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**VARIATION AND SYSTEMATICS OF THE SCINCOID
LIZARD, EUMECES EGREGIUS (BAIRD)**

Robert H. Mount



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VARIATION AND SYSTEMATICS OF THE SCINCROID LIZARD, *EUMECES EGREGIUS* (BAIRD)

ROBERT H. MOUNT¹

SYNOPSIS: *Eumeces egregius* (Baird) varies geographically in tail color, dorsolateral and lateral light striping, relative head and body proportions, ground color of hatchlings, rate of growth and development, size, and in number of supralabial scales, scale rows at midbody, midventral scales, and presacral vertebrae. The overall pattern of geographic variation appears to reflect strongly the Pleistocene history of the Southeast.

Five subspecies are recognized, two of them previously undescribed: *E. e. lividus* of the Lake Wales Ridge of central Florida and *E. e. insularis* of Cedar and Seahorse keys, small islands off the northwestern coast of peninsular Florida.

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¹ The author, Associate Professor of Biology at Alabama College, Montevallo, completed much of this research while a graduate student at the University of Florida. His doctoral dissertation dealt with the life history and ecology of the lizard species treated taxonomically herein. Manuscript submitted 15 March, 1965.

INTRODUCTION

Eumeces egregius is a fossorial skink found in Florida and the Coastal Plain of Georgia and Alabama. It occurs most abundantly in areas where the soil is sandy and well drained (fig. 1). From the time of the species' description in 1858, a red, orange, or pinkish tail has been considered its most distinctive feature. In January 1959 while studying the ecology of this skink, I discovered a population of blue-tailed individuals; this find led to the study of variation reported herein.

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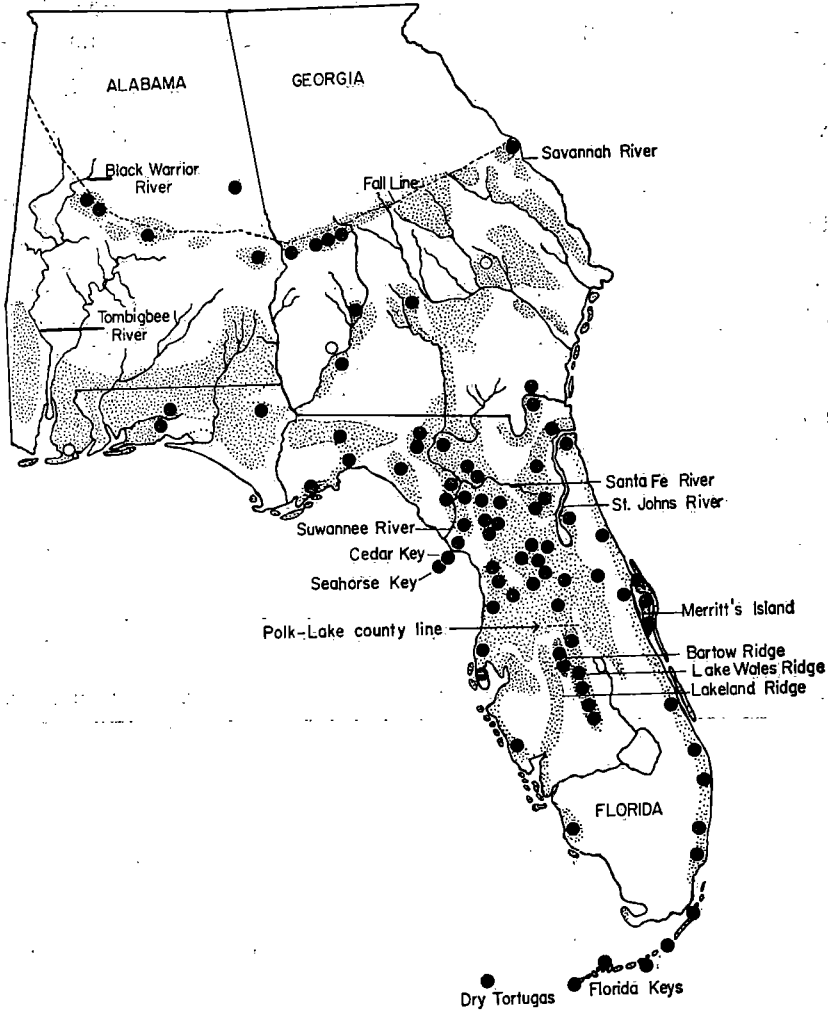


Figure 1. Locality records for *Eumeces egregius*. Generalized distribution of most suitable habitat is indicated by stippling. Open circles are literature records for which specimens are unavailable.

METHODS

I examined a total of 608 specimens of *Eumeces egregius*, 188 of which I obtained through loans from individuals and museums. The remainder were collected during the course of the study and deposited in the Florida State Museum. Collecting methods have been described in detail by Telford (1959) and Mount (1963). The lizards were killed, fixed, and preserved by conventional methods. Unless otherwise specified, all measurements are of preserved specimens.

All major external features were studied except appendage scalation. Presacral vertebrae counts were made by radiography.

For convenience and clarity in presenting the data on geographic variation, I have divided the range into numbered sample areas, most of which include two or more localities from which specimens were available (fig. 2 and table 1). This approach was necessary because of the relatively few specimens available from most localities. I did not group specimens from localities between which significant taxonomic differences could be detected.

Numbers of colors refer to Maerz and Paul, 1950.

TABLE 1. DISTRIBUTION BY SAMPLE AREA AND SEX OF SPECIMENS OF *Eumeces egregius* USED IN THIS STUDY. (See figure 2.)

Sample area designation	No. males	No. females	Number sex undeter.	Sample area designation	No. males	No. females	Number sex undeter.
1	3	5		17	11	10	6
2	8	5		18	6	8	
3	1	1	2	19	4	2	1
4	2	5		20	1	3	
5	2	2		21	9	6	
6	3	1		22	6	3	
7	2	5		23	3	2	
8	3	1		24	3	4	1
9	9	10		25	10	6	
10	2	3		26	8	10	5
11	4	4		27	4	2	
12	12	7	1	28		3	
13	8	10		29	2	2	
14	7	3		30	5	2	1
15	20	36		31	33	18	5
16	117	89	1				

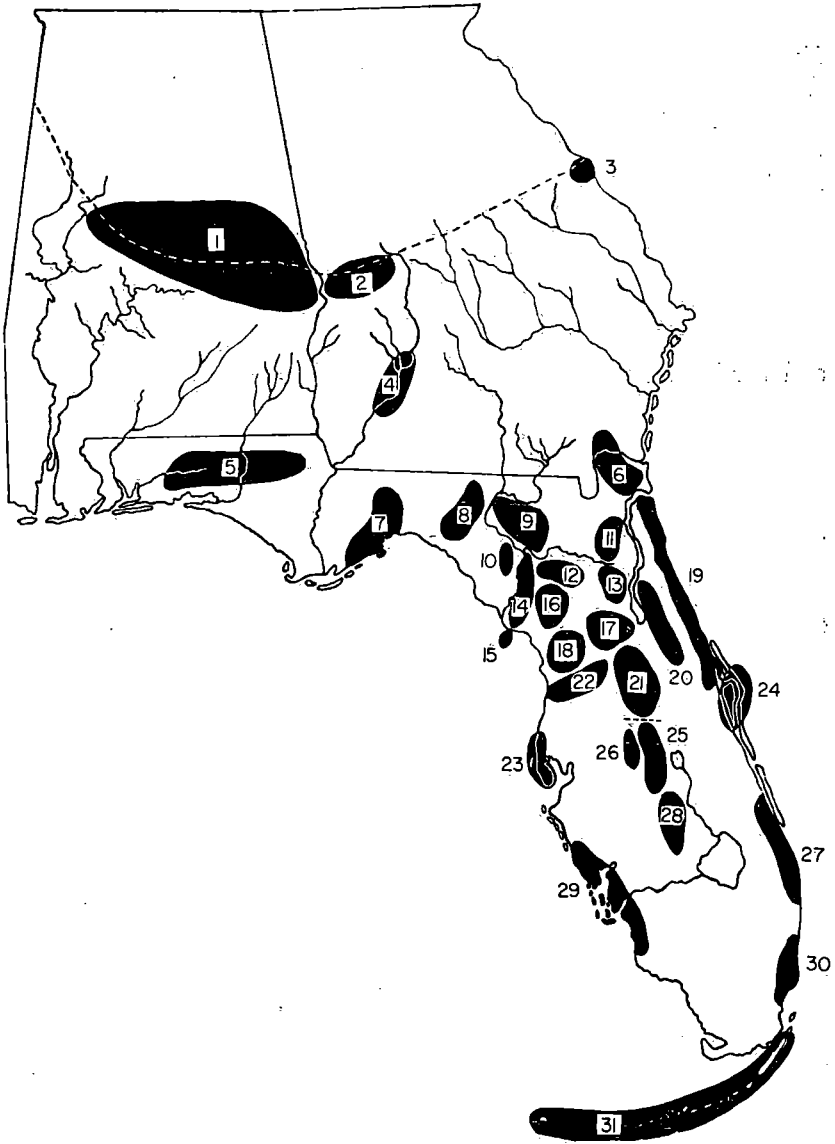


Figure 2. Location of sample areas used in this study. Blackened portions represent areas from which samples of *Eumeces egregius* were taken.

TAXONOMIC HISTORY

McConkey (1957) aptly characterized the taxonomic history of *Eumeces egregius* as one of vacillation and uncertainty. Baird's (1858) description was based on specimens collected on Indian Key, Monroe County, Florida, by G. Wurdemann. Cope (1871) described as a closely related species *Plistodon* (= *Eumeces*) *onocrepis* from a single specimen collected at "Dummet's Plantation, Florida," but in 1900 he placed *onocrepis* in the synonymy of *E. egregius* without comment.

Taylor (1935) recognized *onocrepis* as a subspecies and assigned to it all specimens from peninsular Florida north of the Florida Keys. To the subspecies *egregius* he assigned not only those specimens from the Keys, but also a group from an area in extreme northern Florida and southeastern Georgia, which constituted the northernmost part of the known range. As Carr (1940) could find no evidence of intergradation between *onocrepis* and *egregius*, he considered them separate species. Smith (1946), while agreeing with Carr, questioned whether the northern lizards were the same as those on the Keys. Schmidt (1953) listed *onocrepis* as a subspecies of *E. egregius*.

In the most recent study of the problem, McConkey (1957) concurred in Schmidt's decision but considered the "northern population" of skinks sufficiently distinct from the far-removed "southern population" (*E. e. egregius*) to warrant subspecific recognition. For this northern group he proposed the name *E. e. similis*.

GEOGRAPHIC RANGE

The range of *Eumeces egregius* includes Florida and the Coastal Plain of Georgia and Alabama west to the Black Warrior and Tombigbee rivers. On the mainland portion of its range *E. egregius* is restricted chiefly to sandy, well-drained soils of the type that usually supports sandhill, scrub, or xeric hammock vegetational associations (Laessle, 1942; Mount, 1963). On islands it is found occasionally under tidal wrack along the beaches and under rocks and debris. Only once has it been reported well outside the Coastal Plain in Randolph County, Alabama (Mecham, 1960).

E. egregius has been collected in the following counties (literature records undocumented by available specimens are followed by citations):

ALABAMA: Baldwin (Kauffeld, 1941), Bibb, Hale, Randolph, and Russell; James Boyles informs me he collected specimens in Tuscaloosa County, which Conant (1958) indicated on his range map.

FLORIDA: Alachua, Brevard, Broward, Citrus, Clay, Collier, Co-

lumbia, Dade, Dixie, Duval, Franklin, Gilchrist, Hernando, Highlands, Jackson, Lafayette, Lake, Leon, Levy, Madison, Marion, Martin, Monroe, Nassau, Okaloosa, Orange, Palm Beach, Pasco, Pinellas, Sumter, Suwannee, Taylor, Volusia, and Wakulla.

GEORGIA: Baker, Burke (Neill, 1948), Charlton, Chattahoochee, Irwin, Lee, Marion, Mitchell, Richmond, Stewart, Talbot, Taylor, and Toombs (Janson, 1954).

SEXUAL DIMORPHISM

Sexual differences in these skinks are numerous. Females tend to exceed males of the same populations in growth rate (Mount, 1963) and in maximum size attained (fig. 3). Among skinks 45 mm snout-vent length and larger, evidence (significant at the 5 per cent level) shows females tend to have a relatively longer trunk (axilla to groin) and shorter head (measured from tip of snout to hind edge of interparietal scale) than males. These differences do not occur in the smaller size classes (figs. 4 and 5).

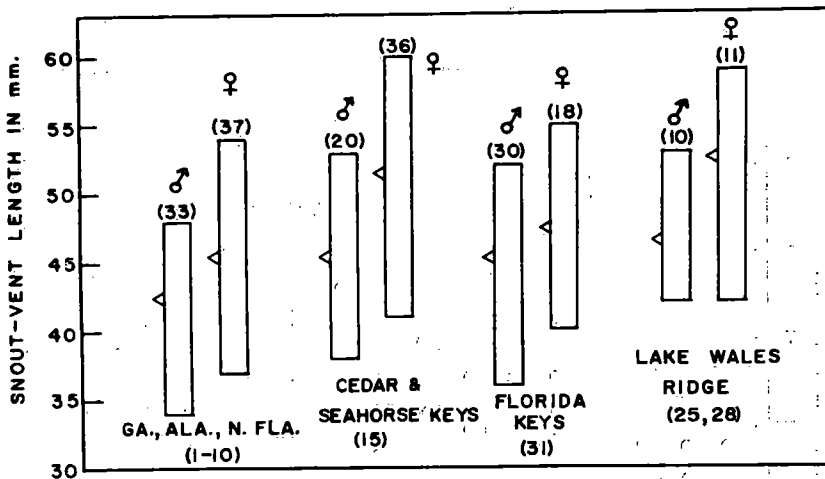


Figure 3. Extent of sexual and geographic variation in adult size, in *Euromeces egregius*. Bars indicate range in size, triangle apices the means. Numbers in parentheses above bars show number of specimens in each group. Numbers at bottom indicate sample areas as delimited in fig. 2.

Head and body proportions also show the ontogenetic differences characteristic of other lizards; as snout-vent length increases, relative trunk length increases while relative head length decreases.

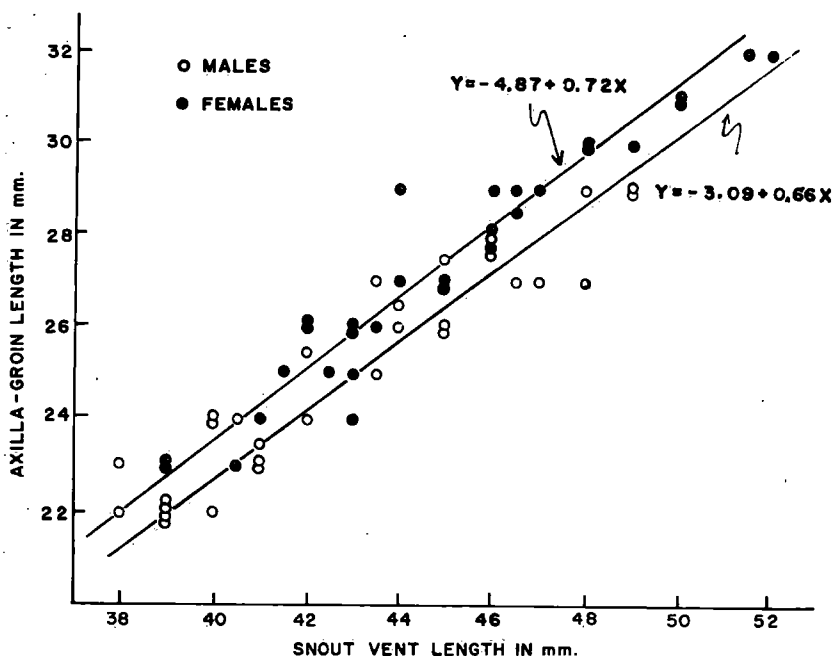


Figure 4. Sexual dimorphism in relative trunk length (axilla to groin) in *Eumeces egregius*. Data are plotted for 30 males and 30 females randomly selected from a large series of specimens from Levy County, Florida (sample area 16 in fig. 2).

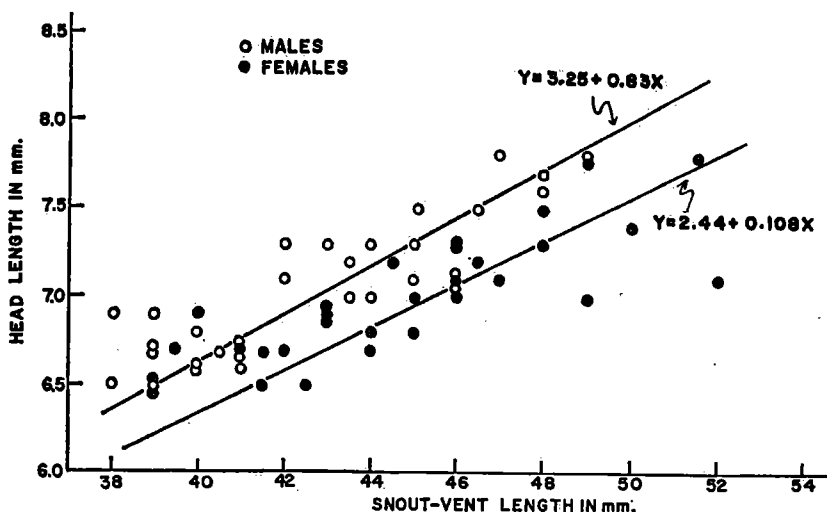


Figure 5. Sexual dimorphism in relative head length in *Eumeces egregius*. Data are plotted for 30 males and 30 females randomly selected from a large series of specimens from Levy County, Florida (sample area 16 in fig. 2).

The mean numbers of both midventral scales and presacral vertebrae are significantly greater (1 per cent level) for females. Midventral scale number for a sample of 30 Levy County females ranges from 56 to 63 (mean 59.2), while the number for 30 males ranges from 53 to 62 (mean 57.4). The mean number of presacral vertebrae in a sample of 27 Levy County females is 32.5, with 14 specimens having 32 and 13 having 33. For 27 Levy County males the mean is 31.9, with 5 having 31, 21 having 32, and 1 having 33.

During the mating season mature males may be recognized by the reddish-orange, orange, or yellow suffusion that appears on the lips, sides of the neck, on the lower sides of the body, and occasionally on the venter. Some males show traces of this coloration throughout the year (Mount, 1963).

GEOGRAPHIC VARIATION

Eumeces egregius varies geographically in the following characters: (1) tail color; (2) ground color of body in hatchlings; nature of the (3) dorsolateral and (4) lateral light striping; (5) relative head and body proportions; (6) size attained by adults; (7) growth rate; (8) age at which sexual maturity is reached; and in number of (9) supralabial scales, (10) scale rows at midbody, (11) midventral scales, and (12) presacral vertebrae. Variation among these characters is remarkably concordant, owing perhaps to the species' relatively sedentary nature.

TAIL COLOR

Tail color in *Eumeces egregius* in life varies from bright blue (33L11) through various shades of lavender and pink to bright red (2L6), and from yellowish orange (2A12) to brown (7L12) and maroon (7A6). Occasionally the tail is nearly flesh color (1B9).

The pattern of geographic variation in this character is most evident in skinks under 45 mm in snout-vent length that have retained the original tail, and any unqualified reference to tail color pertains to such individuals. On the Lake Wales Ridge in Florida south of the line between Lake and Polk counties (sample areas 25 and 28), the distal three-fourths to four-fifths of the tail is bright blue (33L11) (fig. 6). The basal portion is usually brown (6J10) or dull orange (5J12). The transition from basal to distal color is abrupt with virtually no blending.

Northward into Lake County underlying light reddish orange (3J12) pigments become discernible, giving rise to violet or lavender tail colors (41L9). Similar colors obtain in the tails of skinks inhabit-

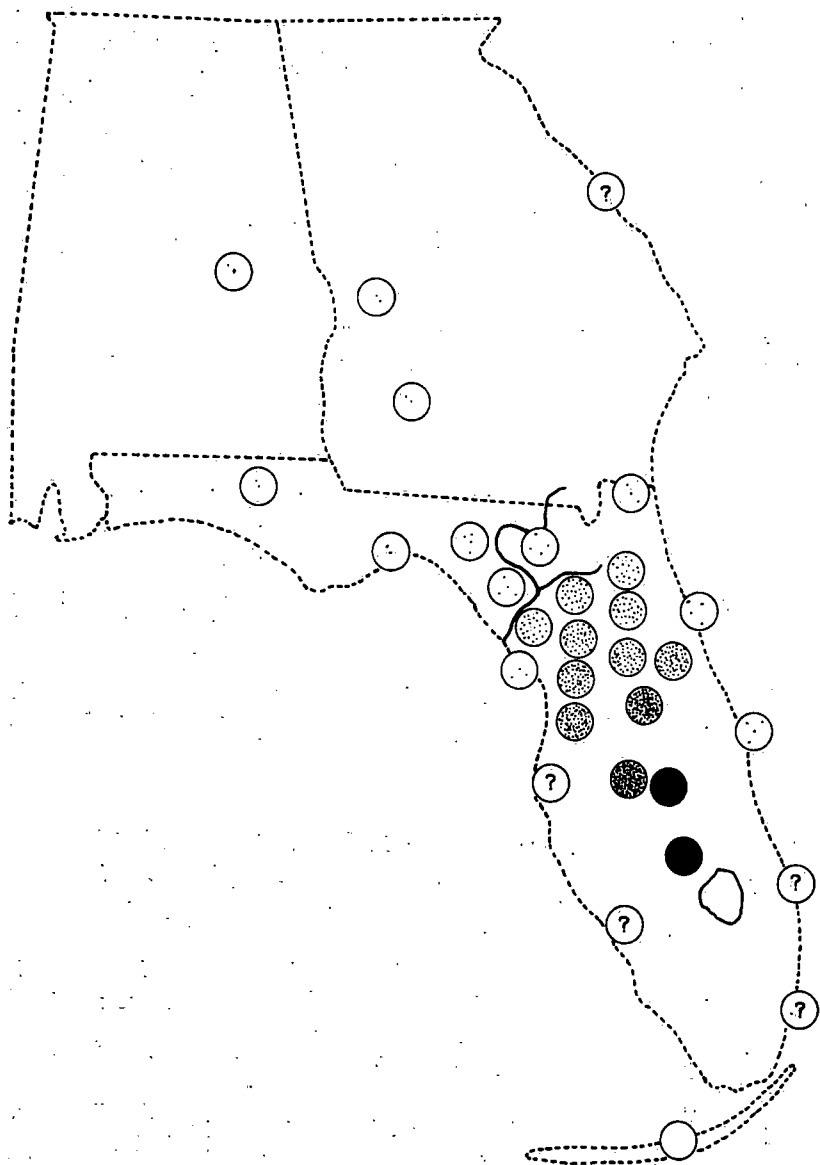


Figure 6. Geographic variation in one aspect of tail color in *Eumeces egregius*. Circles represent samples from areas delimited in fig. 2. The degree of stippling within each circle represents the average intensity of blueness in the original tails of young lizards from the sample area.

ing a portion of the Bartow Ridge around Winter Haven in central Polk County (sample area 26). This ridge is separated from the Lake Wales Ridge to the east by a lowland drainage area 3 to 4 miles wide at the narrowest place.

Northward from Lake County through the interior of the state, tail colors of lavender and violet give way to various shades of pink (such as 41J12), which predominate in lizards inhabiting Marion, Citrus, Levy, Alachua, Putnam, and most other counties of northern central Florida (sample areas 11, 12, 13, 14, 16, 17, 18, and 22). The tail in these skinks shows only traces of blue.

North and west of the Suwannee River and north of the Santa Fe River (sample areas 1 through 10), the tail color is red, orange, or reddish orange. Tail color in skinks from the eastern coastal area of Florida from Merritt Island in Brevard County northward to the St. Johns River in Duval County (sample areas 19 and 24) is predominantly pink with a slight bluish tint. I was unable to secure living specimens of less than 45 mm snout-vent length from the lower eastern coastal area. In a series of large skinks from Martin County, Florida (sample area 29) the tails were orange brown.

In large skinks collected on Key West and Stock Island, Monroe County, Florida (sample area 31), the tail was red or brownish red in life. In a small skink seen but not collected on Key Largo, Monroe County, the tail was bright red.

I was unable to secure live material from the southwestern coastal area (sample area 29). In central western Florida (sample areas 22 and 23) tail color varies from brownish and orange to pink, but shows definite traces of blue.

On Cedar and Seahorse keys (sample area 15), small islands lying just off the west coast in Levy County, Florida, tail color varies from dull, dark orange (15C12) to maroon (7J6).

In lizards over 45 mm snout-vent length and in those with regenerating tails, individual variation in tail color is great and relationships are obscured. On the Lake Wales Ridge the color varies from dull blue to salmon pink, the latter color predominating in the regenerating tails of the largest lizards. In other parts of the range individual variation in the large lizards ranges chiefly from pale pink to orange or brownish. In almost every case the newly regenerated portion of the tail is lighter than the original.

GROUND COLOR OF BODY

Ground color varies from light gray to dark gray, greenish gray, or dark brown. The skinks tend to become lighter with age, this

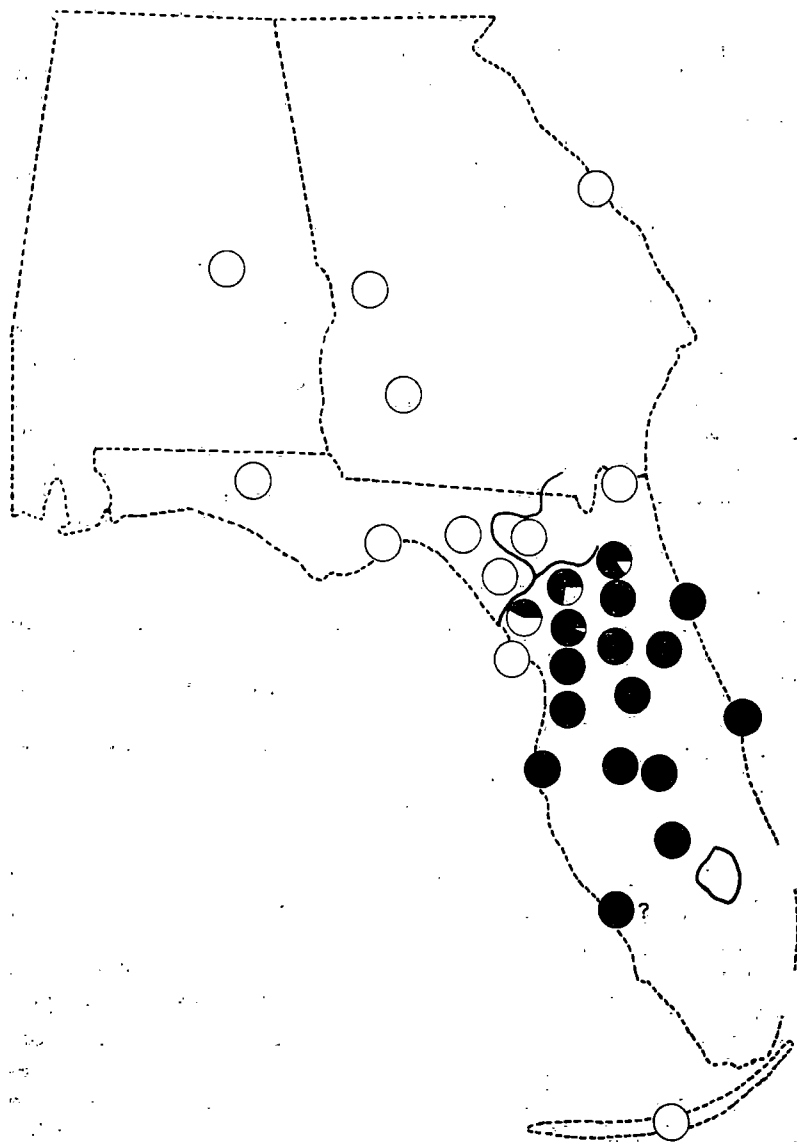


Figure 7. Geographic variation in one aspect of dorsolateral light striping in *Eumeces egregius*. Circles represent samples from areas delimited in fig. 2. Blackened portions of the circles indicate the percentage of individuals having stripes which widen and/or diverge as opposed to those with non-widening and non-diverging stripes.

tendency being especially pronounced in females: Newly hatched skinks from Cedar and Seahorse keys, Levy County, Florida are blackish in life and much darker than any other hatchlings I examined. In mature male skinks from Key West and Stock Island, Monroe County, Florida, the entire venter is often suffused with orange or reddish orange. In males from other areas this coloration is usually confined to the sides, neck, and lips. I noted no other significant variation in ground color. The palest mature skinks encountered were from hilltops around Archer in Levy County, Florida; the darkest were from a scrub in Martin County, Florida.

DORSOLATERAL LIGHT STRIPING

In systematic works on *Eumeces egregius* the extremely variable dorsolateral light striping has been the most widely used taxonomic character. Originating on the supraoculars, the two stripes may be continuous onto the base of the tail or may disappear on the neck or body. They may be prominent throughout their length, or they may become indistinct or disappear caudad; they are never most prominent caudad.

In some skinks the stripes are confined to the second scale row on each side; in others they diverge onto the third row. Divergence may be abrupt or gradual and may occur at the level of the neck or as far back as midbody. In still others the stripes merely widen and come to occupy both the second and third rows.

In skinks inhabiting areas north and west of the Suwannee-Santa Fe river system, the dorsolaterals are invariably confined to the second row (fig. 7). In the eastern and southeastern portions of this area (sample areas 3, 4, 6, 7, 8, 9, and 10), the skinks have vivid, non-widening and non-diverging dorsolateral stripes which are conspicuous to the tail (fig. 8A). Westward and northward (sample areas 1, 2, and 5), the stripes are generally less prominent, and in about one-half of the individuals they disappear before reaching the tail.

Non-widening and non-diverging stripes also characterize the skinks on Cedar and Seahorse keys. In these animals, the stripes are somewhat indistinct and in many they fail to reach the tail (fig. 8B). In the feature they resemble lizards from sample areas 1, 2, and 5.

In Florida Keys skinks the stripes are non-widening and non-diverging. They are usually conspicuous cephalad, but in about one-half of the individuals they fade rapidly and disappear on the body (fig. 8C).

Skinks from the Lake Wales Ridge have stripes that widen in the neck region to include the third scale row on each side and continue

as wide stripes to a point just behind the shoulders. Past this point the stripes gradually fade out on the second row, and by midbody they occupy the third row exclusively. The stripes become obscure caudad but clearly reach the tail in about 90 per cent of the individuals (fig. 8D).

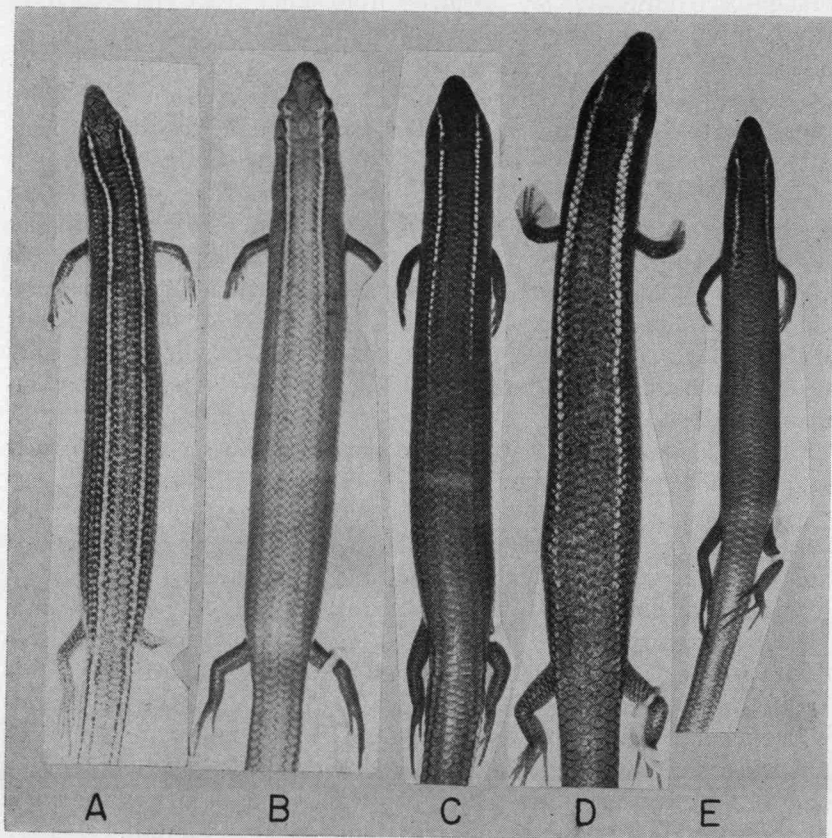


Figure 8. Geographic variation in dorsolateral light striping in *Eumeces egregius*. (A) *E. e. similis*, UF 12656.4, Suwannee County, Florida. (B) *E. e. insularis*, UF 12598.8, Cedar Key Airstrip, Levy County, Florida. (C) *E. e. egregius*, UF 12629.2, Monroe County, Florida. (D) *E. e. lividus*, UF 12647.1, Polk County, Florida. (E) *E. e. onocrepis*, UF 12628.5, Martin County, Florida. (See text for explanation.)

In the lower eastern coastal region (sample areas 27 and 30), skinks have diverging stripes that tend to be greatly abbreviated (fig. 8E). Small, dark specimens from this area could at a distance of several feet be easily mistaken for *Lygosoma laterale*.

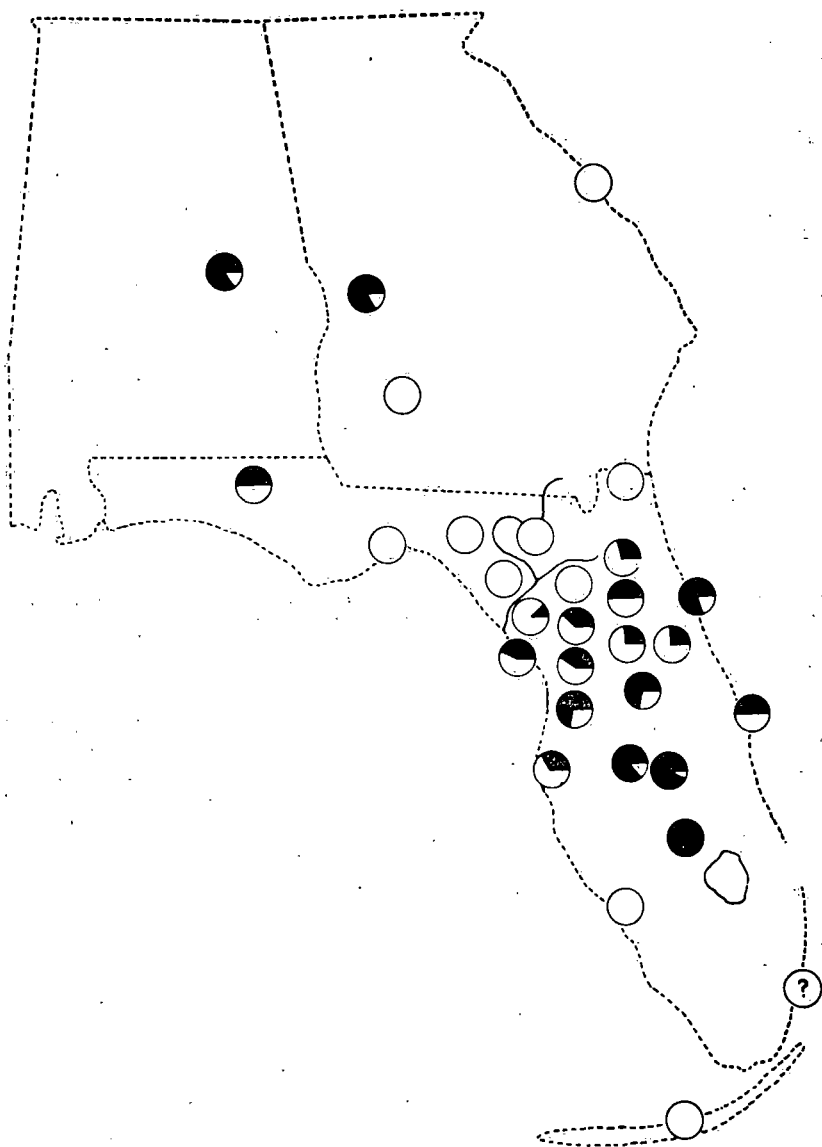


Figure 9. Geographic variation in lateral light body striping in *Eumeces egregius*. Circles represent samples from areas as delimited in fig. 2. Blackened areas within circles indicate percentages of individuals lacking stripes.

In the remainder of the range individual variation is extensive with many patterns of widening and diverging stripes represented. A clinal effect is apparent through the interior portion of peninsular Florida north of Polk County.

LATERAL LIGHT STRIPING

The supralabial scales of *Eumeces egregius* are typically light colored. In most individuals the light coloration extends onto the sides of the neck in the form of stripes. These stripes, occupying the fifth scale row on each side, may end on the neck or extend onto the body, in which case they usually continue to the groin.

McConkey (1957) and others noted that in specimens from the northern populations and in those from the Florida Keys, the lateral light stripes are usually continuous, while in those from the intervening area the stripes are usually abbreviated. Geographic variation in this character, as indicated by specimens examined during the present study, is shown in fig. 9.

NUMBER OF SUPRALABIAL SCALES

Eumeces egregius has either 6 or 7 supralabial scales on each side. Fig. 10 shows the geographic variation in this character.

NUMBER OF SCALE ROWS AT MIDBODY

The number of scale rows at midbody in *Eumeces egregius* ranges from 18 to 24, the majority of individuals having either 20 or 22 (fig. 11). The Florida Keys group is apparently the only one in which a majority of the individuals have 22 or more. McConkey (1957) used this character to separate these lizards (*E. e. egregius*) from those of the northern populations (*E. e. similis*). He examined 30 specimens from the Florida Keys and was able to separate 70 per cent from all 11 he examined of the northern populations. I examined 53 from the Keys and could separate 60 per cent from 90 per cent of the 76 specimens I had of *similis*.

RELATIVE HEAD AND BODY PROPORTIONS AND NUMBER OF MIDVENTRAL SCALES AND PRESACRAL VERTEBRAE

While the relatively small number of specimens in many samples and the marked sexual dimorphism make it difficult to analyze the geographic variation in these characters, certain conclusions can be drawn. Relative head length (see section on sexual dimorphism) tends to be largest in skinks from the Lake Wales Ridge and surrounding areas. The value of this ratio is smallest in those from Alabama,

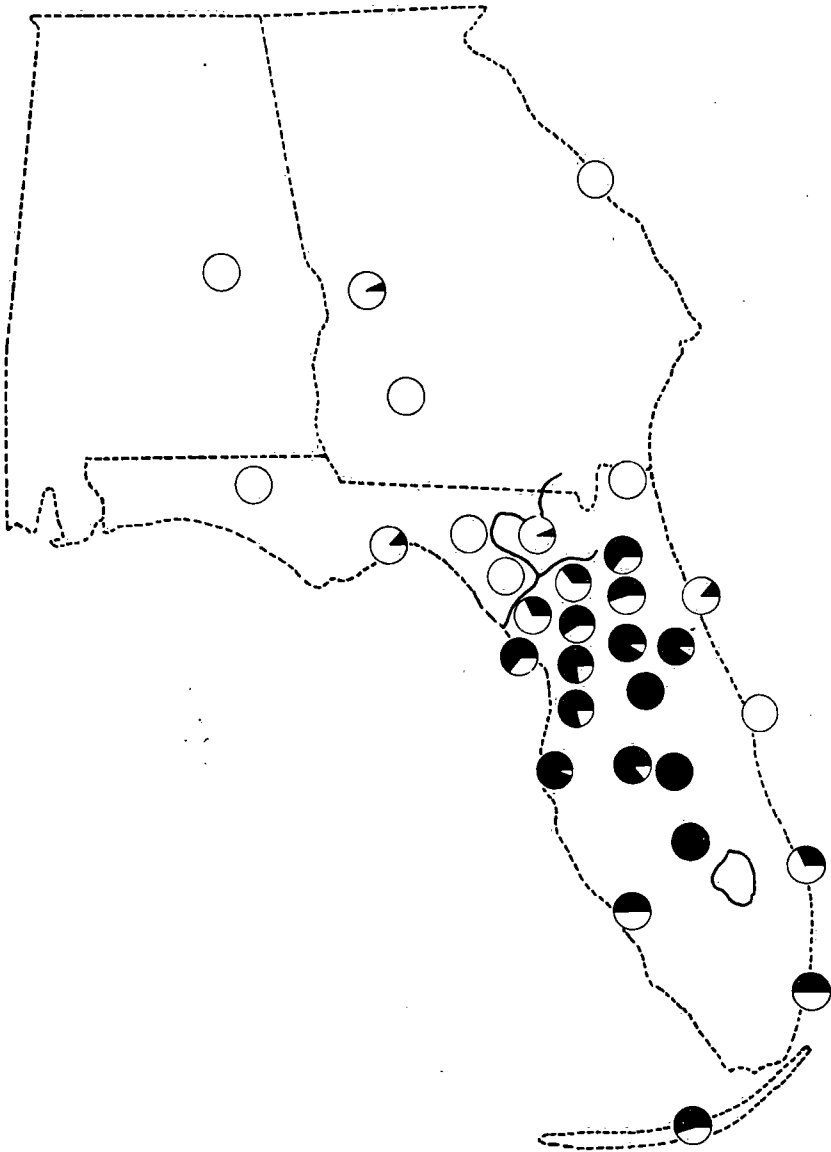


Figure 10. Geographic variation in number of supralabial scales in *Eumeces egregius*. Circles represent samples from areas in fig. 2. Blackened areas within circles indicate percentages of individuals having 7 scales; white portions those having 6.

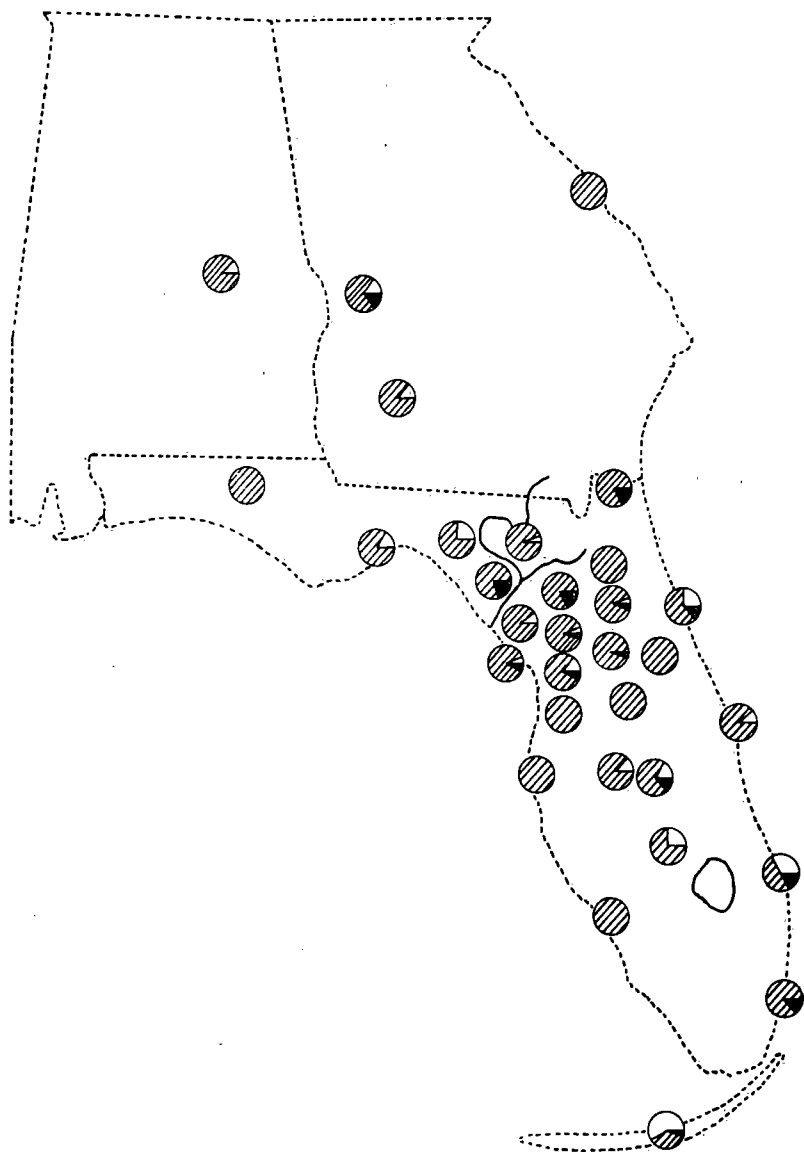


Figure 11. Geographic variation in number of scale rows at midbody in *Eumeces egregius*. Circles represent samples from areas as delimited in fig. 2. Blackened areas within circles indicate percentages of individuals having 19 or less, hatched areas those having 20 or 21, and white areas those having 22 or more.

Georgia, northern Florida, and from Cedar and Seahorse keys. This variation is most evident in females (figs. 12 and 13). A reverse pattern obtains for variation in relative trunk length (axilla-groin length/snout-vent length). Geographic variation in number of presacral vertebrae and midventral scales appears to be concordant with variation in relative trunk length (figs. 14 and 15).

SIZE AND RATE OF GROWTH AND DEVELOPMENT

I reported on these aspects of geographic variation in *Eumeces egregius* in an earlier paper (1963). Generally, the largest individuals occur on the Lake Wales Ridge and on Cedar and Seahorse keys, the smallest in the northern portions of the range. Other populations are intermediate in this respect (fig. 3). Under laboratory conditions the greatest rate of growth and development was shown by young skinks of Lake Wales Ridge parentage, which attained sexual maturity at ages ranging from 124 to 148 days. Those of Georgia and Alabama parents grew more slowly and attained sexual maturity during the second year. No data were available on the Florida Keys skinks. The data indicated that other populations were intermediate in rate of growth and development.

SUMMARY OF GEOGRAPHIC VARIATION

On the Lake Wales Ridge south of Lake County (sample areas 25 and 28), *Eumeces egregius* is characterized by its blue tail (in young), widening and diverging dorsolateral light stripes, large size, 7 supralabial scales, relatively long head, relatively short trunk, relatively low number of midventral scales and presacral vertebrae, and by the absence or near absence of lateral light stripes on the body. Phenotypic homogeneity in this population appears greater than in most others.

Contrasting with this group is a group of populations living north and west of the Suwannee and Santa Fe rivers (sample areas 1 through 10). In these the tail is red in the young, the dorsolateral stripes neither widen nor diverge, adult size is small, the supralabials number 6, the trunk is relatively long, the head relatively short, and the midventral scale and presacral vertebrae counts are high. Within this region skinks from sample areas 3, 4, 6, 7, 8, 9, and 10 have lateral and dorsolateral stripes that extend to the groin and tail, respectively, and are conspicuous throughout their length. In those from areas 1, 2, and 5 the dorsolaterals are less prominent and may fade out before reaching the tail, and the laterals are indistinct or absent.

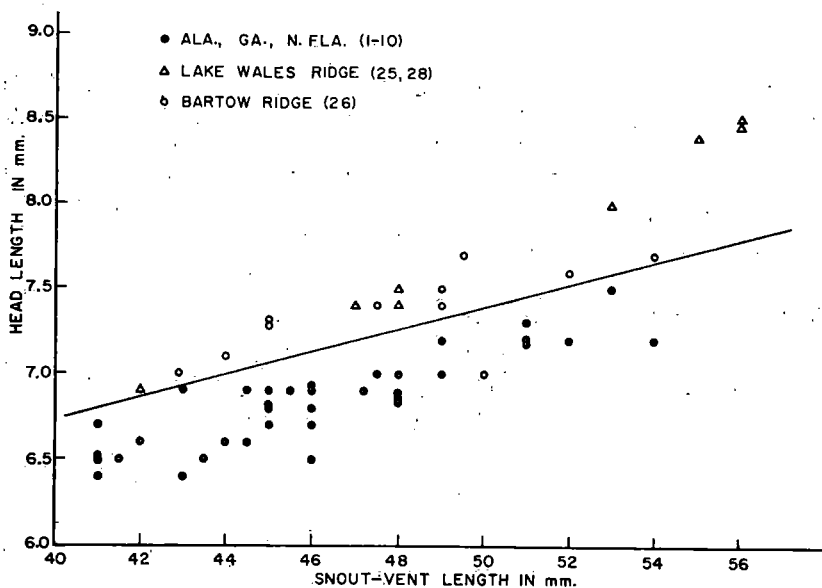


Figure 12. Comparison of relative head length in three groups of female *Eumeces egregius*. Numbers in parentheses indicate sample areas as delimited in fig. 2. Line separates 95 per cent of the two central Floridian groups from 100 per cent of the northern group. (See text for further elaboration.)

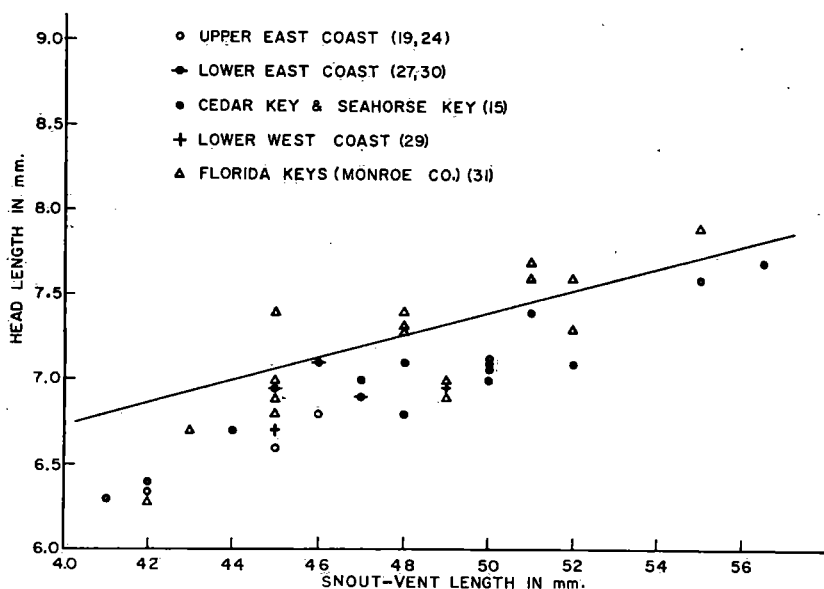


Figure 13. Comparison of relative head length in five groups of female *Eumeces egregius*. Numbers in parentheses indicate sample areas as delimited in fig. 2. The line is in the same relative position as that in fig. 12.

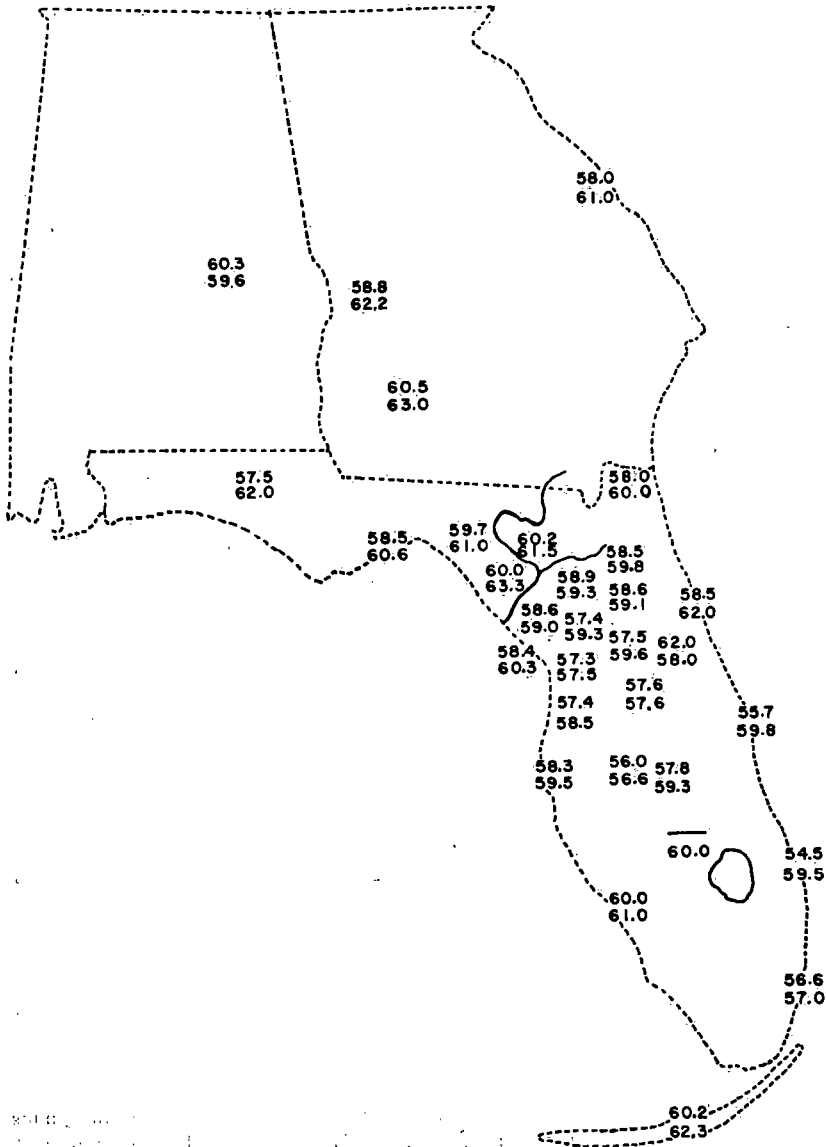


Figure 14. Geographic variation in midventral scale number in *Eumeces egregius*. The upper number is the mean for males within each sample; the lower is the mean for females.

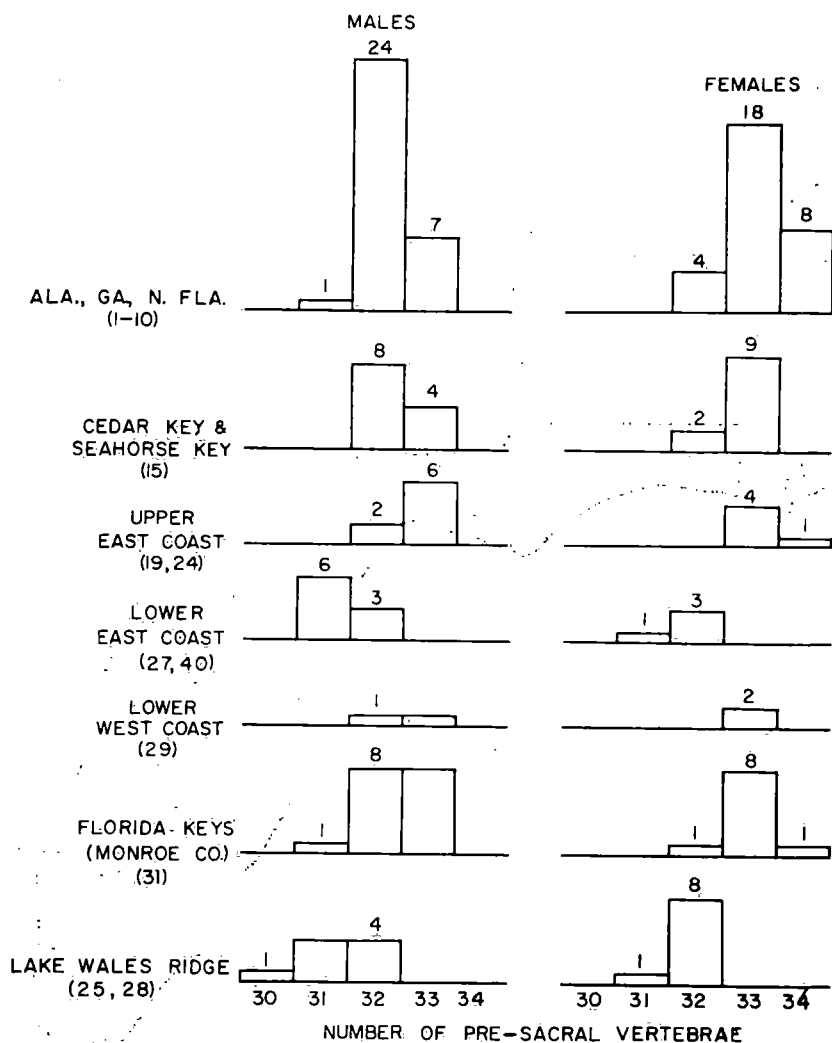


Figure 15. Variation in number of pre-sacral vertebrae among several groups of *Eumeces egregius*. The height of each bar is proportional to the number of individuals in the corresponding class. The numbers in parentheses indicate sample areas as delimited in fig. 2.

In *E. egregius* from the area of northern central Florida between the northern end of the Lake Wales Ridge (Lake-Polk county line) and the Suwannee and Santa Fe rivers, north to south clinal variation clearly obtains in all characters. In the remainder of Florida, except for the Florida Keys and Cedar and Seahorse keys, most individuals are intermediate in one or more features, and geographic variation appears discordant. Well-preserved material from some areas is scarce, particularly from the lower coastal regions of the Florida mainland.

Skins from the Florida Keys (sample area 31) resemble those of some of the northern populations in having non-widening and non-diverging dorsolateral light stripes, conspicuous lateral stripes, a red tail, a relatively long trunk, relatively high midventral and presacral vertebrae counts, and relatively small size. The Keys populations are intermediate in relative head length. The Florida Keys are the only portion of the range in which a majority of individuals have 22 or more scale rows at midbody.

In *E. egregius* from Cedar and Seahorse keys (sample area 15), the dorsolaterals are typically inconspicuous and neither widen nor diverge. On about one-half the individuals they fail to reach the tail. The tail color varies from dull orange to reddish brown. The head is relatively short and the trunk relatively long. The midventral scale and presacral vertebrae counts are high. In most of these characteristics these skinks resemble those from sample areas 1, 2, and 5. In size they resemble the Lake Wales Ridge group. In lateral striping and in number of supralabial scales they are intermediate. The hatchlings of this population in life are dark gray, almost black, and are apparently darker than those of any other population.

EVOLUTION AND ZOOGEOGRAPHY

A central Floridian blue-tailed population of *Eumeces egregius* intergrading through northern central Florida with a northern red-tailed race apparently provided the basis for the development of the existing pattern of geographic variation in the species. The northern race is represented today by populations living north and west of the Suwannee-Santa Fe river system, and the blue-tailed race is confined to the lower end of the Lake Wales Ridge. Presumably the differences between these two groups stemmed from a period of separation during the Pleistocene, the Lake Wales Ridge population representing the insular stock. Variational patterns with similar bases are not uncommon among southeastern animal species (see Neill 1957,

and McCrone 1963). Significantly, the highest elevations in peninsular Florida are associated with the Lake Wales Ridge.

Separation probably occurred during the first interglacial stage and was not re-established until the most recent glacial. Had gene flow been re-established earlier, it seems doubtful that the blue-tailed race would have retained its characteristic homogeneity. Apparently the Suwannee and Santa Fe rivers, or their predecessors, acted as barriers. Today a relatively narrow ridge in eastern Florida between the Santa Fe and St. Johns river drainages provides the only avenue of free genetic interchange between peninsular populations and those to the north.

The evolutionary status of the Lake Wales Ridge population is not precisely clear. Perhaps it is a relict, and the blue tail and relatively short body are indicative of the phenotype of the ancestral stock. This is certainly the most logical conclusion if we assume that the prototype was indeed a generalized skink.

The circumstances surrounding the colonization of the Florida Keys and of Cedar and Seahorse keys likewise remain a mystery. The skinks from these two areas have much in common with the northern populations. McConkey (1957) believed, with good reason, that the Florida Keys race is of northern ancestry. On the other hand, both groups have some characteristics suggesting intergradient pedigrees. It is of course possible that the similarities between these insular populations and the Lake Wales Ridge group arose through convergence. This is plausible if one accepts the idea that the Ridge group itself developed under insular conditions. McConkey proposed that the lowland drainage areas of eastern Florida provided an access route to the Florida Keys. I consider it more plausible that the eastern coastal ridge served this purpose. I found no evidence of any intergradation between the mainland populations and those on either the Florida Keys or on Cedar and Seahorse keys.

All the mainland populations of peninsular Florida, as well as that on Merritt Island, appear to be intergrades, or derivatives therefrom, between the Ridge group and the northern group.

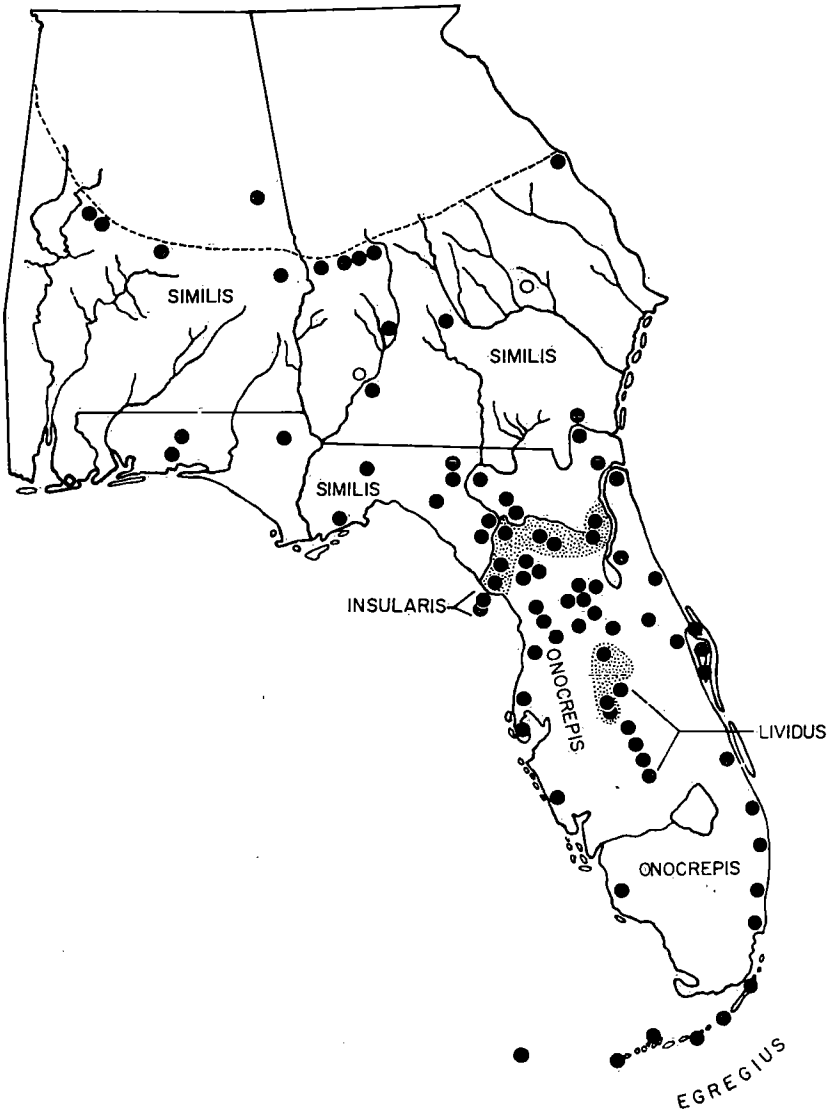


Figure 16. Distribution of the subspecies of *Eumeces egregius*. Stippling indicates zones of intergradation. (See text for further elaboration.)

TAXONOMY

Eumeces egregius egregius (Baird)

Plistodon egregius: Baird, 1858: 256.

Eumeces egregius: Cope, 1875: 45 (part).

Eumeces egregius egregius: Taylor, 1935: 490.

SYNTYPES. USNM 3127, two specimens, both apparently males, Indian Key, Monroe County, Florida, collected by G. Wurdemann.

DIAGNOSIS. A subspecies of *E. egregius* in which approximately 60 per cent of the individuals have 22 or more scale rows at mid-body and in which the reddish-orange or orange suffusion in sexually mature males frequently extends downward to occupy some or all of the venter.

RANGE. Monroe County, Florida. It is known from Dry Tortugas and the following Florida Keys: Key West, Stock Island, Upper Matecumbe, Big Pine, Indian, and Key Largo.

Eumeces egregius onocrepis (Cope)

Plistodon onocrepis Cope, 1871: 82.

Eumeces onocrepis: Cope, 1875: 45.

Eumeces egregius: Cope, 1900: 655 (part).

Eumeces egregius onocrepis: Taylor, 1935: 497.

HOLOTYPE. Apparently the type is lost. C. J. Maynard collected it at "Dummet's [Dummett's] Plantation", which Stejneger and Barbour (1939: 90) believed to be the famous Dummett's Grove, near Allenhurst on Merritt Island, Brevard County, Florida. Specimens collected in this vicinity are in general agreement with Cope's description. In view of this and of Taylor's (1935) excellent description, it seems unnecessary to designate and describe a neotype.

DIAGNOSIS. A variable race of *Eumeces egregius* characterized by having a brown, red, orange, yellow, pinkish, or lavender tail in conjunction with dorsolateral light stripes that widen or diverge or both.

RANGE. Mainland peninsular Florida south of Alachua and Putnam counties except for that portion of the Lake Wales Ridge in Polk and Highlands counties. It also occurs on Merritt Island, Brevard County, Florida.

REMARKS. All populations of this group are apparently derived from intergrades between *E. e. similis* and *E. e. lividus*.

Eumeces egregius similis McConkey

Eumeces egregius egregius Taylor, 1935: 490 (part).

Eumeces egregius similis: McConkey, 1957: 17.

HOLOTYPE. UF 7647, a female from the northwestern outskirts of Augusta, Richmond County, Georgia, collected 29 March 1939 by Wilfred T. Neill. McConkey's description of the type is adequate.

DIAGNOSIS. A race of *Eumeces egregius* having a reddish orange, reddish brown, or orange tail, dorsolateral light stripes that neither widen nor diverge, 21 or fewer scale rows at midbody (usually), 6 supralabial scales on each side, and one in which the hatchlings have easily discernible markings on the dorsum.

RANGE. Florida north and west of the Suwannee and Santa Fe rivers, and the Coastal Plain and possibly adjacent provinces of Georgia and Alabama west to the Tombigbee and Black Warrior rivers.

REMARKS. Specimens of *E. e. similis* from the eastern and southeastern portions of the range have dorsolateral stripes that are continuous to the tail. In the relatively small number of specimens available from the western and southwestern portions of the range, the stripes tend to be abbreviated. While future studies may justify a taxonomic splitting of these two groups, I feel such action is unwarranted at present.

Eumeces egregius lividus new subspecies

HOLOTYPE. UF 12642.1, an adult female from the east side of U. S. Hwy. 27, 5.2 miles N Avon Park, Polk County, Florida, collected 27 February 1960 by R. H. Mount.

DIAGNOSIS. A subspecies of *Eumeces egregius* having a bright blue tail in the young and in some adults, widening and diverging dorsolateral light stripes, and 7 supralabial scales on each side.

RANGE. Limited to the Lake Wales Ridge in Polk and Highlands counties, Florida.

DESCRIPTION OF HOLOTYPE. The following is based on the preserved specimen: Snout-vent length is 55 mm. The tail is complete and measures 92 mm. From axilla to groin is 34 mm. From the tip of the snout to the posterior edge of the interparietal scale is 8.4 mm. The specimen has 7 supralabials and 5 infralabials on each side, 57 midventral scales from throat to anal plate, and 21 scale rows at midbody. The ground color of the dorsum is gray with a greenish cast (31E6). The dorsolateral light stripes widen just behind the head and occupy the second and third scale rows back to a point just behind the shoul-

ders. From that point they occupy the third scale rows exclusively and extend to the tail, becoming progressively less distinct caudad. Lateral light stripes are absent. The distal two-thirds of the tail is pale blue (33A7) dorsally with many scattered whitish and tan flecks. The basal portion of the tail is tan (15E6). The posterior portion of the dorsum has two narrow transverse scars. The alimentary tract has been removed through an opening in the venter.

REMARKS. Unfortunately, most of the habitat of this unusual race is rapidly being destroyed by encroaching real estate developments and citrus orchards. Certainly no more than 50,000 acres of suitable habitat remain, probably much less.

Eumeces egregius insularis new subspecies

HOLOTYPE. UF 12598.4, an adult female from Cedar Key Airstrip, Levy County, Florida, collected 8 April 1960 by R. H. Mount.

DIAGNOSIS. A subspecies of *Eumeces egregius* having inconspicuous dorsolateral light stripes which neither widen nor diverge, 21 or fewer scale rows at mid-body, large body size, and in which the hatchlings in life are almost black in color.

RANGE. Known only from Cedar Key Airstrip, Cedar Key, and from nearby Seahorse Key, Levy County, Florida.

DESCRIPTION OF HOLOTYPE. The following is based on the preserved specimen. Snout-vent length is 53 mm. The tail is complete and measures 83 mm in length. From the tip of the snout to the hind edge of the interparietal scale is 7.1 mm. The specimen has 7 supralabial and 5 infralabial scales on each side, 62 midventral scales from throat to anal plate, and 20 scale rows at midbody. The ground color is grayish tan (15A12). The dorsolateral light stripes are narrow and inconspicuous, they neither widen nor diverge, and they terminate before reaching midbody. There are no lateral stripes. The tail is light orange-brown (15H8) and is faintly marked with narrow dark longitudinal stripes. The alimentary tract has been removed through an opening in the venter.

REMARKS. Many specimens of this race are practically indistinguishable from some western representatives of *E. e. similis*. With hatchlings this difficulty should not arise. I found no evidence of intergradation between *insularis* and mainland *E. egregius*.

COMMON NAMES

The currently accepted common name "red-tailed skink" no longer seems appropriate for *Eumeces egregius* in view of the existence of

a blue-tailed race. Therefore, I propose that *E. egregius* hereinafter be called the "mole skink." I further propose that *E. e. egregius* be called the "Florida Keys Mole skink," *E. e. onocrepis* be called the "peninsula mole skink," *E. e. similis* be called the "northern mole skink," *E. e. lividus* be called the "blue-tailed mole skink," and *E. e. insularis* be called the "Cedar Key mole skink."

KEY TO THE SUBSPECIES OF *Eumeces egregius*

(For distribution of each form see fig. 16).

1. Distal three-fourths to four-fifths of the original tail bright blue in life in individuals up to 45 mm snout-vent length.....
E. e. lividus ?
 Distal portion of original tail in all individuals not blue and showing at least traces of red, orange, yellow, or pink..... 2
2. Dorsolateral light stripes widening or diverging or both.....
E. e. onocrepis
 Dorsolateral light stripes neither widening nor diverging..... 3
3. Scale rows at midbody usually 22 or more; mature males frequently with reddish or orange suffusion extending onto the venter during mating season..... *E. e. egregius*
 Scale rows at midbody 21 or fewer; suffusion on mature males confined to lips, neck, and lower sides of body..... 4
4. Size large, to 60 mm snout-vent length; hatchlings in life dark gray, almost black, with inconspicuous dorsolateral stripes on body..... *E. e. insularis*
 Size small, seldom exceeding 55 mm snout-vent length; hatchlings lighter than above, with conspicuous dorsolateral stripes..... *E. e. similis*

Within the size, age, and sex groups specified, this key should separate all *lividus* from all individuals of any other race; all *onocrepis* from all others; 60 to 80 per cent of the *egregius* from 90 to 100 per cent of the *similis* and 92 to 100 per cent of the *insularis*; and all *similis* from all *insularis*.

LITERATURE CITED

Baird, Spencer F.

1858. Description of new genera and species of North American lizards in the museum of the Smithsonian Institution. Proc. Acad. Nat. Sci. Philadelphia, vol. 10, pp. 253-256.

Carr, Archie F., Jr.

1940. A contribution to the herpetology of Florida. Univ. Florida Publ., Biol. Sci. Ser., vol. 3, no. 1, pp. 1-118.

Conant, Roger

1958. A field guide to reptiles and amphibians of the United States and Canada east of the 100th meridian. Houghton-Mifflin, Boston. 366 pp., 40 pl., 62 fig., 248 maps.

Cope, Edward D.

1871. Catalogue of the Reptilia and Batrachia obtained by C. J. Maynard in Florida. Second and Third Ann. Rept. Peabody Acad. Sci. for 1869-70, pp. 82-85.
1875. Checklist of North American batrachians and reptiles. U. S. Natl. Mus. Bull. 1, pp. 1-104.
1900. Crocodilians, lizards, and snakes of North America. U. S. Natl. Mus. Report for 1898, pp. 153-1270, 36 pl.

Janson, Harvey S.

1954. Notes on the lizard *Eumeces egregius* in Georgia. Copeia, 1954, p. 229.

Kauffeld, Carl F.

1941. The red-tailed skink, *Eumeces egregius*, in Alabama. Copeia, 1941, p. 51.

Laessle, Albert M.

1942. The plant communities of the Welaka area. Univ. Florida Publ., Biol. Sci. Ser., vol. 4, no. 1, pp. 1-143.

McConkey, Edwin H.

1957. The subspecies of *Eumeces egregius*, a lizard of the southeastern United States. Bull. Florida State Mus., vol. 2, no. 2, pp. 13-23.

McCrone, John D.

1963. Taxonomic status and evolutionary history of the *Geolycosa pikei* complex in the southeastern United States (Araneae, Lycosidae). Amer. Midland Nat., vol. 70, no. 1, pp. 47-73.

Maerz, Aloys J., and M. Rea Paul

1950. A dictionary of color. 2nd edition. McGraw-Hill, New York, 208 pp., 56 pl.

Mecham, John S.

1960. Range extensions for two southeastern skinks. Herpetologica, vol. 16, no. 3, p. 224.

Mount, Robert H.

1963. The natural history of the red-tailed skink, *Eumeces egregius* Baird [sic]. Amer. Midland Nat., vol. 70, no. 2, pp. 356-385.

Neill, Wilfred T.

1948. The lizards of Georgia, Herpetologica, vol. 4, no. 4, pp. 153-158.

1957. Historical biogeography of present-day Florida. Bull. Florida State Mus., vol. 2, no. 7, pp. 175-220.

Schmidt, Karl P.

1953. A check list of North American amphibians and reptiles. Sixth edition. Amer. Soc. Ichthyologists and Herpetologists, pp. viii + 280.

Smith, Hobart M.

1946. Handbook of lizards. Comstock, New York. pp. viii + 557, pl. 135, figs. 136, maps 41.

Stejneger, L., and T. Barbour

1939. A checklist of North American amphibians and reptiles. Harvard Univ. Press, Cambridge. pp. 1-207.

Taylor, Edward H.

1935. A taxonomic study of the cosmopolitan scincoid lizards of the genus *Eumeces*, with an account of the distribution and relationship of the species. Univ. Kansas Sci. Bull., vol. 23, no. 1, pp. 1-643.

Telford, Samuel R., Jr.

1959. A study of the sand skink, *Neoseps reynoldsi* Stejneger. Copeia, 1959, pp. 110-119.

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