5.07	1.248
VMNH	131499	*carolinensis*	X	19.22	5.328	10.56	6.75	5.07	5.49	1.440
VMNH	131506	*carolinensis*	X	18.38	5.088	9.99	6.58	5.12	5.09	1.248
VMNH	131519	*carolinensis*	X	18.33	5.280	10.07	6.64	5.01	5.38	1.344
VMNH	131601	*carolinensis*	X	18.64	5.280	10.34	6.63	5.18	5.19	1.248
VMNH	131605	*carolinensis*	X	18.61	5.088	10.59	6.75	5.13	5.28	1.440
VMNH	131684	*carolinensis*	X	18.82	5.328	9.96	6.67	5.28	5.39	1.392
VMNH	131881	*carolinensis*	X	18.73	5.424	9.57	6.44	5.00	5.26	1.152

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
VMNH	131906	*carolinensis*	X	17.91	5.088	9.51	6.30	4.80	5.21	1.248
VMNH	131946	*carolinensis*	X	18.75	5.184	10.06	6.53	5.30	5.38	1.200
VMNH	132024	*carolinensis*	X	19.09	5.376	10.20	6.66	5.06	5.38	1.392
VMNH	132218	*carolinensis*	X	18.51	5.280	10.15	6.58	5.14	5.23	1.152
VMNH	138703	*carolinensis*	W	18.97	5.184	9.97	6.35	5.15	5.37	1.392
VMNH	138704	*carolinensis*	W	18.61	5.232	9.99	6.33	4.86	5.44	1.152
VMNH	138705	*carolinensis*	W	19.04	5.472	10.01	6.34	4.95	5.57	1.248
VMNH	138708	*carolinensis*	W	18.67	5.184	10.08	6.41	4.88	5.59	1.248
VMNH	138712	*carolinensis*	W	18.42	5.088	9.90	5.97	4.85	5.05	1.248
VMNH	138717	*carolinensis*	W	18.75	5.280	9.91	6.27	4.97	5.19	1.440
VMNH	138718	*carolinensis*	W	18.74	5.280	9.50	6.11	5.09	5.13	1.152
VMNH	138719	*carolinensis*	W	18.86	5.088	9.92	6.22	4.85	5.35	1.344
VMNH	138720	*carolinensis*	W	18.65	5.280	10.03	6.36	5.11	5.29	1.344
VMNH	138722	*carolinensis*	W	18.84	5.088	10.37	6.41	5.28	5.24	1.344
VMNH	138725	*carolinensis*	W	18.21	4.704	9.62	5.94	5.00	5.17	1.440
VMNH	138727	*carolinensis*	W	18.62	5.136	9.94	6.25	5.02	5.12	1.344
VMNH	138728	*carolinensis*	W	18.29	5.136	10.22	6.11	5.09	5.32	1.152
VMNH	138730	*carolinensis*	W	18.16	5.088	9.88	6.34	5.05	5.08	1.296
VMNH	138733	*carolinensis*	W	18.25	4.896	10.03	6.14	5.02	5.11	1.392
VMNH	138734	*carolinensis*	W	18.94	5.184	10.18	6.42	5.15	5.28	1.344
VMNH	138776	*carolinensis*	W	18.38	5.040	9.60	6.22	4.90	5.04	1.344
VMNH	138778	*carolinensis*	W	18.17	5.088	9.51	6.06	4.92	5.31	1.344
VMNH	138780	*carolinensis*	W	18.34	5.136	9.72	6.30	4.79	5.42	1.392

Appendix III (cont.)

Institution	Cat. #	Subspecies	Group	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
VMNH	138781	*carolinensis*	W	18.84	5.040	10.09	6.54	5.14	5.24	1.152
VMNH	138789	*carolinensis*	W	17.92	4.992	9.60	5.90	5.04	4.94	1.152
VMNH	138802	*carolinensis*	W	18.43	5.184	9.94	6.31	4.96	5.19	1.200
VMNH	138803	*carolinensis*	W	17.43	4.752	9.51	5.85	5.09	5.01	1.344
VMNH	138805	*carolinensis*	W	18.50	5.184	10.12	6.50	5.05	5.28	1.440
VMNH	138806	*carolinensis*	W	19.04	5.328	10.10	6.63	5.09	5.20	1.392
VMNH	138807	*carolinensis*	W	19.14	5.232	10.06	6.55	5.28	5.48	1.344
VMNH	138809	*carolinensis*	W	18.87	5.232	10.46	6.51	5.31	5.43	1.248
VMNH	138814	*carolinensis*	W	18.45	5.184	10.51	6.54	5.35	5.42	1.440

Appendix IV - Identification and measurement data for all specimens which were examined but not used in analyses. The columns are as follows: Institution = acronym for the institution from which the specimen was borrowed; Cat. # = catalog number unique to that specimen at its home institution; Subspecies = nominal subspecies for that specimen, which I determined using the distribution map from McCay (2001), see Fig. 4; OPLEN = occipito-premaxillary length measurement; P4-M3 = length of molariform toothrow measurement; CRNBR = cranial breadth measurement; MAXBR = maxillary breadth measurement; INOBR = interorbital breadth measurement; HEMAN = height of mandible measurement; COPBR = breadth of condyloid process measurement. For more information on the measurements that were recorded, consult Fig. 5.

Appendix IV

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
ASU	39	*minima*	X	X	X	X	X	X	X
ASU	98	*carolinensis*	X	4.944	10.14	6.59	5.30	5.25	1.150
ASU	99	*minima*	X	5.280	X	6.60	5.57	5.62	1.340
ASU	508	*carolinensis*	18.83	X	9.96	6.64	5.01	5.17	1.296
ASU	532	*carolinensis*	X	5.280	X	6.85	5.03	5.51	1.392
ASU	655	?	19.25	5.328	10.37	6.44	5.16	5.52	1.340
ASU	772	*carolinensis*	19.07	X	9.72	6.90	5.24	5.54	1.250
ASU	1161	*carolinensis*	X	5.472	10.13	6.52	5.31	5.22	1.340
ASU	1162	*carolinensis*	X	5.472	X	6.53	X	5.32	1.200
ASU	1222	*minima*	X	5.280	X	6.38	5.07	5.32	1.150
ASU	1336	*carolinensis*	X	X	X	X	X	X	X
ASU	1364	*minima*	X	X	X	X	X	X	X
ASU	1405	*minima*	X	4.848	9.46	6.65	X	5.37	1.250
ASU	1411	*minima*	19.59	5.328	10.68	X	5.40	5.58	1.296
ASU	1426	*minima*	X	X	X	X	X	X	X
ASU	1434	*minima*	19.07	5.380	X	6.57	4.95	5.20	1.250
ASU	1528	*carolinensis*	X	5.180	X	6.60	5.07	5.31	1.250
ASU	1592	*minima*	X	5.180	X	6.38	X	5.18	1.340
ASU	1886	*carolinensis*	X	5.090	X	6.83	X	5.43	1.390
ASU	2108	*minima*	X	5.470	X	6.81	5.43	5.76	1.250
ASU	2506	*carolinensis*	X	5.090	X	6.13	4.72	5.06	1.250
ASU	2671	*minima*	X	5.280	X	6.55	5.23	5.42	1.200
ASU	6064	*carolinensis*	X	5.280	X	7.40	5.30	5.28	1.250

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
ASU	6090	*carolinensis*	18.82	5.470	10.28	6.67	5.35	X	X
ASU	6338	*minima*	X	X	X	X	X	X	X
ASU	6385	*carolinensis*	X	5.570	X	6.74	5.13	5.62	1.344
ASU	6405	*minima*	18.58	5.280	X	6.63	5.16	5.54	1.248
ASU	6581	*carolinensis*	X	X	X	X	X	X	X
ASU	6627	*carolinensis*	X	X	X	X	X	X	X
ASU	8888	*carolinensis*	X	X	X	X	X	X	X
ASU	10698	*carolinensis*	X	X	X	X	X	X	X
ASU	10725	*carolinensis*	X	X	X	X	X	X	X
ASU	10756	*carolinensis*	X	X	X	X	X	X	X
ASU	10757	*carolinensis*	X	X	X	X	X	X	X
ASU	11866	*carolinensis*	X	X	X	X	X	X	X
ASU	11867	*minima*	X	X	X	X	X	X	X
ASU	11877	*carolinensis*	X	X	X	X	X	X	X
ASU	11879	*carolinensis*	X	X	X	X	X	5.41	1.440
ASU	12613	*carolinensis*	X	5.280	X	6.45	X	5.33	1.152
ASU	12614	*carolinensis*	18.34	5.090	10.23	X	5.29	5.18	1.152
ASU	12625	*carolinensis*	X	5.230	9.87	6.38	4.89	5.10	1.200
ASU	12687	*carolinensis*	19.71	X	10.31	6.76	5.36	5.69	1.248
ASU	12900	*carolinensis*	X	5.140	X	6.61	4.87	5.05	1.248
ASU	12950	*carolinensis*	X	5.040	X	6.76	5.25	5.30	1.344
ASU	15182	*carolinensis*	X	4.990	X	6.69	5.06	5.15	1.248

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
ASU	15183	*carolinensis*	X	5.088	X	6.26	5.09	5.18	1.152
ASU	15192	*carolinensis*	X	X	X	X	X	X	X
ASU	15288	*minima*	X	X	X	X	X	X	X
ASU	15331	*carolinensis*	X	5.184	X	6.54	4.96	5.23	1.296
ASU	15419	*carolinensis*	X	X	X	X	X	X	X
ASU	16015	*carolinensis*	X	4.992	X	6.38	5.03	5.01	1.248
ASU	19693	*carolinensis*	19.18	4.992	X	6.56	5.12	5.23	1.296
ASU	19704	*carolinensis*	X	4.896	X	6.10	X	4.91	1.200
ASU	21588	*carolinensis*	X	X	X	X	X	X	X
ASU	27782	*carolinensis*	X	X	X	X	X	X	X
ASU	27911	*carolinensis*	X	X	X	X	X	5.27	1.248
ASU	27915	*carolinensis*	X	4.944	X	X	X	5.07	1.152
ASU	27916	*carolinensis*	X	X	9.99	X	X	5.22	1.248
ASU	27917	*carolinensis*	X	5.184	X	6.45	4.82	5.04	1.296
CM	64707	*carolinensis*	X	5.376	X	6.93	X	5.60	1.536
CM	70906	*carolinensis*	19.37	5.136	X	6.49	5.06	5.49	1.344
CM	70907	*carolinensis*	X	5.184	X	6.57	5.21	5.16	1.344
CM	70908	*carolinensis*	19.04	4.992	X	6.18	5.19	5.29	1.248
CM	92554	*carolinensis*	X	5.088	10.09	6.30	4.80	5.31	1.152
CM	92567	*carolinensis*	19.03	5.088	10.29	6.52	4.95	X	X
CUSC	895	*carolinensis*	18.85	5.232	X	5.75	4.71	5.30	1.296
CUSC	1323	*carolinensis*	X	4.992	X	6.47	5.19	5.47	1.248

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
CUSC	1915	*carolinensis*	X	5.280	X	6.87	5.17	5.46	1.344
CUSC	1917	*carolinensis*	18.42	X	X	6.22	4.87	5.06	1.200
CUSC	1920	*carolinensis*	17.99	5.136	X	6.14	4.82	5.24	1.056
CUSC	1932	*carolinensis*	X	5.184	X	6.69	5.16	5.42	1.248
CUSC	1935	*carolinensis*	18.54	5.088	X	6.85	5.06	5.44	1.200
CUSC	1943	*carolinensis*	X	5.040	10.17	6.65	4.96	5.05	1.248
CUSC	1956	*carolinensis*	X	5.088	X	6.37	5.05	5.26	1.200
CUSC	1958	*carolinensis*	X	5.376	X	6.78	5.18	5.42	1.296
CUSC	1968	*carolinensis*	18.09	5.088	X	6.57	4.87	5.27	1.344
CUSC	1974	*carolinensis*	18.99	5.424	9.78	6.39	X	5.32	1.200
CUSC	1977	*carolinensis*	X	4.992	9.85	6.68	5.10	5.20	1.200
CUSC	1978	*carolinensis*	X	4.896	X	6.22	5.05	5.31	0.960
CUSC	1979	*carolinensis*	X	X	X	6.76	5.12	5.45	1.296
CUSC	1989	*carolinensis*	X	4.992	X	6.35	5.02	5.74	1.248
CUSC	2475	*carolinensis*	X	X	X	X	X	X	X
CUSC	2799	*carolinensis*	X	5.040	10.61	6.67	5.02	5.42	1.296
CUSC	3010	*carolinensis*	X	5.280	X	6.68	4.92	5.55	1.296
CUSC	3153	*carolinensis*	X	5.232	X	6.16	4.66	4.99	1.344
CUSC	3159	*carolinensis*	X	X	X	6.31	5.06	5.26	1.248
CUSC	3167	*carolinensis*	X	5.568	X	6.53	5.23	5.38	1.296
FMNH	7829	*carolinensis*	X	5.184	X	6.56	5.16	5.40	1.200
FMNH	15413	*carolinensis*	X	5.328	X	6.58	4.85	5.24	1.392

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
FMNH	15415	*carolinensis*	19.26	5.520	10.44	6.82	5.33	X	X
FMNH	15416	*carolinensis*	X	5.280	X	6.52	5.22	5.51	1.440
FMNH	15417	*carolinensis*	18.52	4.896	X	6.65	5.18	5.12	1.248
FMNH	15418	*carolinensis*	X	X	10.61	X	X	5.40	1.440
FMNH	15810	*carolinensis*	X	5.280	X	6.55	5.22	5.27	1.104
FMNH	15812	*carolinensis*	X	5.472	X	6.72	5.28	5.54	1.440
FMNH	15815	*carolinensis*	X	5.040	X	6.49	X	5.51	1.440
FMNH	16057	*carolinensis*	X	5.232	X	6.59	5.06	5.37	1.248
FMNH	16059	*carolinensis*	X	5.184	X	6.45	5.02	5.14	1.248
FMNH	16409	*minima*	X	5.088	X	6.58	5.16	5.31	1.392
FMNH	16534	*minima*	X	5.280	X	6.68	5.10	5.47	1.344
FMNH	16538	*minima*	X	5.184	X	6.63	5.09	5.38	1.344
FMNH	16540	*minima*	X	5.040	X	6.56	5.24	5.43	1.200
FMNH	16541	*minima*	X	5.136	X	6.53	X	5.52	1.344
LSUMZ	2298	*minima*	18.63	5.088	X	6.78	5.05	5.31	1.344
LSUMZ	2479	*minima*	18.90	5.232	X	6.65	5.32	5.37	1.344
LSUMZ	9564	*carolinensis*	19.47	5.280	10.90	7.07	5.11	X	1.248
LSUMZ	13426	*minima*	X	5.376	X	6.78	5.02	5.53	1.296
LSUMZ	15442	*minima*	19.38	5.160	9.91	6.44	5.42	X	1.244
LSUMZ	18454	*minima*	18.24	5.088	X	6.53	5.08	5.08	1.200
LSUMZ	29843	*minima*	18.35	5.280	X	6.49	4.98	5.20	1.200
MCZ	1292	*carolinensis*	18.71	5.280	X	6.62	5.35	4.94	1.056

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
MCZ	6172	*carolinensis*	X	5.136	X	6.33	X	5.18	1.248
MCZ	6193	*carolinensis*	18.69	4.992	X	6.40	5.19	5.45	1.056
MCZ	6194	*carolinensis*	X	5.040	X	6.56	X	5.20	1.008
MCZ	6205	*carolinensis*	X	X	X	5.92	4.84	5.00	1.248
MHP	5433	*carolinensis*	19.19	5.184	X	6.97	5.44	5.49	1.334
MHP	16050	*minima*	18.59	5.280	X	6.75	4.86	5.48	1.200
MHP	16051	*minima*	18.89	5.289	X	6.82	5.49	5.79	1.257
MHP	16053	*minima*	X	5.385	X	6.34	5.06	5.54	1.104
MHP	16055	*minima*	X	X	X	X	X	X	X
MHP	31868	*carolinensis*	X	X	X	X	X	X	X
MHP	31869	*carolinensis*	X	X	X	X	X	X	X
MHP	31874	*carolinensis*	X	X	X	X	X	X	X
MHP	31876	*carolinensis*	X	X	X	X	X	X	X
MHP	31877	*carolinensis*	X	X	X	X	X	X	X
MHP	31882	*carolinensis*	X	X	X	X	X	X	X
MHP	31883	*carolinensis*	X	X	X	X	X	X	X
MHP	32222	*carolinensis*	X	X	X	X	X	X	X
MHP	32348	*carolinensis*	19.24	5.280	X	7.02	5.36	5.56	1.257
MHP	32379	*carolinensis*	X	X	X	X	X	X	X
MHP	32816	*carolinensis*	X	X	X	X	X	X	X
MMNS	694	*carolinensis*	X	5.126	X	6.38	X	5.38	1.344
MMNS	695	*carolinensis*	X	5.136	X	6.47	X	X	1.200

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
MMNS	697	*minima*	X	5.088	X	6.47	5.00	5.37	1.440
MMNS	698	*carolinensis*	18.86	5.040	X	6.83	4.94	5.38	1.248
MMNS	886	*minima*	X	5.232	X	6.62	5.15	5.17	1.296
MMNS	887	*minima*	X	X	X	X	X	5.25	1.248
MMNS	893	*minima*	X	5.424	X	6.77	5.25	5.49	1.440
MMNS	894	*minima*	X	5.280	X	6.59	5.18	5.31	1.200
MMNS	895	*minima*	X	5.088	X	6.24	4.87	5.10	1.296
MMNS	908	*minima*	X	5.184	X	6.65	5.14	5.20	1.344
MMNS	934	*minima*	X	5.184	X	6.8	5.07	5.31	1.344
MMNS	935	*minima*	X	5.088	X	6.72	5.19	5.11	1.296
MMNS	936	*minima*	X	5.088	X	6.43	X	5.00	1.200
MMNS	938	*minima*	X	5.136	X	6.31	5.05	X	1.392
MMNS	939	*minima*	X	5.184	X	6.43	4.75	5.16	1.200
MMNS	944	*minima*	X	5.136	X	6.66	4.97	5.33	1.440
MMNS	945	*minima*	X	X	X	6.68	5.26	5.39	1.248
MMNS	946	*minima*	X	5.424	10.50	6.88	5.37	5.53	1.200
MMNS	947	*minima*	18.03	5.040	X	6.64	4.97	5.10	1.248
MMNS	991	*minima*	X	5.280	X	6.36	X	5.18	1.440
MMNS	1008	*minima*	X	1.344	X	6.46	4.88	5.15	1.200
MMNS	1009	*minima*	X	5.088	X	6.42	5.07	5.22	1.104
MMNS	1096	*minima*	X	5.232	X	6.57	5.05	5.14	1.248
MMNS	1146	*minima*	X	5.184	X	6.53	4.98	5.19	1.200

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
MMNS	1255	*minima*	X	5.184	X	6.59	4.84	5.38	1.296
MMNS	1326	*minima*	18.32	5.136	X	6.35	4.74	4.97	1.296
MMNS	1438	*minima*	X	5.184	X	6.62	4.99	5.43	1.248
MMNS	1441	*minima*	X	5.328	X	6.89	5.41	5.77	1.344
MMNS	1442	*minima*	X	5.136	X	6.39	X	5.37	1.248
MMNS	1443	*minima*	X	5.376	X	6.96	5.26	5.48	1.344
MMNS	1585	*minima*	X	5.232	X	6.71	5.21	5.44	1.440
MMNS	1588	*minima*	X	5.328	X	6.52	X	5.55	1.248
MMNS	1591	*minima*	X	5.040	X	6.53	5.03	5.05	1.248
MMNS	1709	*carolinensis*	X	5.040	X	6.67	5.09	5.00	1.248
MMNS	1710	*carolinensis*	18.78	5.184	X	6.92	5.16	X	X
MMNS	1711	*carolinensis*	X	5.088	X	6.50	4.93	5.08	1.344
MMNS	1712	*carolinensis*	X	5.184	X	6.62	X	5.12	1.344
MMNS	1725	*carolinensis*	X	X	X	X	X	5.10	1.152
MMNS	1761	*carolinensis*	X	5.232	10.43	6.62	5.09	5.46	1.344
MMNS	1864	*carolinensis*	X	5.184	X	6.57	5.13	5.25	1.344
MMNS	1971	*minima*	X	4.992	X	6.38	5.09	5.30	1.248
MMNS	2119	*minima*	X	X	X	X	X	5.26	1.248
MMNS	2127	*minima*	X	5.376	X	6.66	5.09	5.12	1.152
MMNS	2153	*carolinensis*	X	5.040	X	6.39	4.88	5.15	1.152
MMNS	2279	*minima*	19.14	5.184	X	6.61	5.07	5.23	1.344
MMNS	2313	*minima*	18.75	X	10.30	6.49	5.16	5.39	1.248

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
MMNS	2339	*carolinensis*	X	4.896	X	6.59	5.03	5.36	1.296
MMNS	2373	*minima*	X	5.184	X	6.60	X	X	X
MMNS	2476	*minima*	X	5.184	X	6.76	5.05	5.25	1.248
MMNS	2549	*carolinensis*	X	5.088	X	6.59	5.08	5.18	1.248
MMNS	2577	*minima*	X	5.184	X	6.40	4.99	5.27	1.344
MMNS	2639	*carolinensis*	X	5.088	X	6.48	5.27	5.25	1.152
MMNS	2670	*carolinensis*	X	X	X	6.69	5.07	5.27	1.200
MMNS	2688	*minima*	X	X	10.14	6.68	4.96	5.01	1.200
MMNS	2689	*minima*	X	X	X	6.43	4.96	5.31	1.344
MMNS	2714	*minima*	X	X	X	6.46	X	5.28	1.248
MMNS	2724	*minima*	X	5.136	X	6.73	5.17	5.40	1.152
MMNS	2777	*carolinensis*	18.50	X	10.15	6.53	4.88	5.02	1.344
MMNS	2780	*carolinensis*	X	X	10.06	6.50	5.24	5.22	1.296
MMNS	2781	*carolinensis*	18.62	X	10.12	6.40	4.89	5.20	1.152
MMNS	2782	*carolinensis*	X	5.280	X	6.55	X	5.14	1.248
MMNS	2785	*carolinensis*	X	5.136	X	6.80	4.85	5.41	1.296
MMNS	2872	*carolinensis*	X	5.472	X	7.04	5.45	5.61	1.344
MMNS	2958	*minima*	X	5.280	X	6.46	5.15	5.16	1.344
MMNS	2989	*minima*	X	5.088	9.56	6.92	5.23	5.70	1.344
MMNS	3001	*minima*	X	4.944	X	6.46	4.94	5.21	1.248
MMNS	3002	*minima*	X	5.232	X	6.39	5.03	5.27	1.200
MMNS	3212	*minima*	X	4.992	X	6.51	X	4.98	1.056

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
MMNS	3220	*minima*	X	5.376	X	X	X	5.29	1.344
MMNS	3221	*minima*	X	X	X	X	X	5.56	1.056
MMNS	3224	*minima*	X	5.520	X	6.71	5.08	5.35	1.344
MMNS	3273	*carolinensis*	18.75	X	X	6.63	4.97	5.23	1.104
MMNS	3276	*carolinensis*	18.71	5.328	X	6.67	4.97	5.16	1.344
MMNS	3291	*carolinensis*	X	5.088	X	6.35	4.93	5.14	1.248
MMNS	3300	*minima*	X	X	X	6.54	5.06	5.28	1.344
MMNS	3310	*carolinensis*	X	5.136	X	6.49	5.12	5.21	1.248
MMNS	3311	*carolinensis*	X	5.184	X	6.37	4.99	5.07	1.248
MMNS	3312	*carolinensis*	X	4.944	X	6.77	X	5.31	1.248
MMNS	3313	*carolinensis*	X	5.088	X	6.49	4.94	5.25	1.296
MMNS	3347	*carolinensis*	X	4.896	X	6.25	4.83	5.46	1.344
MMNS	3348	*carolinensis*	X	5.136	X	6.69	5.20	5.69	1.440
MMNS	3500	*minima*	X	5.280	X	6.69	5.07	5.45	1.344
MMNS	3504	*minima*	X	5.280	X	6.77	X	5.30	1.440
MMNS	3510	*minima*	X	X	X	6.70	5.08	5.37	1.344
MMNS	3551	*minima*	X	5.088	X	6.46	4.99	5.12	1.440
MMNS	3552	*minima*	X	4.752	X	6.65	5.16	5.40	1.392
MMNS	3558	*minima*	X	5.136	X	6.49	4.93	5.10	1.200
MMNS	3633	*minima*	18.75	4.992	X	6.67	4.94	5.15	1.200
MMNS	3635	*minima*	X	5.136	X	6.88	5.17	5.27	1.200
MMNS	3638	*minima*	X	5.232	X	6.79	5.15	5.27	1.248

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
MMNS	3669	*carolinensis*	X	5.040	X	6.43	4.85	5.18	1.248
MMNS	3670	*carolinensis*	X	5.232	10.28	6.67	5.04	5.22	1.296
MMNS	3678	*carolinensis*	X	5.184	X	6.78	X	5.59	1.344
MMNS	3685	*carolinensis*	X	4.896	X	6.32	X	5.06	1.200
MMNS	3687	*carolinensis*	X	5.184	10.29	6.60	5.16	5.43	1.248
MMNS	3713	*minima*	X	5.328	X	6.60	5.21	5.17	1.344
MMNS	3716	*minima*	X	5.184	X	6.50	4.94	5.08	1.344
MMNS	3724	*minima*	X	5.184	X	6.29	4.76	5.11	1.056
MMNS	3774	*carolinensis*	X	5.088	X	6.34	4.72	5.10	1.200
MMNS	3796	*minima*	X	5.184	X	6.30	4.80	5.12	1.152
MMNS	3797	*minima*	X	5.136	X	6.40	X	5.44	1.248
MMNS	3825	*carolinensis*	X	5.088	X	6.96	5.04	5.30	1.200
MMNS	3837	*minima*	X	5.088	X	6.38	4.76	5.18	1.296
MMNS	3854	*minima*	X	5.232	X	6.59	5.03	5.27	1.440
MMNS	3957	*carolinensis*	X	5.328	10.28	6.67	5.24	5.29	1.200
MMNS	3959	*carolinensis*	X	5.184	X	6.90	5.39	5.36	1.344
MMNS	4158	*carolinensis*	X	5.184	X	6.48	5.08	5.05	1.344
MMNS	4159	*carolinensis*	19.32	5.184	X	6.61	5.19	5.44	1.440
MMNS	4161	*carolinensis*	X	5.088	X	6.69	5.13	5.34	1.344
MMNS	4178	*carolinensis*	X	5.280	X	6.75	5.18	5.40	1.440
MMNS	4471	*minima*	X	X	X	6.93	5.40	5.61	1.392
MMNS	4502	*minima*	X	5.184	X	6.51	5.05	5.47	1.344

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
MMNS	4531	*carolinensis*	X	5.136	X	6.57	5.10	5.35	1.440
MMNS	4945	*carolinensis*	X	5.280	X	6.45	5.07	5.14	1.248
MMNS	4968	*carolinensis*	19.05	5.328	X	7.05	5.20	5.51	1.296
MMNS	4975	*carolinensis*	X	5.280	X	6.49	4.85	5.20	1.296
MMNS	5225	*minima*	X	5.328	X	6.59	X	5.50	1.248
MMNS	5285	*minima*	X	4.944	X	6.41	4.98	5.23	1.248
MMNS	5286	*minima*	X	4.992	X	6.09	X	5.14	1.392
MMNS	5287	*minima*	X	4.944	X	6.39	5.06	5.25	1.248
MMNS	5351	*minima*	X	5.040	X	6.48	5.01	5.37	1.296
MMNS	5353	*minima*	X	4.992	X	6.50	X	5.13	1.344
MMNS	5411	*carolinensis*	X	5.472	X	6.88	5.11	5.37	1.344
MMNS	5552	*carolinensis*	X	5.184	X	X	X	5.52	1.344
MMNS	5745	*carolinensis*	X	5.280	X	6.42	5.00	5.33	1.248
MMNS	5751	*carolinensis*	X	5.136	X	6.15	X	5.10	1.296
MMNS	5759	*carolinensis*	X	5.280	X	6.71	5.07	5.46	1.296
MMNS	5831	*carolinensis*	X	5.088	X	6.27	5.12	5.13	1.392
MMNS	5858	*carolinensis*	18.26	X	10.00	6.45	5.01	5.23	1.344
MMNS	5876	*carolinensis*	X	5.088	X	6.61	5.20	5.19	1.248
MMNS	5879	*carolinensis*	X	5.328	9.88	6.80	5.26	5.37	1.440
MMNS	5887	*carolinensis*	X	5.328	X	6.85	5.14	5.48	1.344
MMNS	5916	*carolinensis*	X	5.040	X	6.66	5.05	5.47	1.344
MMNS	5922	*carolinensis*	X	5.472	X	6.89	5.01	5.52	1.248

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
MMNS	6578	*minima*	X	5.136	X	6.41	4.97	5.25	1.248
MVZ	70506	*minima*	X	X	X	X	X	X	X
MVZ	81252	*carolinensis*	X	5.376	X	6.69	X	5.51	1.344
MVZ	81254	*carolinensis*	X	5.232	X	6.88	5.59	6.10	1.248
MVZ	97171	*carolinensis*	18.52	5.184	X	6.60	5.29	5.52	1.248
MVZ	179719	*carolinensis*	17.98	4.992	X	6.62	4.88	5.14	1.200
MVZ	179750	*carolinensis*	18.67	5.184	X	6.29	5.06	5.61	1.344
MVZ	179761	*carolinensis*	17.71	5.136	X	6.12	4.89	5.23	1.248
OMHN	3887	*carolinensis*	X	X	X	5.99	X	3.66	1.248
ROM	94398	*carolinensis*	X	X	X	X	X	X	X
ROM	94399	*carolinensis*	X	X	X	X	X	X	X
ROM	94401	*carolinensis*	X	X	X	X	X	X	X
SHSU	142	*minima*	X	5.568	X	6.65	5.29	5.54	1.248
SHSU	199	*minima*	19.20	5.424	9.78	6.66	5.17	X	X
SIUCM	3004	*carolinensis*	19.39	5.376	X	6.49	5.14	5.27	1.344
SIUCM	3025	*carolinensis*	X	5.424	X	6.75	5.12	5.60	1.344
SIUCM	3039	*carolinensis*	X	5.280	X	6.72	5.31	5.56	1.488
SIUCM	3042	*carolinensis*	X	5.520	10.89	6.95	5.31	5.66	1.488
SIUCM	3052	*carolinensis*	X	5.424	10.36	6.79	5.17	5.47	1.248
SIUCM	3054	*carolinensis*	19.45	5.472	X	6.73	5.24	5.41	1.392
SIUCM	3055	*carolinensis*	X	5.472	X	6.75	5.38	5.29	1.440
SIUCM	3067	*carolinensis*	19.22	5.472	X	6.61	5.25	5.44	1.344

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
SIUCM	3077	*carolinensis*	19.61	5.376	X	6.63	5.42	5.38	1.248
SIUCM	3083	*carolinensis*	19.08	5.472	10.44	6.65	5.35	X	1.296
SIUCM	3084	*carolinensis*	X	5.28	9.88	6.25	4.92	5.41	1.248
SIUCM	3088	*carolinensis*	X	X	X	6.64	5.16	X	X
SIUCM	3090	*carolinensis*	X	5.424	10.60	6.55	5.35	5.41	1.344
SIUCM	3104	*carolinensis*	X	5.184	X	6.45	5.06	5.27	1.200
SIUCM	3107	*carolinensis*	19.50	5.472	X	6.75	5.46	5.54	1.248
SIUCM	3109	*carolinensis*	19.34	5.376	X	6.31	5.38	5.60	1.344
SIUCM	3110	*carolinensis*	X	5.376	X	X	X	X	X
TCWC	6423	*minima*	X	X	X	X	X	X	X
TCWC	6624	*carolinensis*	X	X	X	X	X	X	X
TCWC	16192	*minima*	X	X	X	X	X	X	X
TCWC	27622	*minima*	X	X	X	X	X	X	X
TCWC	27625	*minima*	X	X	X	X	X	X	X
TCWC	27626	*minima*	X	X	X	X	X	X	X
TCWC	27975	*minima*	X	X	X	X	X	X	X
TCWC	31454	*minima*	X	5.184	X	6.32	4.94	5.2	1.248
TCWC	31456	*minima*	18.61	5.088	X	6.67	5.09	5.52	1.248
TCWC	31461	*minima*	X	4.896	X	6.23	4.95	5.39	1.056
TCWC	31462	*minima*	X	5.184	X	6.16	4.98	5.07	1.200
TCWC	31832	*minima*	X	X	X	X	X	X	X
TCWC	33339	*minima*	X	X	X	X	X	X	X

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
TCWC	33340	*minima*	18.89	5.280	10.37	6.67	5.08	X	X
TCWC	33344	*minima*	X	X	X	X	X	X	X
TCWC	33348	*minima*	X	5.232	10.25	6.49	4.89	5.63	1.344
TCWC	33354	*minima*	X	4.800	10.39	6.66	5.16	5.60	1.200
TCWC	33359	*minima*	X	X	X	X	X	X	X
TCWC	33361	*minima*	X	X	X	X	X	X	X
TCWC	34946	*minima*	X	5.040	X	6.27	5.02	5.28	1.152
TCWC	34947	*minima*	X	5.184	X	6.58	X	X	X
TCWC	34948	*minima*	X	X	X	X	X	X	X
TCWC	34949	*minima*	X	5.328	X	6.45	5.16	5.49	1.296
TCWC	34952	*minima*	X	5.328	X	6.47	5.08	5.15	1.200
TCWC	34953	*minima*	X	X	X	X	X	X	X
TCWC	34954	*minima*	X	5.184	X	6.42	X	5.63	1.296
TCWC	34955	*minima*	18.90	5.184	10.46	6.68	5.24	X	X
TCWC	34966	*minima*	X	5.088	X	6.53	4.99	5.37	1.248
TCWC	34969	*minima*	18.44	5.184	10.04	6.58	5.09	X	X
TCWC	34971	*minima*	X	X	X	X	X	X	X
TCWC	34973	*minima*	X	X	X	X	X	X	X
TCWC	37447	*minima*	X	5.040	X	6.38	4.95	5.33	1.152
TCWC	37449	*minima*	X	5.232	X	6.67	5.33	5.36	1.200
TCWC	37450	*minima*	18.69	5.088	X	6.68	4.90	5.53	1.344
TCWC	50110	*carolinensis*	X	X	X	6.53	5.17	5.44	1.248

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
TCWC	50113	*carolinensis*	X	X	X	6.72	X	5.51	1.152
TCWC	50115	*carolinensis*	X	X	10.00	X	5.12	5.18	1.296
TCWC	50116	*carolinensis*	X	4.992	X	6.19	4.86	5.18	1.200
TCWC	57990	*minima*	X	X	X	X	X	X	X
TTU	78	*minima*	18.42	X	9.65	6.46	5.02	5.10	1.200
TTU	1773	*carolinensis*	19.13	5.280	X	6.51	5.05	5.30	1.248
TTU	93088	*carolinensis*	X	5.184	X	6.55	5.04	5.19	1.248
TTU	93138	*carolinensis*	X	X	X	X	X	X	X
UAMZC	571	*carolinensis*	X	5.328	X	6.63	X	X	X
UAMZC	572	*minima*	X	X	X	X	X	X	X
UAMZC	577	*carolinensis*	X	5.568	X	6.86	5.39	5.78	1.488
UAMZC	578	*minima*	X	X	X	X	X	X	X
UAMZC	579	*minima*	X	X	X	X	X	X	X
UGAMNH	464	*carolinensis*	X	5.280	X	6.86	5.32	5.81	1.344
UGAMNH	1185	*carolinensis*	X	5.184	X	6.52	5.11	5.70	1.200
UGAMNH	1370	*carolinensis*	X	5.136	X	6.74	4.93	5.49	1.248
UGAMNH	1897	*carolinensis*	X	5.232	X	6.78	5.24	5.53	1.440
UGAMNH	22470	*carolinensis*	18.94	5.376	X	6.33	5.08	5.07	1.344
UGAMNH	22486	*carolinensis*	18.71	4.992	X	6.52	5.04	5.36	1.344
UGAMNH	22515	*carolinensis*	X	4.992	X	6.71	5.32	5.43	1.248
UGAMNH	22661	*carolinensis*	X	X	X	5.60	X	4.89	X

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
UGAMNH	22727	*carolinensis*	X	5.088	10.11	6.51	5.12	5.36	1.200
UF	20688	*peninsulae*	19.15	X	9.97	6.33	4.84	5.64	1.344
UMNH	27977	*carolinensis*	X	5.376	X	6.92	4.96	5.43	1.344
USNM	33997	*minima*	X	5.232	X	6.27	5.01	5.39	1.248
USNM	70875	*peninsulae*	X	X	X	X	X	X	1.248
USNM	70876	*peninsulae*	X	X	10.69	X	X	5.85	1.296
USNM	71478	*minima*	18.47	5.088	X	6.36	4.93	5.44	1.200
USNM	71480	*minima*	X	X	X	X	X	5.10	1.296
USNM	151456	*minima*	X	4.896	X	6.70	X	5.60	1.344
USNM	151457	*minima*	X	X	10.11	X	5.27	5.33	1.248
USNM	151458	*minima*	X	5.280	X	6.64	5.33	5.30	1.344
USNM	151459	*carolinensis*	X	5.040	X	6.55	X	4.84	1.344
USNM	206364	*minima*	X	5.040	X	5.96	4.89	5.53	1.248
USNM	207231	*carolinensis*	X	5.232	X	6.55	5.07	5.64	1.440
USNM	207232	*carolinensis*	X	5.088	X	6.74	5.17	5.52	1.344
USNM	207234	*carolinensis*	X	5.184	X	6.65	5.01	5.42	1.392
USNM	207235	*carolinensis*	X	4.992	X	6.45	X	5.22	1.248
USNM	207290	*carolinensis*	X	5.376	X	6.67	5.04	5.42	1.248
USNM	210791	*minima*	X	5.184	X	6.42	5.19	5.62	1.248
USNM	222599	*carolinensis*	X	5.088	X	6.63	5.16	5.33	1.440
USNM	222600	*carolinensis*	X	5.280	9.99	6.63	4.88	5.42	1.152
USNM	222601	*carolinensis*	X	X	X	X	X	5.48	1.536
USNM	222602	*carolinensis*	X	4.896	X	6.32	5.00	5.50	1.248

Appendix IV (cont.)

Institution	Cat. #	Subspecies	OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
USNM	222603	*carolinensis*	X	5.184	X	6.74	5.20	5.66	1.200
USNM	267160	*minima*	X	5.088	X	6.31	5.16	X	1.104
USNM	267161	*minima*	X	5.184	X	6.26	X	5.19	1.200
USNM	267175	*minima*	20.16	5.568	X	7.35	5.40	5.52	1.344
USNM	267737	*minima*	X	5.184	X	6.58	5.16	5.31	1.296
USNM	267738	*minima*	X	5.424	X	6.20	X	5.37	1.248
USNM	267740	*minima*	X	X	X	6.39	5.03	X	X
USNM	267741	*minima*	X	X	X	6.87	X	5.64	1.440
USNM	269988	*minima*	X	5.136	X	6.57	4.93	5.29	1.344
USNM	274688	*minima*	19.34	5.520	X	7.05	5.55	5.53	1.344
UWBM	71451	*minima*	X	5.184	X	6.61	5.25	5.40	1.440
UWBM	71526	*carolinensis*	X	5.280	X	6.80	5.08	5.59	1.152
UWBM	71622	*carolinensis*	X	5.376	X	7.15	5.48	6.30	1.296

Appendix V – Descriptive statistics for each of the subspecies of *Blarina carolinensis* (Fig. 4) and each group (Fig. 6).

Appendix V

CAROLINENSIS		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 796							
	Mean	18.87	5.19	10.22	6.58	5.09	5.37	1.29
	SD	0.55	0.18	0.36	0.24	0.18	0.21	0.09

MINIMA		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 354							
	Mean	18.72	5.18	10.11	6.55	5.06	5.30	1.26
	SD	0.44	0.16	0.28	0.21	0.15	0.17	0.07

PENINSULAE		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 34							
	Mean	19.63	5.16	10.26	6.53	5.14	5.50	1.34
	SD	0.49	0.15	0.29	0.27	0.18	0.28	0.08

Appendix V (cont.)

A		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 63							
	Mean	18.85	5.18	10.31	6.62	5.12	5.38	1.25
	SD	0.56	0.19	0.30	0.26	0.17	0.21	0.09

AA		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 156							
	Mean	18.83	5.15	10.24	6.53	5.02	5.37	1.28
	SD	0.53	0.14	0.34	0.23	0.16	0.16	0.09

AB		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 69							
	Mean	18.61	5.16	10.13	6.53	5.05	5.32	1.23
	SD	0.40	0.15	0.28	0.17	0.17	0.16	0.08

B		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 37							
	Mean	18.53	5.12	10.05	6.47	5.04	5.34	1.24
	SD	0.41	0.15	0.25	0.28	0.14	0.21	0.06

Appendix V (cont.)

C		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 83							
	Mean	18.67	5.15	10.08	6.54	5.03	5.33	1.28
	SD	0.54	0.17	0.32	0.26	0.18	0.24	0.08

D		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 88							
	Mean	18.67	5.17	10.07	6.57	5.09	5.24	1.28
	SD	0.41	0.13	0.25	0.19	0.13	0.16	0.07

E		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 34							
	Mean	18.64	5.11	10.09	6.57	5.02	5.32	1.28
	SD	0.44	0.12	0.29	0.20	0.17	0.22	0.08

F		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 40							
	Mean	18.40	5.08	9.98	6.46	5.04	5.25	1.25
	SD	0.46	0.19	0.25	0.16	0.14	0.15	0.07

Appendix V (cont.)

G		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 27							
	Mean	19.04	5.23	10.33	6.62	5.13	5.37	1.30
	SD	0.44	0.14	0.28	0.12	0.11	0.17	0.08

H		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 100							
	Mean	19.09	5.25	10.28	6.67	5.14	5.39	1.29
	SD	0.34	0.14	0.28	0.16	0.15	0.16	0.07

I		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 48							
	Mean	19.31	5.37	10.46	6.76	5.24	5.45	1.35
	SD	0.41	0.13	0.27	0.21	0.15	0.15	0.06

J		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 66							
	Mean	19.20	5.34	10.46	6.70	5.19	5.46	1.35
	SD	0.41	0.14	0.25	0.19	0.13	0.17	0.07

Appendix V (cont.)

K		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 4							
	Mean	19.09	5.30	10.33	6.67	5.10	5.39	1.33
	SD	0.21	0.09	0.04	0.23	0.09	0.15	0.06

L		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 22							
	Mean	19.11	5.24	10.17	6.68	5.13	5.46	1.29
	SD	0.45	0.28	0.40	0.24	0.19	0.16	0.09

M		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 41							
	Mean	18.82	5.22	10.09	6.53	5.05	5.27	1.28
	SD	0.41	0.12	0.28	0.19	0.14	0.15	0.09

N		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 27							
	Mean	18.59	5.15	9.92	6.43	5.11	5.26	1.27
	SD	0.49	0.15	0.42	0.22	0.19	0.18	0.09

Appendix V (cont.)

O		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 26							
	Mean	18.72	5.21	10.13	6.56	5.09	5.33	1.22
	SD	0.48	0.12	0.40	0.24	0.20	0.26	0.08

P		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 35							
	Mean	18.66	5.13	10.10	6.46	5.03	5.30	1.27
	SD	0.38	0.13	0.29	0.19	0.19	0.19	0.08

Q		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 16							
	Mean	18.90	5.13	10.20	6.55	5.06	5.38	1.29
	SD	0.67	0.17	0.49	0.30	0.20	0.23	0.12

R		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 21							
	Mean	19.31	5.10	10.01	6.42	4.99	5.36	1.34
	SD	0.47	0.14	0.43	0.21	0.17	0.18	0.09

Appendix V (cont.)

S		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 23							
	Mean	19.59	5.13	10.19	6.54	5.14	5.46	1.33
	SD	0.56	0.15	0.30	0.23	0.20	0.28	0.07

T		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 5							
	Mean	19.73	5.24	10.48	6.49	5.20	5.76	1.31
	SD	0.34	0.12	0.15	0.52	0.19	0.22	0.08

U		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 12							
	Mean	19.21	5.31	10.49	6.76	5.21	5.58	1.32
	SD	1.22	0.32	0.69	0.42	0.23	0.55	0.19

V		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 18							
	Mean	18.89	5.18	10.08	6.48	5.03	5.27	1.26
	SD	0.48	0.16	0.35	0.24	0.18	0.22	0.10

Appendix V (cont.)

W		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 48							
	Mean	18.74	5.15	10.09	6.40	5.08	5.31	1.30
	SD	0.69	0.22	0.41	0.29	0.18	0.26	0.10

X		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 19							
	Mean	18.66	5.23	10.10	6.59	5.07	5.27	1.30
	SD	0.35	0.13	0.30	0.12	0.13	0.13	0.10

Y		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 11							
	Mean	18.79	5.29	10.21	6.72	5.11	5.38	1.25
	SD	0.49	0.16	0.20	0.21	0.15	0.16	0.08

Z		OPLEN	P4-M3	CRNBR	MAXBR	INOBR	HEMAN	COPBR
	n: 46							
	Mean	18.77	5.17	10.23	6.59	5.08	5.35	1.25
	SD	0.36	0.14	0.27	0.20	0.17	0.19	0.08