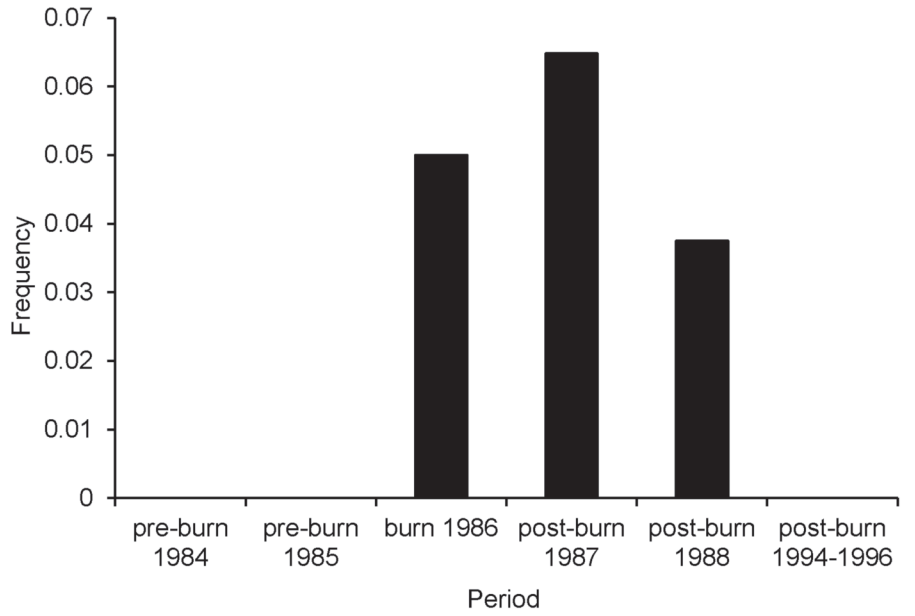

FIGURE 136. Relative abundance of Florida Scrub Lizard, *Sceloporus woodi,* from scrub habitat at the Archbold Biological Station (N = 15).

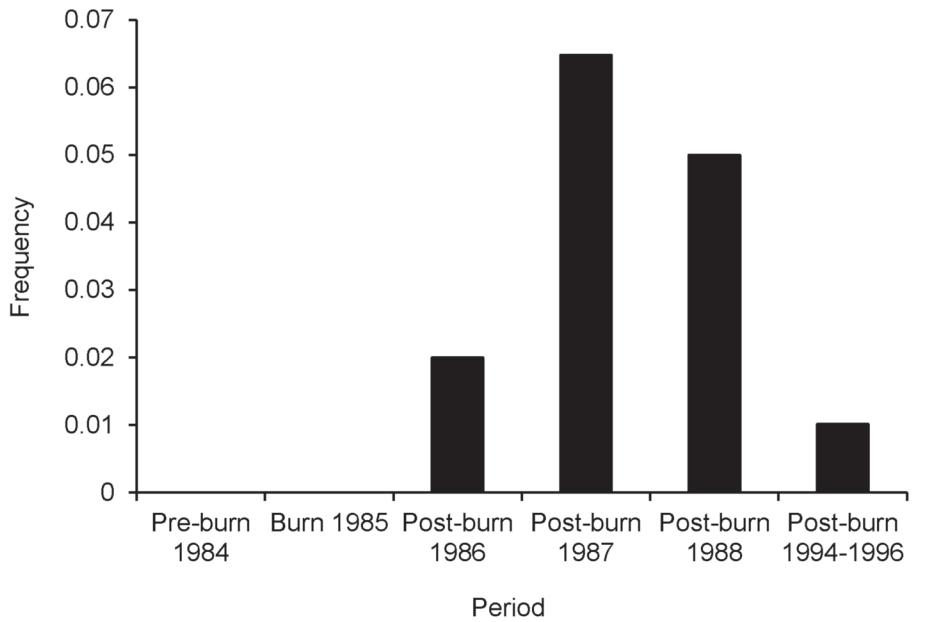

FIGURE 137. Relative abundance of Florida Scrub Lizard, *Sceloporus woodi,* from scrub habitat at the Archbold Biological Station (N = 15).

found in the field during February−September (McCoy et al., 2004). In northern Florida, follicles yolk during February−August, and oviductal eggs were present during April−August (Jackson and Telford, 1974).

In southern Florida, mean clutch size was similarly small as estimated by yolked follicles (mean = 3.2 ± 0.8; range = 2−4; n = 20) or shelled eggs (mean = 3.2 ± 1.5; range = 2−7; n = 11). The relationship between clutch size (enlarged follicles or shelled eggs) and female body size was not significant (Figure 140). Four to six eggs were produced in each clutch by Polk County females (McCoy et al., 2004). Farther north, females produced about four eggs in each clutch, which was also predicted for a 54.4 mm SVL female (Jackson and Telford, 1974). A minimum of three clutches were produced by southern Florida females, but a fourth clutch during the long breeding season could not be ruled out. Conservatively, the annual reproductive potential of southern Florida populations was smaller (9 eggs) than the 12 produced from three clutches each year in northern Florida (Jackson and Telford, 1974).

The cost for large clutches by southern Florida females appeared to have been smaller eggs, but the relationship between largest egg length and female body size was weak and not significant as was the relationship between clutch size and maximum egg length (Figure 141). Eggs produced by southern Florida females were similar in mean dimensions (mean = 12.0 ± 1.1 mm; range = 10.2−14.2; n = 28 X 6.5 ± 0.8 mm; range = 4.8−7.6; n = 28) to those of northern Florida (11.6 X 6.4 mm) (Jackson and Telford, 1974). From these data, southern Florida populations produced smaller clutches over a longer season than did northern counterparts, but overall differences in reproductive potential between them were unresolved.

Growth and survivorship.—In southern Florida, smallest individuals (22−25 mm SVL) were reported during June−December (Figure 142). Minimum body size at reproduction did

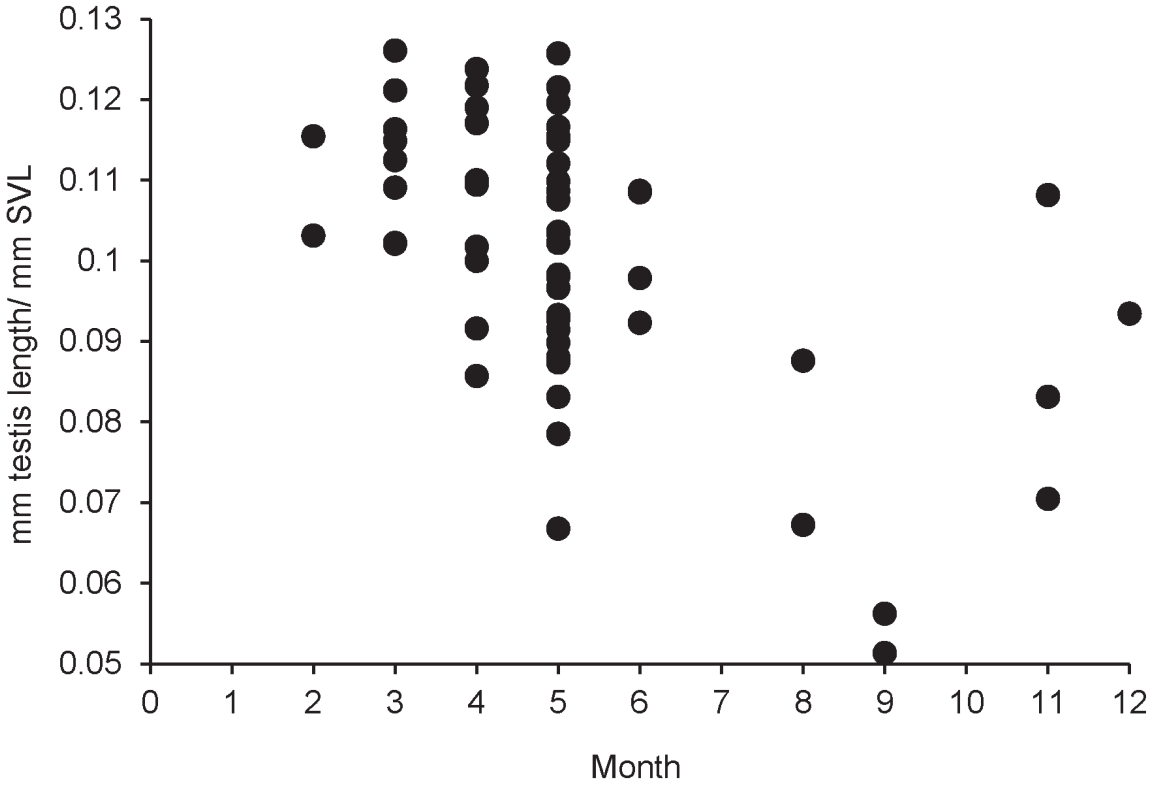

FIGURE 138. Monthly distribution of testis sizes of the Florida Scrub Lizard, *Sceloporus woodi,* from southern Florida (N = 59).

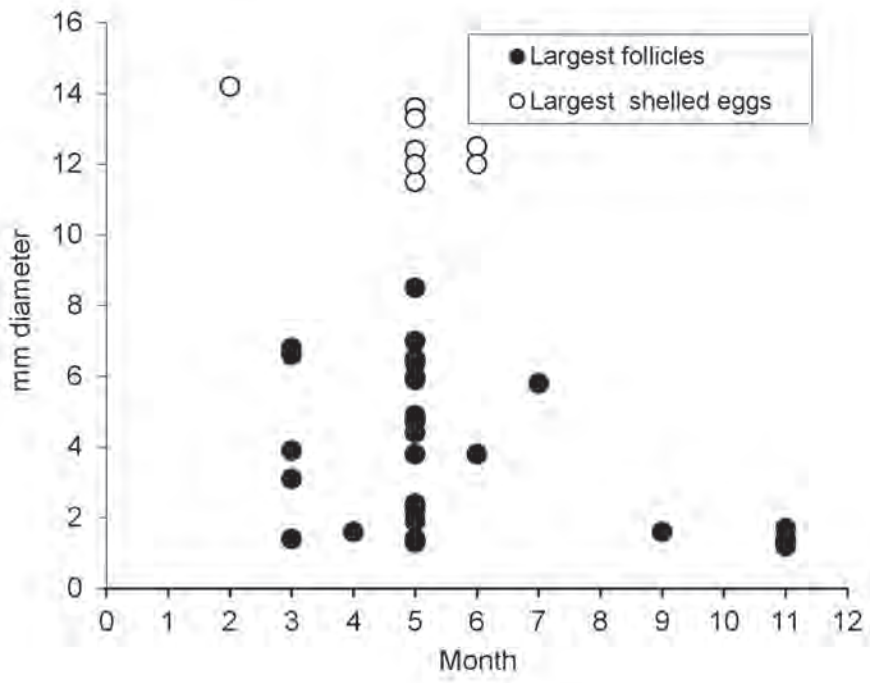

Figure 139. Ovarian cycle of the Florida Scrub Lizard, *Sceloporus woodi*, from southern Florida (N = 40 largest follicles and 11 shelled eggs).

not appear to vary geographically (Table 16) (McCoy et al., 2004). Southern populations of the Florida Scrub Lizard matured faster than those of northern sites. For example, on the ABS, sexual maturity was reached in less than six months (Figure 142, 143). In Polk County, sexual maturity was reached in six to eight months (Hartmann, 1993; McCoy et al., 2004). Growth rates differed seasonally, and males asymptoted at a smaller body size than females; however, generally, individuals grew at a rate of about 0.2 mm/day (Hartmann, 1993). In northern Florida it required at least 10−11 months to reach sexual maturity (Jackson and Telford, 1974), with estimated growth rates lower than those of central Florida (Lee et al., 1974). However, inspection of their monthy distributions of body size (Figure 142) and growth curves (Figure 143) has led us to conclude that sexual maturity of that population was reached in well under one year. On the ABS, survivorship was approximately annual (mean = 9.7 ± 13.3 mo; range = 1.0−56.7) of the 17 of 81 individuals whose survivorship was at least one month (Meshaka and Layne, 2002). Data from arrays on the ABS yielded similar results (mean = 8.6 ± 14.6 mo; range = 0.2−37.6; n = 6). Most Florida Scrub Lizards from central Florida were dead by the end of two years after hatching (Hartmann, 1993; McCoy et al., 2004).

Activity.—On the ABS, activity was observed throughout the year but mostly during spring (Figure 144) and, with a larger sample, again if the late summer−fall (Figure 145). Specifically, males were most active during March−April with the onset of warm weather and intense breeding activity, whereas most activity took place later in the year among females (July−August) and juveniles (August−September) (Figure 144, 145). In northern Florida, this species was likewise active throughout the year and not so readily seen during the winter months (Jackson and Telford, 1974). As for the species elsewhere (Hartmann, 1993), the Florida Scrub Lizard on the ABS was strongly diurnal and most active in hot weather. Bogert and Cowles (1947) reported a mean of 36.2 ^{0}C for cloacal temperatures of active individuals.

Predators.—On the ABS, the Florida Scrub Lizard was eaten by Nine-banded Armadillos, and many individuals were eaten by American Kestrels. In Florida, racers were reported to be predators of this lizard (Jackson and Telford, 1974).

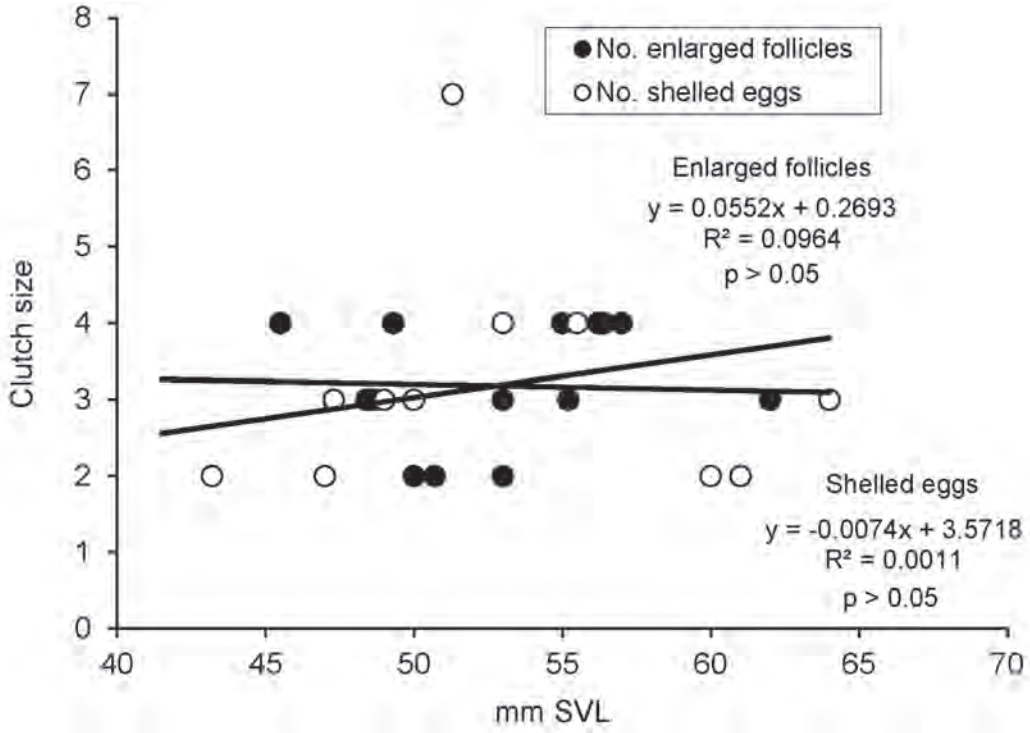

Figure 140. Relationahip of clutch size to body size of the Florida Scrub Lizard, *Sceloporus woodi,* from southern Florida (20 enlarged follicles and 11 conceptuses or shelled eggs).

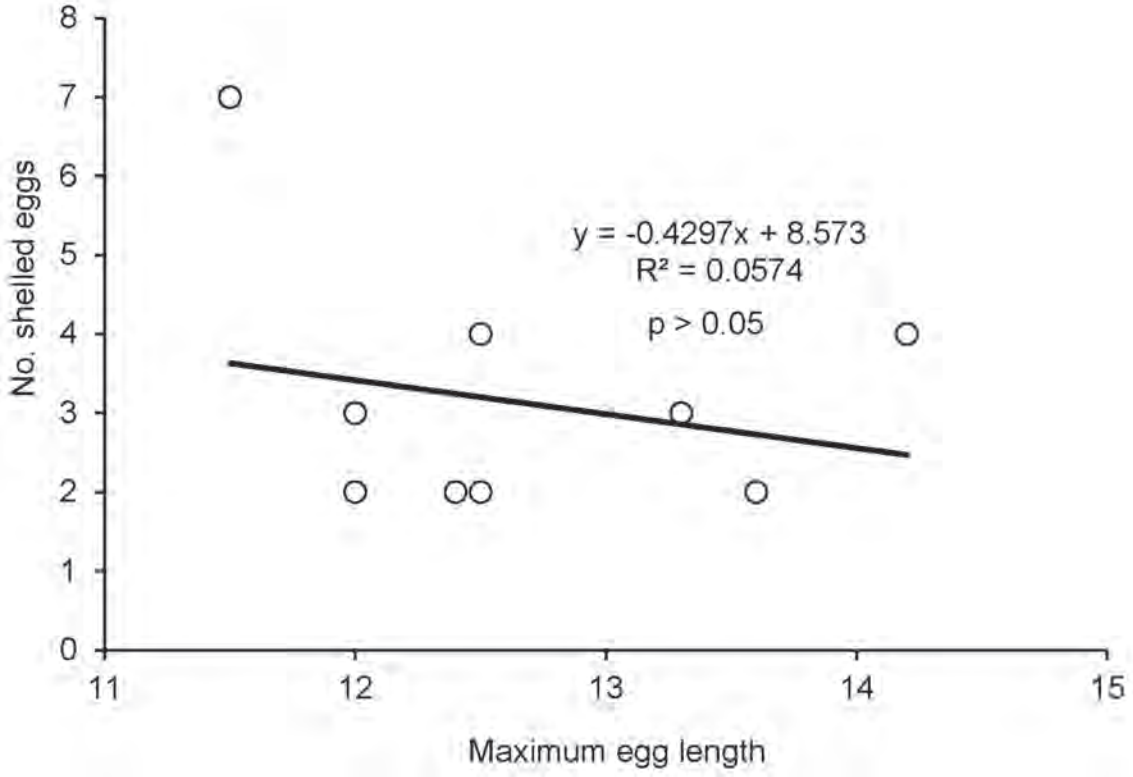

Figure 141. Relationship of clutch size to maximum shelled egg length of Florida Scrub Lizard, *Sceloporus woodi,* from southern Florida (n = 11) .

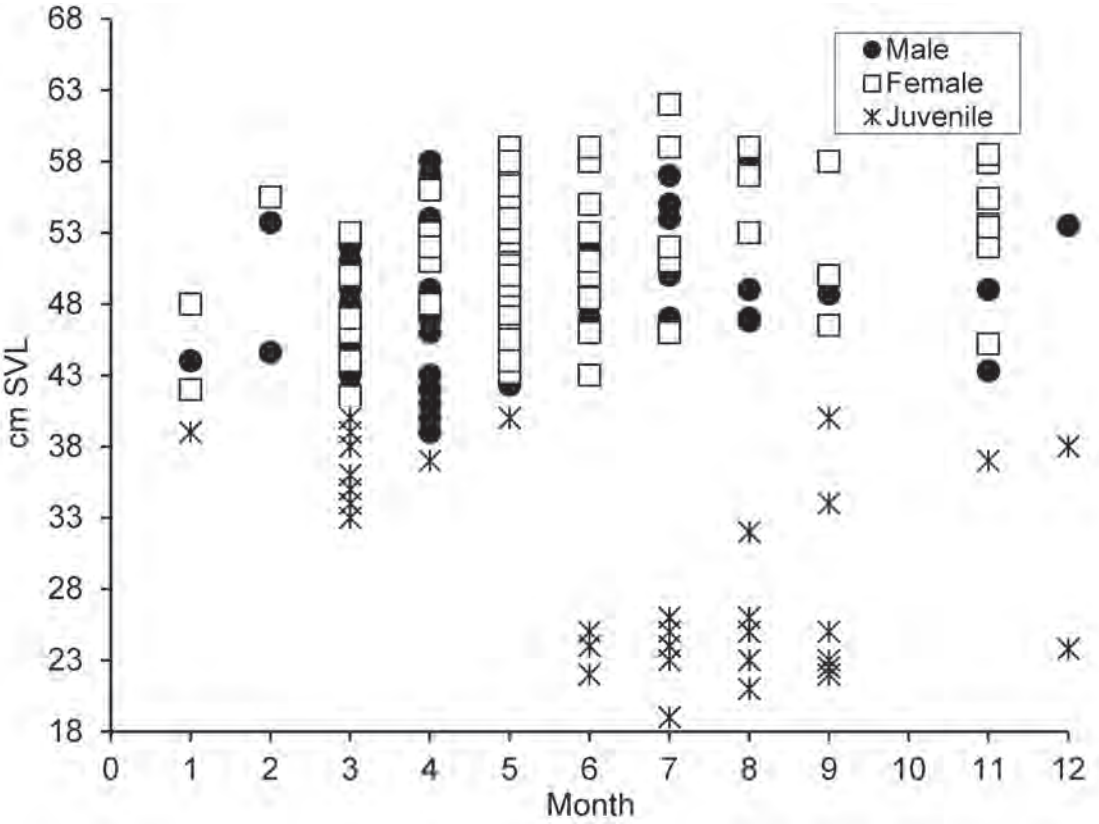

FIGURE 142. Monthly distribution of Body size of the Florida Scrub Lizard, Sceloporus woodi, from southern Florida.

Threats.—Although potentially high abundances and long breeding seasons could buffer populations from perturbations, a strong association for frequently burned or cleared scrub and poor vagility place isolated populations at great risk as more and more scrub were fragmented, developed, and not managed as pyrogenic systems.

Scincidae

Plestiodon egregius Baird, 1858
Mole Skink

Description.—Three forms of the Mole Skink have been described that occur in southern Florida: The Florida Keys Mole Skink (*E. e. egregius* Baird, 1858), Peninsula Mole Skink (*E. e. onocrepis,* Cope, 1871), and Bluetail Mole Skink (*E. e. lividus* Mount, 1965) (Figure 146). The dorsum of the Florida Keys Mole Skink is brown, and the reddish-colored tail persists through life. Lower Florida Keys populations are more similar in markings to those of northeastern Florida and southern Georgia Northern Mole Skinks, *E. e. similis* (McConkey, 1957), than to those of southern mainland Florida, whereas individuals of the upper Florida Keys share characteristics of both lower Florida Keys skinks and Peninsula Mole Skinks of the mainland (Duellman and Schwartz, 1958). The dorsum of the Bluetail Mole Skink is tan−brown in color with paired dark dorsolateral stripes. This form is distinguished by a bright blue tail found in juveniles, which is a trait that sometimes persists into adulthood. The tail color of adults is generally light blue to salmon. The dorsum of Peninsula Mole Skink is brown. A light yellow stripe passes from the nose over each eye and onto the side of the body. The tail color is highly variable, ranging in shades of pink, red, orange, yellow, lavender, or light blue.

Males of all forms are seasonally-suffused in bright shades of "yellow, orange, or reddish-orange along the lower sides of the body and usually on the lower lips, chin, and on the sides of the neck" (Mount, 1963). This coloration is most vibrant on dark males and during the breeding season, fading afterward but generally

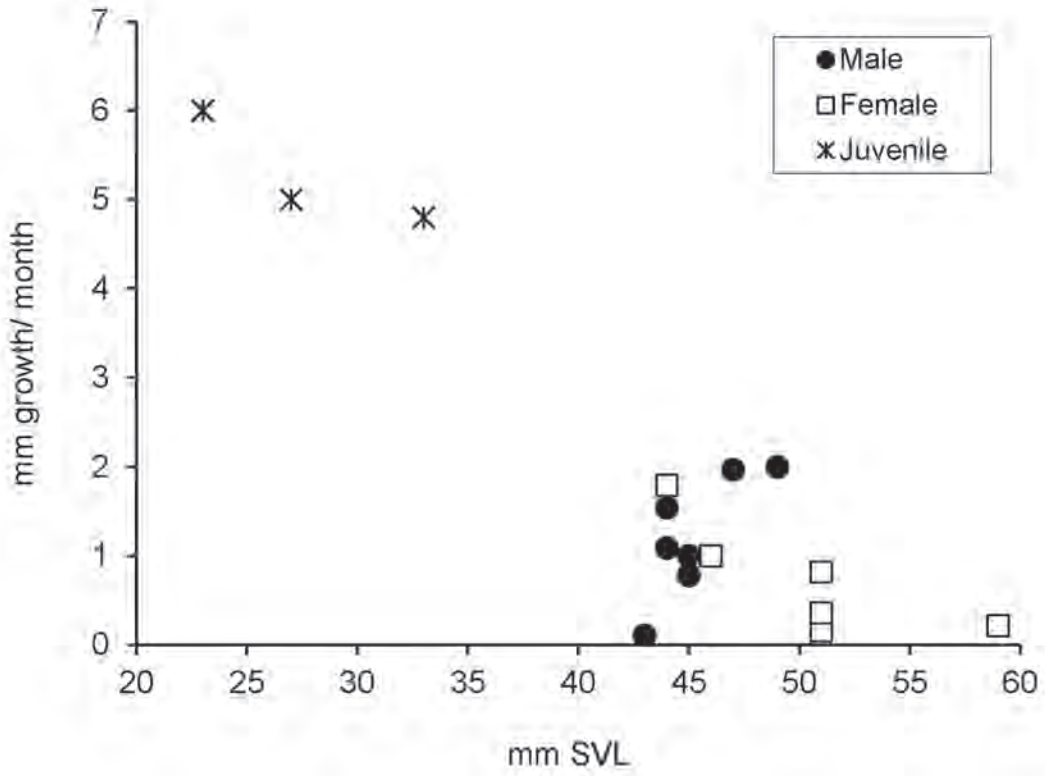

FIGURE 143. Growth curve of the Florida Scrub Lizard, *Sceloporus woodi,* from southern Florida (N: males = 7, females = 6, juveniles = 3).

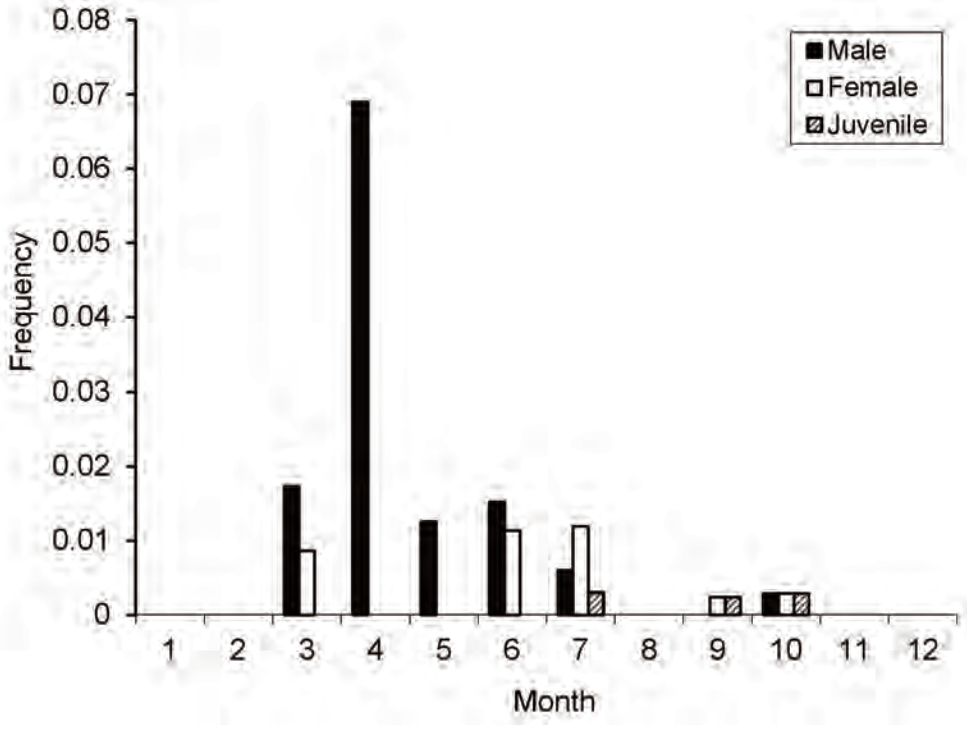

FIGURE 144. Seasonal activity of the Florida Scrub Lizard, *Sceloporus woodi,* from scrub habitat on the Archbold Biological Station (N: .male = 24, female = 12, juvenile = 3)

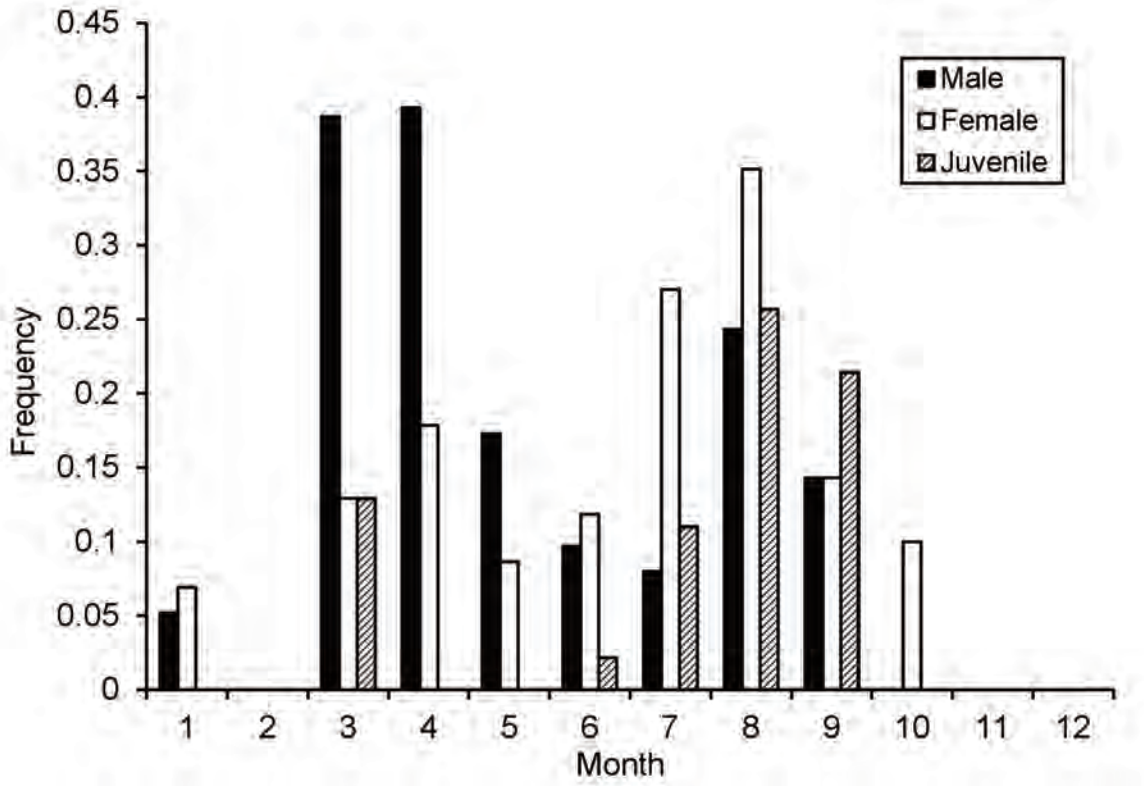

Figure 145. Seasonal activity of the Florida Scrub Lizard, *Sceloporus woodi,* from sandhill habitat at the Archbold Biological Station (N: male = 94, female = 96, juveniles = 42).

persistent (Mount, 1963).

Distribution.—Southern Florida populations of the Mole Skink represent the southern terminus of the species' geographic range (Conant and Collins, 1998). A Florida endemic, the Florida Keys Mole Skink occurs on the Florida Keys, and the Peninsula Mole Skink, also a Florida endemic, is found over most of the Florida peninsula, exclusive of much of the Everglades and of the "Little Everglades" above Lake Okeechobee (Mount, 1968; Ashton and Ashton, 1991; Conant and Collins, 1998; Meshaka and Ashton, 2005). A Florida endemic, and scarcely entering the region of our study, the Bluetail Mole Skink (restricted to the interior highlands of the Lake Wales Ridge in south-central Florida) is the differentiated form of the Lake Wales Ridge and the one for which we have the most life history information. Carr (1940a) reported a single specimen of the Mole Skink was reported from the Dry Tortugas (Carr, 1940a).

Body Size.—Mean body size of 15 adults from Key West was 48.7 mm SVL (42−57) (Duellman and Schwartz, 1958).

Habitat and abundance.—All accounts described the Mole Skink to be an animal of loose sandy soil in generally open canopied conditions, where it moved about on or just under the soil surface, including that of tidal wrack (Carr, 1940a; Duellman and Schwartz, 1958; Mount, 1963; Campbell and Christman, 1982). Nonetheless, it was capable of persisting in long-unburned sandhill as long as open sandy microhabitats were maintained, either by manmade trails or natural thinning of the understory over time (Meshaka and Layne, 2002). On the ABS, its absence in two unburned arrays and one pre-burn array as well as an increase in its frequency of capture immediately post−burn in two arrays (Figure 147, 148) were in keeping with its association with early successional sandy uplands. From small mammal trapping grids on the ABS, number of days this species was observed/trap/month was estimated in the following habitats: Low flatwoods-palmetto (0.002).

Figure 146 A Florida Keys Mole Skink, *Plestiodon egregiius egregius,* from the Florida Keys, Monroe (A) County, Florida. Bluetail Mole Skinks, *P. e. lividus,* adult (B) and juveniles (C, D) from Highlands County. Photographed by R.D. Bartlett. Peninsula Mole Skinks, *P. e. onocrepis,* from Palm Beach (E) and Sarasota (F) counties.

Diet.—Roaches, spiders, and crickets dominated the diet of mainland Florida populations of this lizard (Mount, 1963) and of an Ocala sample (Smith, 1982). From what was a Georgia sample with three Florida specimens, this species was found to have eaten a wide range of prey but especially ants, spiders, orthopterans, and beetles (Hamilton and Pollack, 1958).

Reproduction.—Fall−winter mating followed by late spring−early summer nesting with attendant females was thought to be the pattern across the geographic range of this species (Mount, 1963). On the ABS, we noted a spring burst in activity of the species (Figure 149). In a sealed cavity, females tended their nests and attacked potential threats to it (Mount, 1963). Six eggs laid by a female from Highlands County measured 10.6 mm (10.1−11.6) X 6.5 mm (6.0−6.7) (Mount, 1963).

Growth and Survivorship.—Seven hatchling Bluetail Mole Skinks from Highlands County were larger in body size (mean = 22.8 mm SVL; 22.0−24.0) than Mole Skinks from northern Florida or Alabama (Mount, 1963). Captive hatchlings from Highlands County grew fast, their growth rates were faster than those from northern Florida and Georgia, and females grew faster than males (Mount, 1963). Growth slowed down in the Highlands County group after males reached 45 mm SVL and females reached 50 mm SVL (Mount, 1963). Accordingly, sexual maturity was reached in Highlands County

Bluetail Mole Skinks in time to mate during the first fall of life that was within 150 days of hatching (Mount, 1963). Absence of juveniles in a January collection from Highlands County corroborated lab results (Mount, 1963). Farther north, however, sexual maturity of some individuals occurred the following year and north of Florida individuals of this species were still sexually immature at almost one year of age (Mount, 1963).

Body size at sexual maturity ranges 34−38 mm SVL for males and 36−42 for females, with both sexes of southern populations having matured at slightly larger body sizes than those of northern Populations (Mount, 1963). From the same site, survivorships were 7.8 and 1.5 months from two of 12 individuals whose survivorship was at least one month (Meshaka and Layne, 2002). From a long-unburned sandhill on the ABS, we estimated growth rates for a 41 mm SVL female (0.77 mm/mo) and a 37 mm SVL male (1.96 mm/mo).

Activity.—On the ABS, individuals were most active in the spring (Figure 149). In northern Florida, activity occurred more or less throughout the year (Franz et al., 1995). This species was active under a wide range of temperature, with most activity having occurred at 25−34 ^{0}C (Mount, 1963). Distance between successive captures (6.7, 6.7, 14.5 m) was available for three individuals from a site on the ABS (Meshaka and Layne, 2002).

Threats – Because of its strong association with well-drained open habitat, the future of this species in Florida is connected with management success of its sandy uplands.

Plestiodon inexpectatus (Taylor, 1932)
Southeastern Five-lined Skink

Description.—The dorsum of the Southeastern Five-lined Skink in southern Florida is smooth in texture and shiny in appearance. The dorsum is brownish in overall pattern. A faint middorsal stripe runs the length of the body. Two distinct and broad lateral stripes are bordered by light stripes. The blue tail of the juvenile is faint but present in adult females. Males are occasionally somewhat indistinct in body pattern and acquire an orange hue to the head (Figure 150).

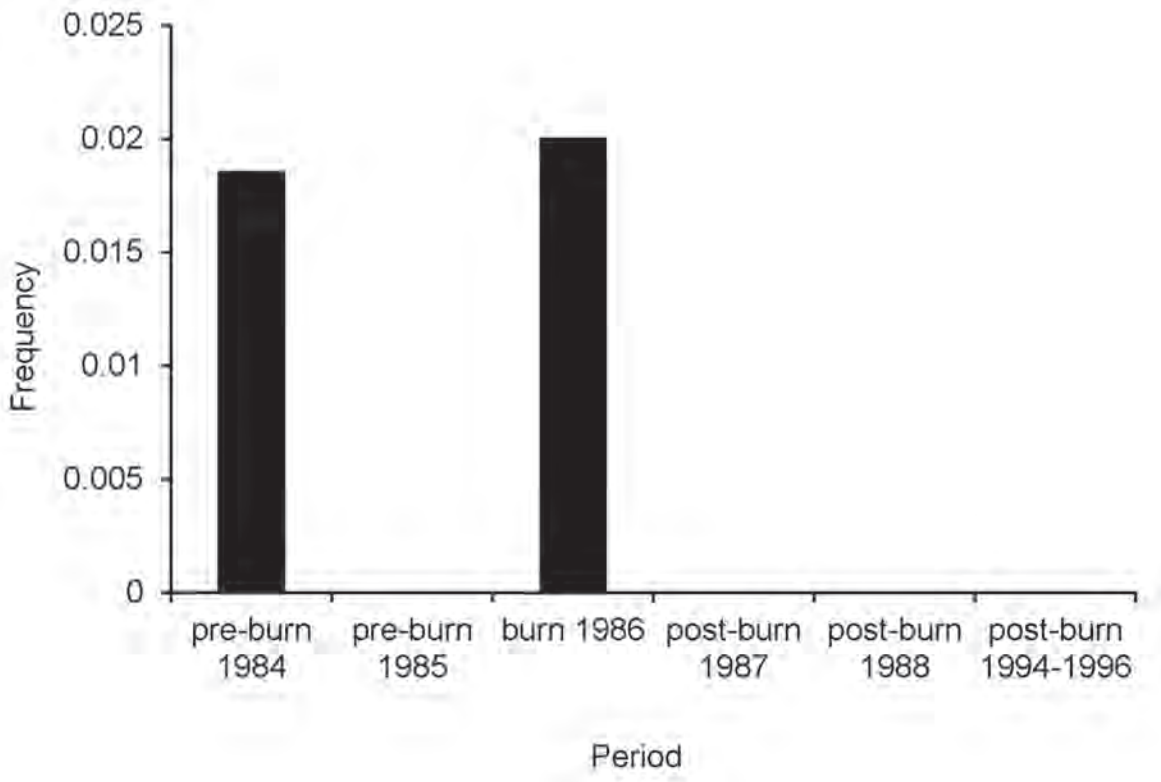

Figure 147. Relative abundance of the Bluetail Mole Skink, *Plestiodon egregius lividus,* from scrub habitat on the Archbold Biological Station (N = 3).

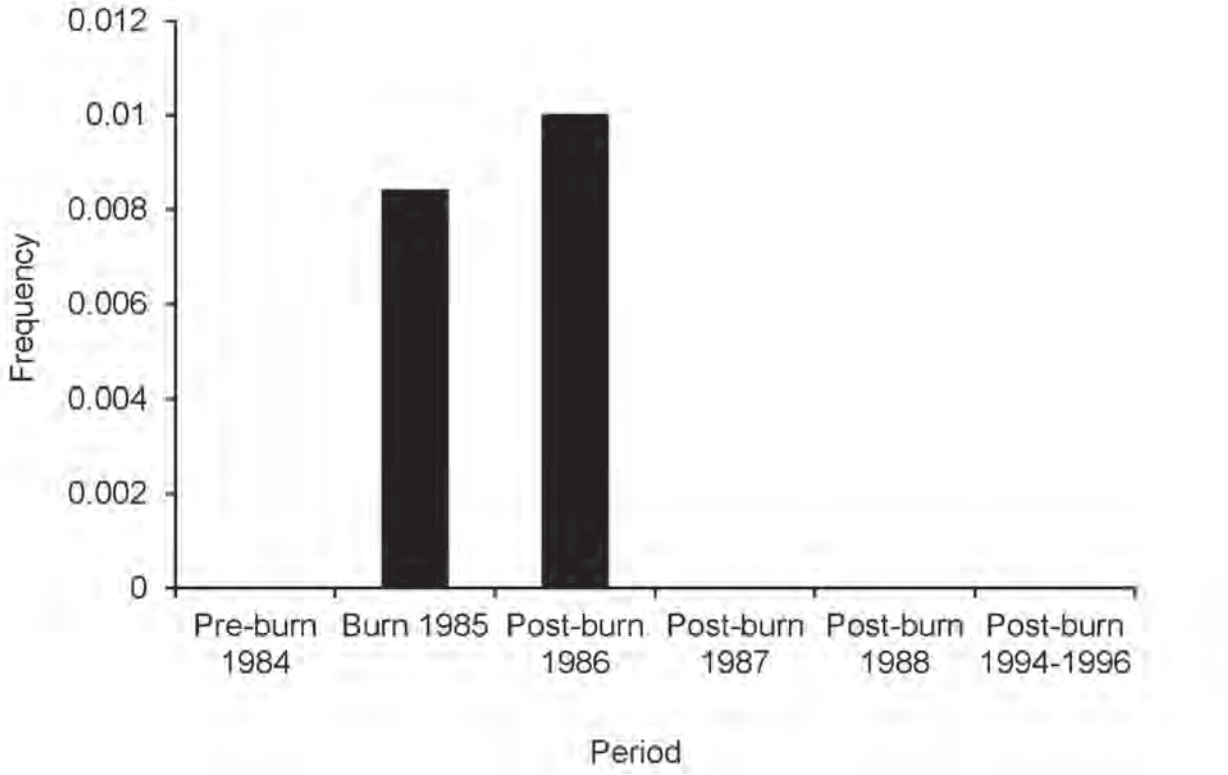

FIGURE 148. Relative abundance of the Bluetail Mole Skink, *Plestiodon egregius lividus,* from scrub habitat on the Archbold Biological Station (N = 2).

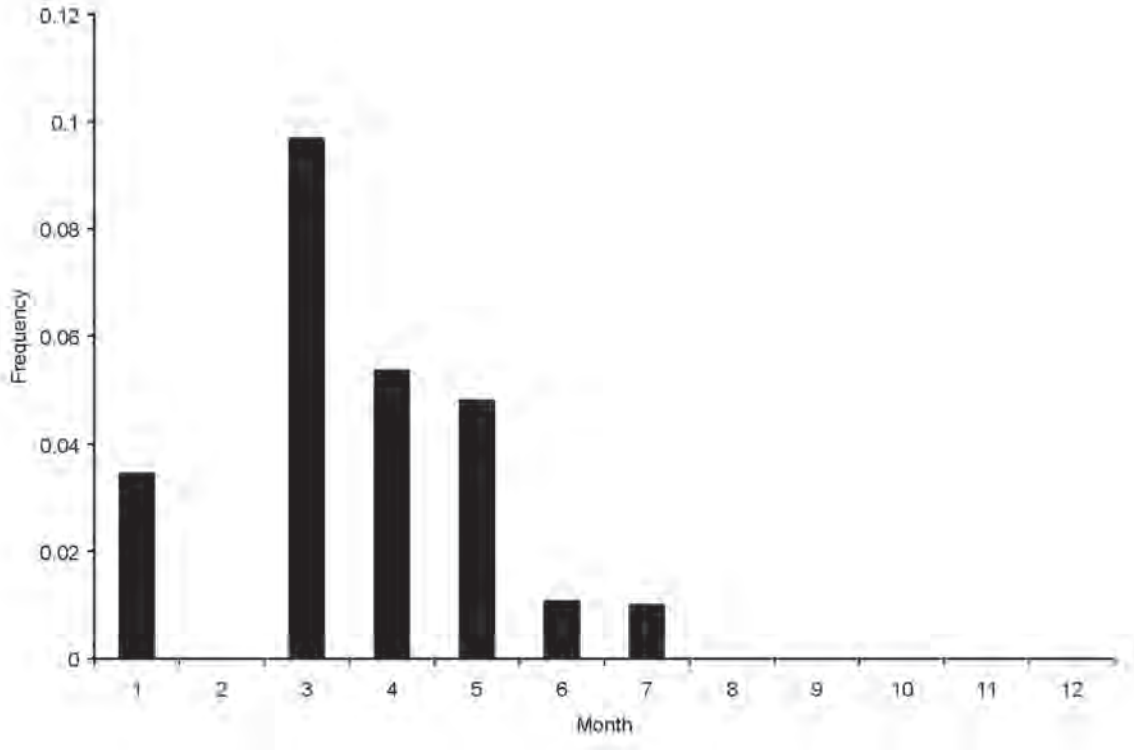

FIGURE 149. Seasonal activity of the Bluetail Mole Skink, *Pleistodon egregius lividus,* from sandhill habitat on the Archbold Biological Station (N = 15).

Distribution.—Southern Florida populations of the Southeastern Five-lined Skink represent the southern terminus of the species' geographic range (Conant and Collins, 1998). The geographic distribution of the Southeastern Five-lined Skink in Florida is statewide (Ashton and Ashton, 1991; Conant and Collins, 1998; Meshaka and Ashton, 2005). Historically reported from the Dry Tortugas (Carr, 1940a), no individuals were found during visits to Garden Key during the mid-1990s by WEM where it was already presumed to have been locally extinct (Steiner, 1986).

Body Size.—Males were on average larger than females, and adults of both sexes were largest in body size when away from their ecologically similar congeneric species, the Five-lined Skink, *P. fasciatus* (Linnaeus, 1758), and the Broadhead Skink, *P. laticeps* (Schneider, 1801) (Table 17). Mean body sizes of adult males was similar between a long-unburned sandhill and a more frequently burned scrub. On the other hand, among sites, adults of both sexes and juveniles were largest in an infrequently burned sandhill (Mushinsky, 1992).

Habitat and Abundance.—In southern Florida, the Southeastern Five-lined Skink occurred in all terrestrial systems, but was considered most abundant in mesic habitats (Duellman and Schwartz, 1958). In ENP, this species was most abundant in tropical hardwood hammocks and equally abundant in prairie and pineland (Dalrymple, 1988). This species also occurred in mangrove forest (Meshaka et al., 2000). On the ABS, it was much more abundant in Gopher Tortoise burrows of turkey oak than those of sandpine scrub or scrubby flatwoods (Lips, 1991). Use of those burrows was almost exclusively during the summer (Lips, 1991). From small mammal trapping grids on the ABS, number of days this species was observed/trap/month was estimated in the following habitats: Bayhead (0.021), low flatwoods-palmetto (0.011), low flatwood- grass (0.039), mature sand pine scrub- oak phase- (0.063), scrubby flatwoods- inopina oak phase (0.013).At a sandhill site on the ABS, this skink was abundant regardless of burn frequency but was more abundant in the absence of fire (Meshaka and Layne, 2002). Frequency of its captures from two unburned scrub arrays on the ABS (0.105 and 0.085) were on par with those from two adjacent pre-burn arrays, and was followed by a slight shortterm rise in abundance following the fire (Figure 151, 152). Likewise, in Tampa, individuals were more numerous in less frequently burned sandhill habitat (Mushinsky, 1992). However, at a site in Hernando County, abundance was greater in a sandhill than in a xeric hammock (Enge and Wood, 2001). Elsewhere in Hernando County, this skink was found in a wide range of habitats, but favored scrub above the others (Enge and Wood, 2000). At the long-unburned sandhill site of Redhill on the ABS, males (N = 51) outnumbered females (N = 4), and the 10 juveniles captured represented 15.3% of the population. Using array data, males (N = 62) outnumbered females (N = 6), and the 45 juveniles captured represented 39.8% of the population in the unburned scrub. In the adjacent

Table 17. Body size (mm SVL) and body size dimorphism of adult Southeastern Five-lined Skinks, *Plestiodon inexpectatus*, from selected sites. For our study, means are followed by standard deviation, range, and sample size. For literature values, means are followed by range.

Location	Male	Female	M:F
Florida			
Miami (Duellman and Schwartz, 1958)	66.8; 55 – 77; 11	65.4; 49 – 78; 18	1.02
Southern Florida (this study)	78.2 ± 8.5; 62.5 - 96.5; 47	74.9 ± 7.4; 63.0 - 89.9; 16	1.04
ABS (this study)	78.6 ± 9.9; 58 - 96; 135	69.7 ± 5.1; 60 - 78; 16	1.13
Tampa (Mushinsky, 1992)	77.1 (min = 60)	72.3 (min = 60)	1.07
Alachua and Clay counties (this study)	69.0 ± 3.9; 62.5 - 73.3; 7	68.6 ± 7.0; 62.4 - 81.9; 6	1.01
Georgia and South Carolina (Vitt and Cooper, 1986)	71.9 (54 - 85)	66.1 (54 - 72)	1.09
Virginia (Mitchell, 1994)	66.5 (55 - 79)	63.0 (55 - 75)	1.06

Figure 150. Southeastern Five-lined Skinks, *Plestiodon inexpectatus*,. Adult male from Okeechobee (A) County, Florida, and a juvenile from Monroe (B) County, Florida. Photographed by R.D. Bartlett. A male from Broward (C) County, Florida. Photographed by G. Busch.

burned scrub, males (N = 44) outnumbered females (N = 7), and the 24 juveniles captured represented 32.0% of the population. Typically associated with mesic situations like those described here, southern Florida individuals experienced a high rate of moisture loss (Bogert and Cowles, 1947). In Florida, this species was widely distributed but most abundant in high pine, rosemary scrub, and on coastal islands and keys and it was thought to be rare for individuals to enter mesophytic hammocks (Carr, 1940a). Also for Florida, this skink was reported from dry and wet habitats (Ashton and Ashton, 1991).

Elsewhere, the Southeastern Five-lined Skink avoided mesic habitats where the Five-lined Skink occurred (Vitt and Cooper, 1986) and was reported to have preferred drier habitat than the Five-lined Skink (Mount 1975; Mitchell 1994). Rangewide, it was reported to have occurred in habitat more open than that occupied by the Five-lined Skink (Fitch, 1954). In North Carolina, the Southeastern Five-lined Skink was found in habitats ranging from xeric to very mesic, but avoided mesic habitats when in

syntopy with the Five-lined Skink and the Broadhead Skink (Palmer and Braswell, 1995). In Louisiana, it was associated with pinewoods, where individuals were often found in stumps and logs (Dundee and Rossman, 1989). This exclusion of course, did not apply in southern Florida, where it was outside the geographic range of either of the two closely-related forms.

Our trapping on the ABS (Figure 153, 154), like that in Tampa (Mushinsky, 1992), as well as overall captures from the ABS (Figure 155) and those from southern Florida (Figure 156) resulted in higher numbers of males than females, perhaps in response to higher vagility of males as compared to females. Lower vagility in females seemed likely in light of both the high relative clutch mass of gravid females and the time associated with tending a nest.

Diet.—Remains of arthropods, probably beetles, were recovered from stomachs in southern Florida (Duellman and Schwartz, 1958). On the ABS, a male was observed making regular visits to the entrance of an apiary to capture returning European Bees (*Apis melifera*). On 22 August 1967, a large individual was observed jumping off the ground to reach wasps in a nest c.a. 20 cm above it. The Southeastern Five-lined Skink was reported to be a predator of the Sank Skink (Telford, 1959). This skink was likewise primarily a predator of invertebrates in Virginia (Mitchell, 1994).

Reproduction.—Testis diameters of southern Florida males were at their maximum sizes in late winter−spring (Figure 157) concomitant with most mating. A June mating was observed (Duellman and Schwartz, 1958), which was suggestive of an extended mating season during winter−early summer in southern Florida. Monthly distribution of follicles from southern Florida was suggestive of a short May−June (possibly early July) egglaying season (Figure 158), with maternal solicitude until the eggs hatched during June−August (Figure 155, 156), and was within the range of other Florida dates (Duellman and Schwartz, 1958; Hamilton, 1958). The latter hatching date has also been reported in Mississippi (Smith and List, 1955). With the exception of a difficult to interpret observation of a southern Florida female brooding 14 eggs in October (Steiner, 1985), southern Florida females appeared to generally adhere to an abbreviated mid−summer breeding

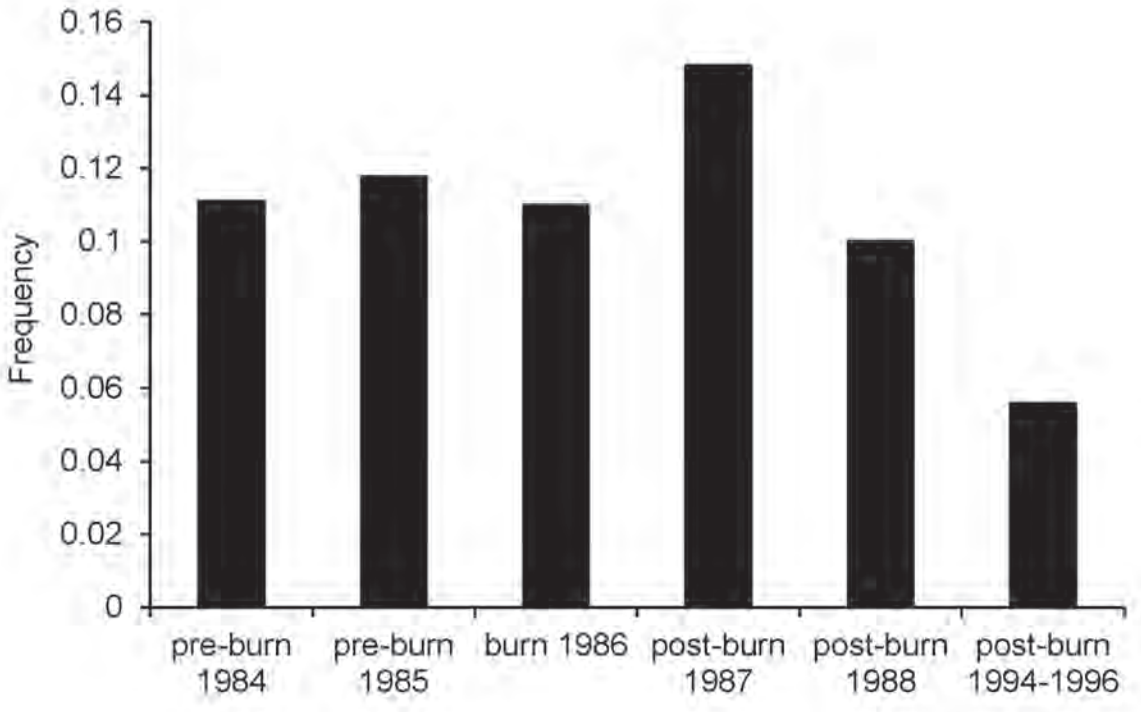

Figure 151. Relative abundance of the Southeastern Five-lined Skink, *Plestiodon inexpectatus,* from scrub habitat on the Archbold Biological Station (N = 66).

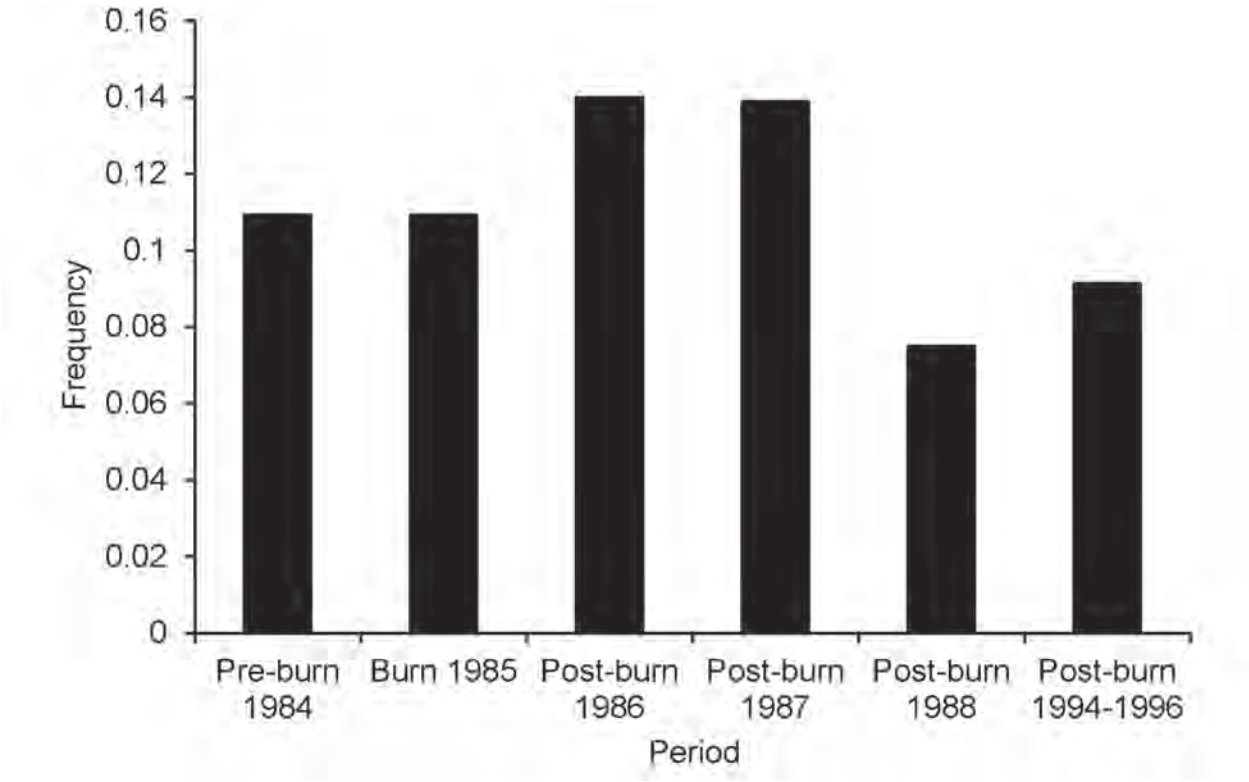

Figure 152. Relative abundance of the Southeastern Five-lined Skink, *Plestiodon inexpectatus,* from scrub habitat on the Archbold Biological Station (N = 73).

season of this species elsewhere (Dundee and Rossman, 1989; Mitchell, 1994) and that of the Five-lined Skink (Vitt and Cooper, 1986; Mitchell, 1994; Trauth, 1994; Minton, 2001) and Broadhead Skink (Vitt and Cooper, 1985; Mitchell, 1994).

In southern Florida, 11 eggs were found in June (Duellman and Schwartz, 1958) and a nest of 14 eggs in October (Steiner, 1985). In southern Florida, clutch size averaged 9.0 ± 2.7 (range = 7−12; n = 3) as estimated by follicle counts. One female (73.4 mm SVL) collected in May contained 11 shelled eggs, and another female collected in June (89.9 mm SVL) contained 10 shelled eggs. At Lake Thonotosassa in Tampa, WEM collected two gravid females on 15 April 1990 under tin. Eight eggs were found in one female (74.0 mm SVL), and 11 eggs were found in the other female (80.0 mm SVL). A an 11−egg clutch was reported for 76 mm SVL female from Bonita Springs Florida, which had eaten one of the eggs while in attendance of the clutch (Hamilton, 1958). Elsewhere, in keeping with smaller body size, this species may have been laying fewer eggs. For example, clutches of six and eight eggs were reported from Alabama (Mount, 1975), 11 in Mississippi (Smith and List, 1955), and an average of 6.9 eggs in North Carolina (Palmer and Braswell, 1995).

The median L X W of 10 of 14 eggs shelled eggs from a Miami female was 13.9 X 10.4 mm (Steiner, 1985). Eggs averaged 14.2 X 9.5 mm for a clutch found in Bonita Springs (Hamilton, 1958). Among the Lake Thonotosassa clutches, the mean length (L) X width (W) of eight eggs found in the smaller female (74.0 mm SVL) was 10.8 ± 0.430 X 7.4 ± 0.589 mm. The RCM was 0.261 and 0.354 (measured with or without the clutch, respectively). The mean L X W of 11 eggs found in the larger female (80.0 mm SVL) was 10.4 ± 0.591 X 6.6 ± 0.290 mm. The RCM was 0.207 or 0.261.

Growth and Survivorship.—In southern Florida, smallest individuals (24.5−29.0 mm SVL) appeared during midsummer (Figures 155, 156). Based on the monthly distributions of body sizes, c.a. 60 mm SVL was attained within one year of hatching. Growth data were available for two males: A 67 mm SVL male grew 2.5 mm/month, and a 70 mm SVL male grew 1.3

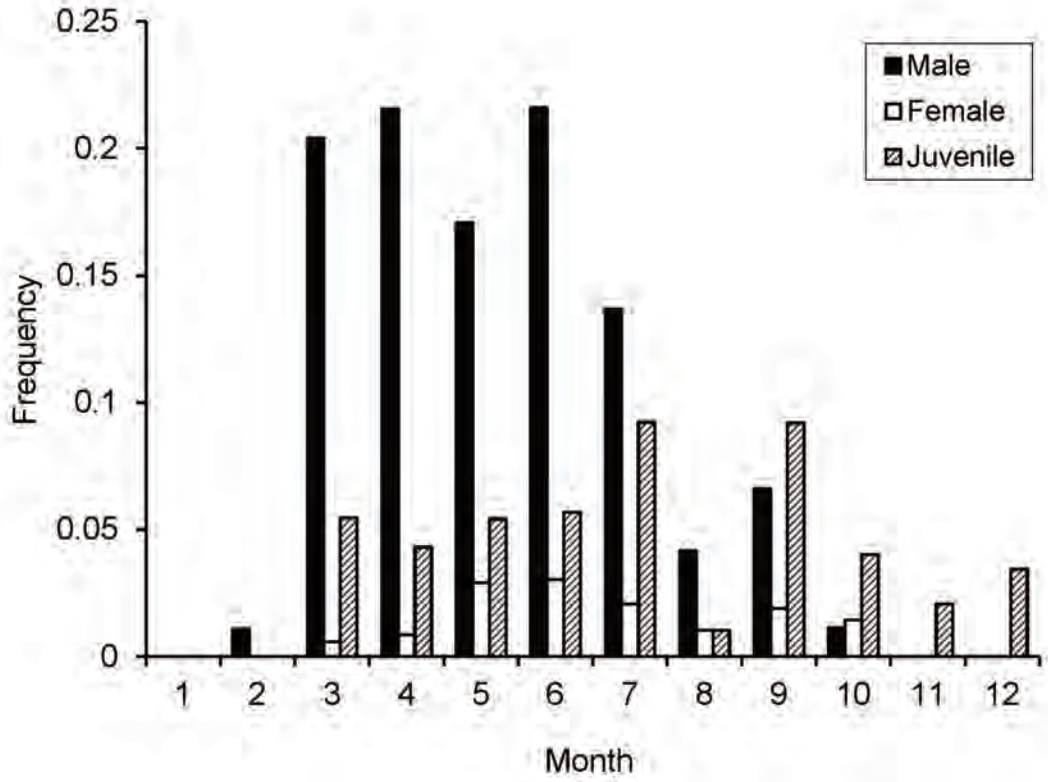

FIGURE 153. Seasonal activity of Southeastern Five-lined Skink, *Plestiodon inexpectatus,* from scrub habitat on the Archbold Biological Station (N: males = 281, females = 40, juveniles = 143).

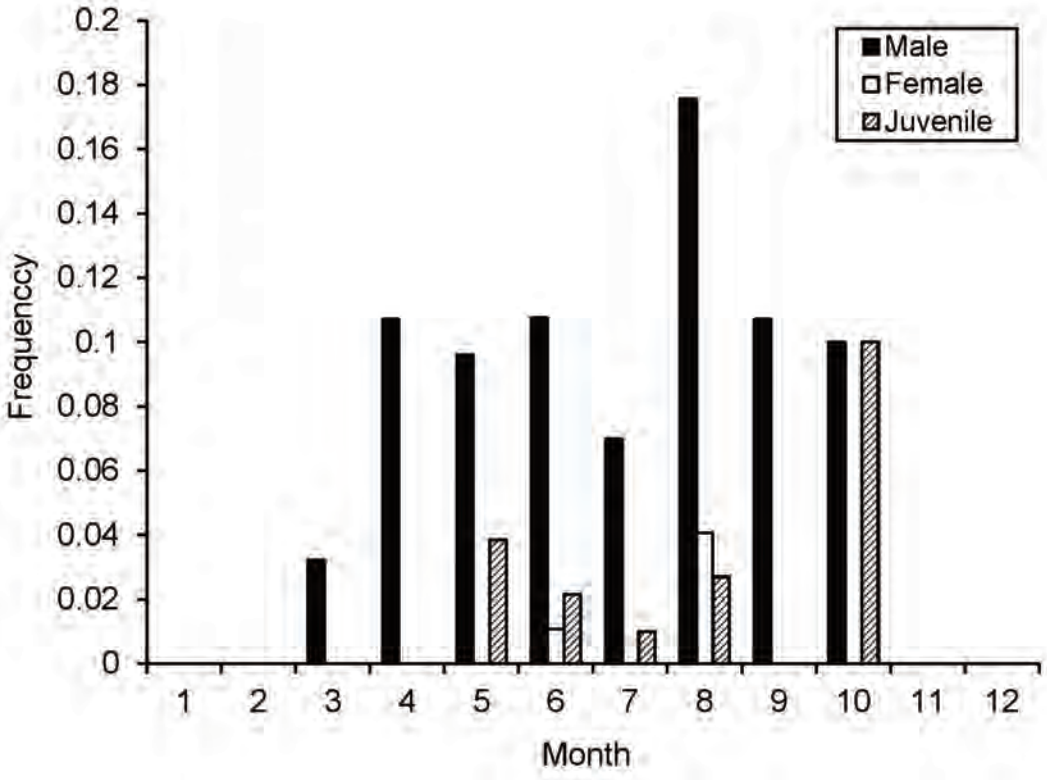

FIGURE 154. Seasonal activity of Southeastern Five-lined Skink, *Plestiodon inexpectus,* from sandhill habitat on the Archbold Biological Station (N: male = 51, female = 4, juvenile = 10).

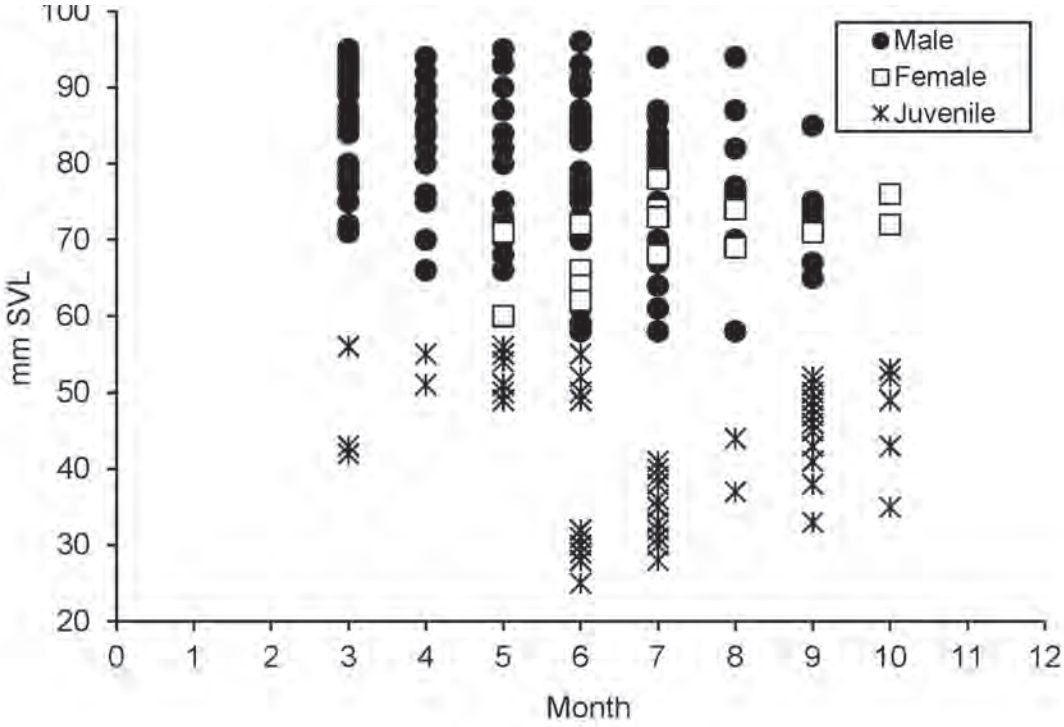

FIGURE 155. Monthly distribution of body sizes of the Southeastern Five-lined Skink, *Plestiodon inexpectatus,* from the Archbold Biological Station (N: male = 135, female = 16, juvenile = 78).

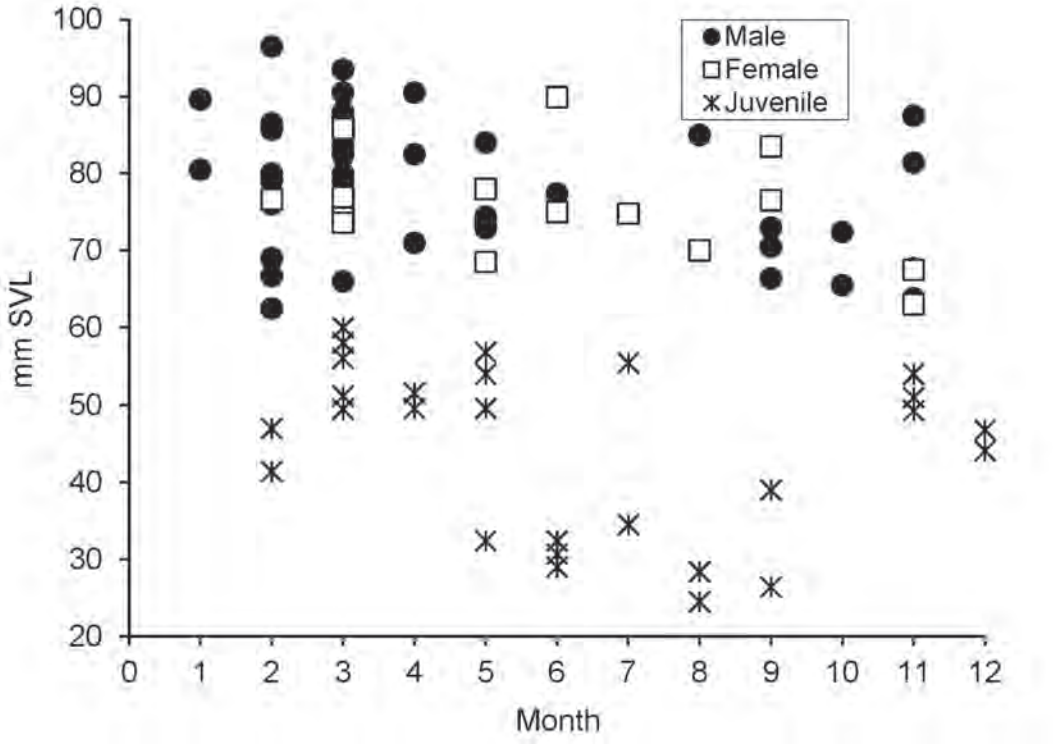

FIGURE 156. Monthly distribution of body sizes of the Southeastern Five-lined Skink, *Plestiodon inexpectatus* from southern Florida (N: male = 47, female = 16, juvenile = 27).

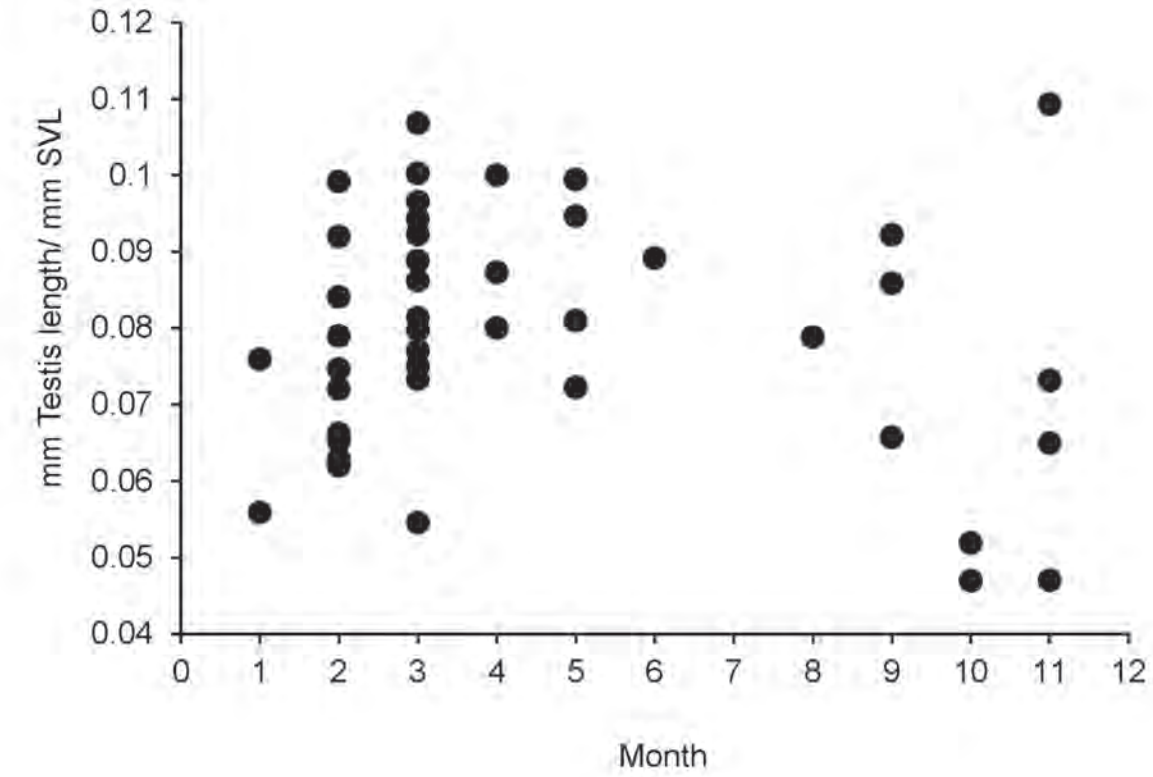

FIGURE 157. Monthly distribution of testis sizes of the Southeastern Five-lined Skink, *Plestidon inexpectatus,* from southern Florida (N = 43).

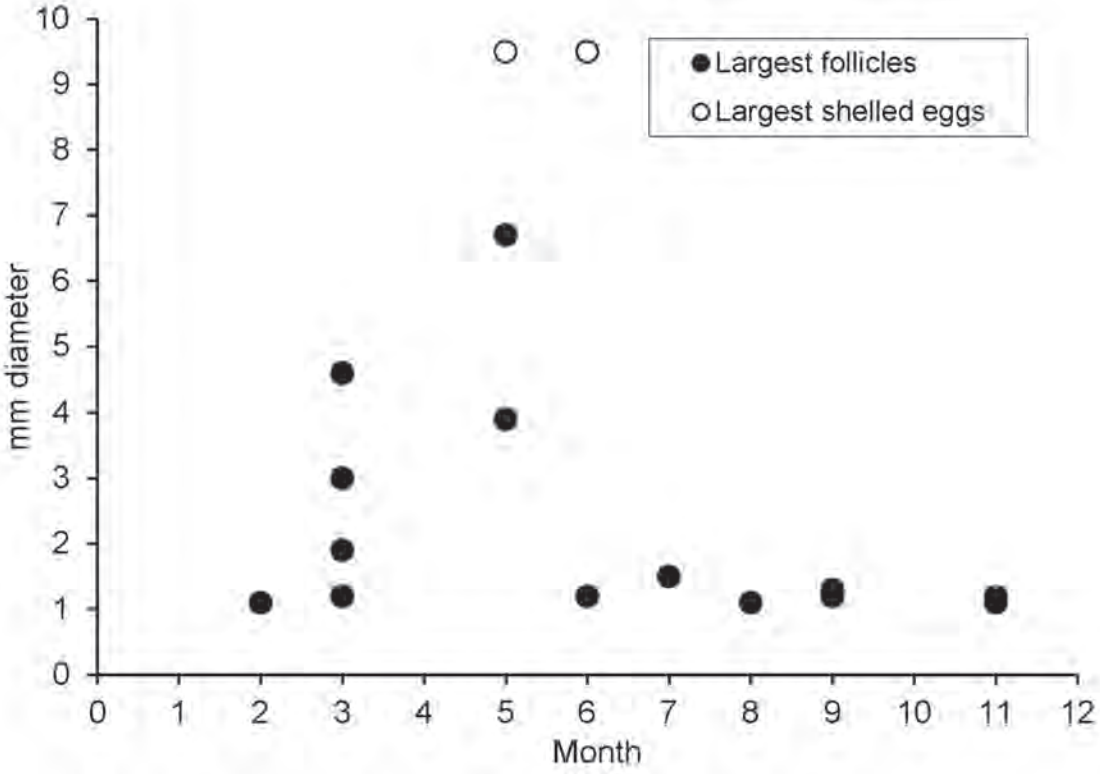

FIGURE 158. Ovarian cycle of the Southeastern Five-lined Skink, *Plestidon inexpectatus,* from southern Florida (N = 14 largest follicles, 2 largest shelled eggs).

mm/month. Seven of 60 marked animals in a long-unburned sandhill on the ABS (Meshaka and Layne, 2002) survived for more than one month (mean = 4.7 ± 3.6 mo.; range = 1.2−9.0; n = 7). Excluded from this calculation was a questionable record of 58.4 months for a 50 mm SVL male.

Activity.—In southern Florida, individuals were active throughout the year (Figure 155, 156), whereas from central (Mushinsky, 1992) and northern (Franz et al., 1995) Florida northward (Mitchell, 1994; Palmer and Braswell, 1995), activity of this species became increasingly seasonal with either fewer individuals active in winter months or fewer months with any active individuals. Despite continuous activity, seasonal amplitudes in its activity were evident in southern Florida. Adults in southern Florida were most active in early spring and summer, commensurate with breeding; Males were especially active during March−July. Females became scarce while tending eggs in midsummer, after which time they reappeared on the surface during July−August (Figure 153, 154, 155, 156). Similar to findings in southern Florida, In North Carolina, 58% of records occurred during April−May (Palmer and Braswell, 1995). Home range size was available (89.8, 518.1 m) for two individuals from a site on the ABS (Meshaka and Layne, 2002). In southern Florida, as elsewhere throughout its geographic range, activity was diurnal. On warm days individuals moved about near dusk. In southern Florida, individuals were active both on the ground and on trees although we do not know if regional differences existed in arboreality in this species. However, it was considered less arboreal than the Broadhead Skink in Florida generally (Carr, 1940a) and less arboreal than the Five-lined Skink in Virginia (Mitchell, 1994) and Virginia and the Carolinas (Martof et al., 1980s), and entirely terrestrial in Alabama (Mount, 1975.

Predators.—On the ABS, the American Kestrel preyed on the Southeastern Five-lined Skink, and from there we have records of individuals having been depredated by the Southern Black Racer, Eastern Coral snake, Scarlet Kingsnake, and the Great Egret (*Ardea alba*). In North Carolina (Palmer and Braswell, 1995) and Virginia (Mitchell, 1994) this species was preyed upon by the Eastern Milk Snake.

Threats.—The loss of natural upland habitat in southern Florida presents the greatest threat to the conservation of this skink.

Plestiodon reynoldsi (Stejneger, 1910)
Sand Skink

Description.—The Sand Skink is distinguished by its elongate body, diminutive limbs, and shiny silver appearance (Figure 159). The only reported albino of this species was found on the ABS (Catenazzi et al., 2008).

Distribution.—Southern Florida populations of the Sand Skink represent the southern terminus of the species' geographic range (Conant and Collins, 1998). A Florida endemic, the Sand Skink is restricted to the central ridge of south-central, central, and northern Florida (Telford, 1969; Ashton and Ashton, 1991; Conant and Collins, 1998; Meshaka and Ashton, 2005).

Habitat and abundance.—On the ABS, the Sand Skink differentially preferred open sandy habitat over shrubby habitat, and its abundances decreased over time in keeping with the preference of this species for loose sand substrate (Meshaka and Layne, 2002). To that end, from small mammal trapping grids, number of days this species was observed/trap/month was estimated in the following habitats: Bayhead (0), low flatwoods-palmetto (0.002), low flatwood-grass (0.001), mature sand pine scrub- oak phase- (0), scrubby flatwoods- inopina oak phase (0.002).Campbell and Chrisman (1982) also noted a close association of this species with scrub habitat, the loose sand of which was more important than the floristic association. Telford (1959) noted a preference of this species for loose soil (strongly associated with St. Lucie Fine Sand) but also noted the importance of moisture and so had greater success in finding Sand Skinks along the scrub−palmetto−pine flatwoods ecotone than in dry interior areas of the scrub. It was rarely found in habitats other than turkey oak sandhill by Smith (1982) and had been reported from rosemary scrub and high pine (Carr, 1940a) and from upland sandhill, sand pine scrub, and turkey−oak stands (Ashton and Ashton, 1991).

Diet.—In a study that included several

individuals from Sebring, termites were found to dominate the diet as measured by frequency of items (Smith, 1982).

Reproduction.—Copulation occurred during February (Ashton, 2005) or March (Telford, 1959)−May in association with the first bimodal pulse in activity (Figure 160). A single clutch was produced in May and June, with some females having oviposited biennially or even less frequently than that (Ashton, 2005). Clutch size averaged about two eggs (Ashton, 2005).

Growth and Survivorship.—On the ABS, hatchlings were present during July−October (Ashton and Telford, 2006). One hatchling measured 24 mm SVL in July (Telford, 1959). Sexual maturity was estimated to have been reached in less than one year of life at about 45 mm SVL (Telford, 1959). In another study, sexual maturity was expected at 19-23 months of age at 49-50 mm SVL in males and 50-53 in females (Ashton, 2005). Normal life expectancy was thought to be three years (Telford, 1959). On the ABS, one male (53 mm SVL) survived for 10.4 months (Meshaka and Layne, 2002) and another individual from the ABS survived at least 10 years (Meneken et al., 2005.)

Activity.—On the ABS, we found the Sand Skink to have been active during March−October and noted a bimodal activity season of April−May and September (Figure 160). Likewise, individuals were especially active in spring and fall in northern Florida (Smith, 1982). Ashton and Telford (2006) found

Figure 159. The Sand Skink, *Plestiodon reynoldsi,* from Highlands (Top) County, Florida. Photographed by R.D. Bartlett. The fusiform body and reduced legs are adaptations to a fossorial existence in sandy upland habitat. Bottom photograph shows tracks left in the sand by surface-active individuals on the Archbold Biological Station. These tracks are commonly encountered in the spring. Photographed by P.R. Delis.

this species to be active throughout the year with seasonal peaks during February−May and August−October. This species was active in a narrow range of high (31−32 ^{0}C) and low (28−29 ^{0}C) temperatures during spring and winter (Andrews, 1994). During the spring, the Sand Skink was active at lower temperatures in the morning than in the evening and was active during the day in winter (Andrews, 1994). Its activity patterns corresponded to the daylight hours associated with similarity between subsurface temperatures and selected body temperatures (Andrews, 1994). The narrow range of temperatures associated with activity could explain the seasonal bimodality of activity on the ABS (Figure 160), whereby mid-winter was too cold, and mid-summer was too hot for activity near the surface. On the ABS, activity, as measured by sand tracks, was negatively associated with precipitation (Ashton and Telford, 2006).

Predators.—On the ABS, the Scarlet Kingsnake was a predator of the Sand Skink, and an individual was recovered from the stomach of a Nine-banded Armadillo on 24 July 1967. In Highlands County, a Sand Skink was recovered from the stomach of an Eastern Coachwhip (Telford, 1959). The Southeastern Five-lined Skink was also a predator of this species (Telford, 1959).

Threats.—This species is a true sandy upland endemic that will perish with the loss of what was presently both greatly reduced and fragmented scrub and sandhill in Florida. In light its habitat specialization in a diminishing habitat and two 1932 records from Miami, Miami-Dade County (See Duellman and Schwartz, 1958), every effort should be made to evaluate its status in what was left of sandy portions of extreme southern Florida.

Scincella lateralis (Say, 1823)
Ground Skink

Description.—The dorsum of the Ground Skink is brittle but smooth in texture and shiny in appearance and uniform golden brown in southern Florida (Figure 161). Lower Florida Keys populations are more similar in markings to those of northern Florida than to those of

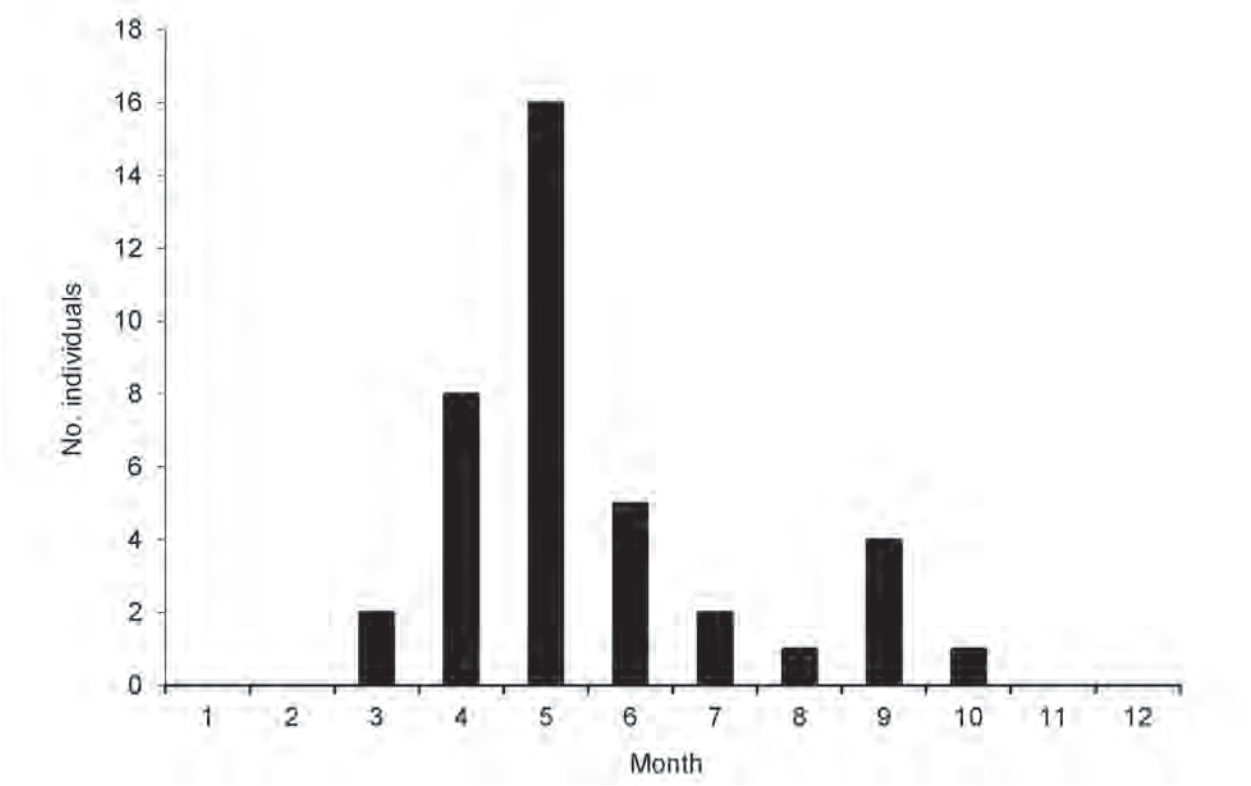

Figure 160. Seasonal activity of the Sand Skink, *Plestiodon reynoldsi,* from sandhill habitat on the Archbold Biological Station (N = 39).

southern mainland Florida and the upper Florida Keys (Duellman and Schwartz, 1958).

Distribution.—Southern Florida populations of the Ground Skink represent the southern terminus of the species' geographic range (Conant and Collins, 1998). The geographic distribution of the Ground Skink in Florida is statewide (Ashton and Ashton, 1991; Meshaka and Ashton, 2005), exclusive of the deep water Everglades immediately south of Lake Okeechobee (Conant and Collins, 1998).

Body Size.—On Key West, body sizes were available from 10 males (mean = 38.7 mm SVL; range = 36.0−40.5) and seven females (mean = 39.7 mm SVL; range = 33.0−46.0) (Duellman and Schwartz, 1958). On the ABS, mean body size of seven males (mean = 38 ± 3.4 mm SVL; range = 34−45) was similar to the body sizes of two females (38, 40 mm SVL). In Virginia, mean body size of adult males (38.1 mm SVL) was similar to that of adult females (43.1 mm SVL) (Mitchell, 1994). Likewise, adult males and females from Louisiana were similar in body size (Johnson, 1953).

Habitat and Abundance.—On the Florida Keys, this species was especially abundant in Buttonwood transition and low hammock (Lazell, 1989). In southern Florida, the Ground Skink was found in hammocks and pine forest and especially abundant where there was plenty of leaflitter (Duellman and Schwartz, 1958). In ENP, it was reported from prairie, pineland, and hammock (Meshaka et al., 2000), and for Florida generally, hammock was noted to be habitat for this species (Carr, 1940a).

Its abundance varied among habitats. In ENP, individuals were far more abundant in prairie than in either pineland or hammock (Dalrymple, 1988), and in a long-unburned sandhill on the ABS, its abundances increased over time in keeping with the preference of this species for leaflitter (Meshaka and Layne, 2002). From small mammal trapping grids on the ABS, number of days this species was observed/trap/month was estimated in the following habitats: Bayhead (0.045), low flatwoods-palmetto (0.002), low flatwood- grass

Figure 161. Ground Skinks, *Scincella lateralis,* from Broward (Top) and Okeechobee (Bottom) Counties, Florida. Photographed by R.D. Bartlett.

(0), mature sand pine scrub- oak phase- (0.002), scrubby flatwoods- inopina oak phase (0).From the arrays on the ABS, we found the Ground skink was present in the two unburned arrays (0.009 and 0.006) and abundant in the pre-burn arrays (Figure 162). Although numbers were small, abundances were somewhat higher in plots of less frequently burned sandhill than in frequently burned plots (Mushinsky, 1985). This species was equally abundant in sandhill as in xeric hammock, each with some layer of ground cover as herbaceous growth or leaflitter (Enge and Wood, 2001). Elsewhere in Hernando County, the Ground Skink was found more frequently in xeric hammock than in sandhill but was most abundant in hydric hammock and upland mixed forest (Enge and Wood, 2000). In Gainesville, individuals preferred leaflitter containing some amount of pine needles (Brooks, 1967). This species was found to have been more abundant in later successional stages of scrub, thereby providing more vertical structure and canopy (Campbell and Christman, 1982). Although found under cover in supratidal habitat in Florida, the Ground Skink was not associated with truly tidal areas (Neill, 1958). Florida habitats were similar to those used by this species in Alabama, where it was found in most forested terrestrial habitats, preferring mesic and dry over damp sites (Mount, 1975). Likewise, as far north as North Carolina, the Ground Skink occurred in a wide structural range of habitats, ranging from open to closed but always with some amount of ground cover (Palmer and Braswell, 1995). Two populations in eastern Texas, like those of southern Florida, were associated with sandy soil (equating with well-drained substrate) leaflitter; the denser of the two being associated with more ground cover (Mather, 1970).

Growth and Survivorship.—In a long-unburned sandhill on the ABS, a survivorship of 1.4 months was reported from one of 27 individuals whose survivorship was at least one month (Meshaka and Layne, 2002).

Activity.—On the ABS, we found activity of the Ground Skink to have occurred nearly throughout the year but with unimodal (pitfalls) and bimodal (arrays) seasonal amplitudes in its activity during January−September (Figure 163). In northern Florida, activity was reported to have occurred during February−November but especially during April−July (Franz et al., 1995). In North Carolina (Palmer and Braswell, 1995) and Virginia (Mitchell, 1994), activity also occurred throughout the year but especially during March−October. In southern Florida, the Ground Skink was diurnal, usually detected as it scurried in and about leaflitter. In North Carolina (Palmer and Braswell, 1995) and eastern Texas (Mather, 1970), this species was likewise reported to be diurnal. In eastern Texas, because activity was greatest when soil temperatures ranged 18.3−21.1 ^{0}C, Ground Skinks were active during the warmest part of the day during early spring and fall, active during mid−morning and dusk during the summer, and scarce at anytime during July−August (Mather, 1970). This species was observed to climb (Townsend et al., 2005) and to swim (McCallum and McAllister, 2006).

Distance between successive captures (6.7, 20.8 m) were available for two individuals at a site on the ABS (Meshaka and Layne, 2002) and were within the range reported for northern Florida (Brooks, 1967). The same was true for eastern Texas, where average distances were larger for males (10.4 m) than for females (7.0 m) and juveniles (5.6 m) (Mather, 1970). Maximum distances between captures were also larger in males (12.2, 13.7 m) than in females (8.7, 9.0 m) (Mather, 1970).

Predators.—On the ABS, an individual was recovered from the nest box of a Screech Owl (*Otis asio*) on 4 May 1978. On the ABS, we have predation records by the Southern Black Racer, Southern Ringneck Snake, and the Dusky Pigmy Rattlesnake. This species was eaten by the Ringneck Snake elsewhere in Florida (Myers, 1965) and in Georgia (Hamilton and Pollack, 1956). In North Carolina, this species was eaten by the Carolina Pigmy Rattlesnake (Palmer and Williamson, 1971; Palmer and Braswell, 1995) and Eastern Milk Snake (Palmer and Braswell, 1995).

Threats.—Ubiquitous in a variety of habitats, the Ground Skink is among the smaller−bodied segments of the southern Florida herpetofauna that can withstand greater levels of habitat fragmentation. This species also presents an opportunity to more fully explore the synecology of the small semi-fossorial amphibians and reptiles of mesic and upland habitats of southern

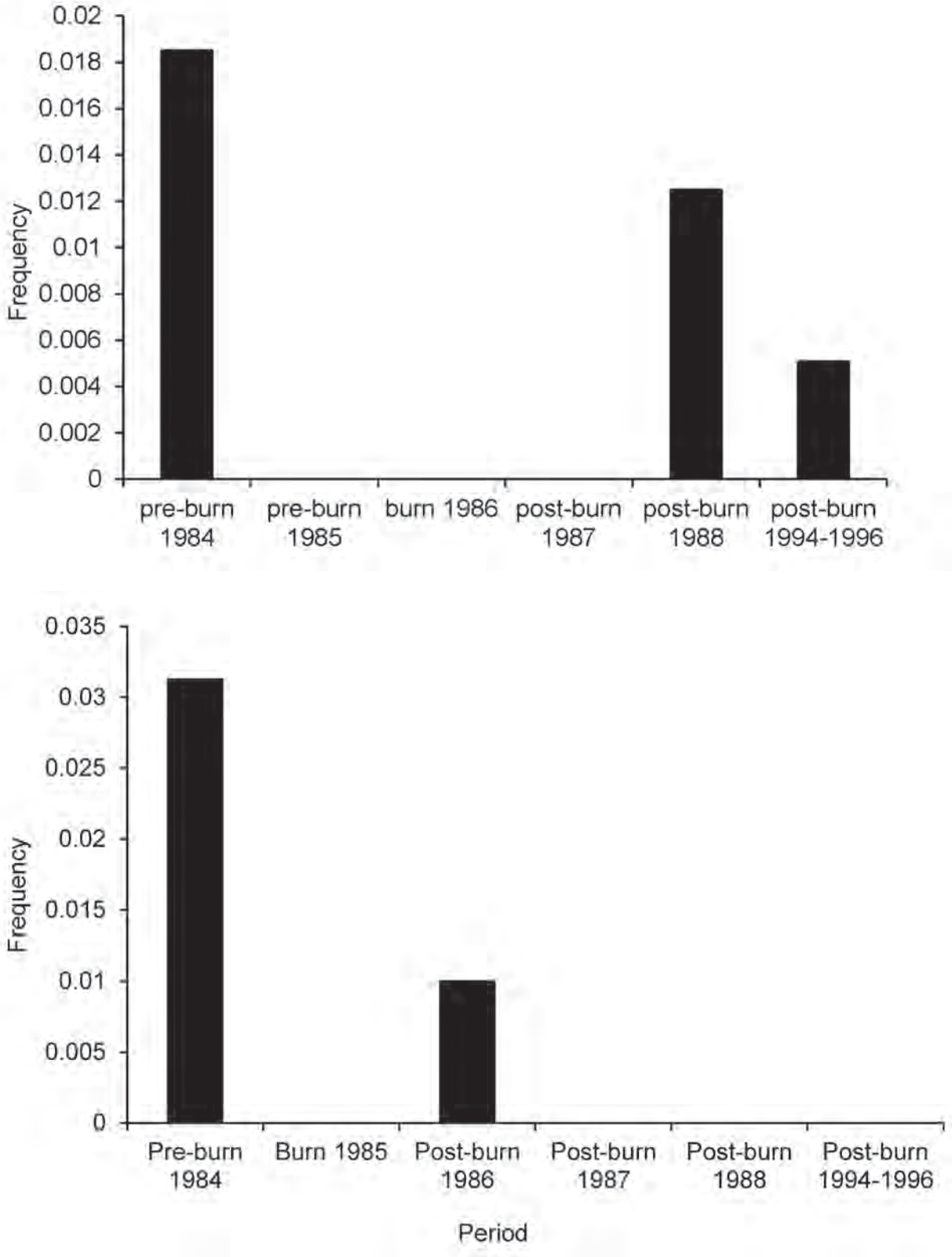

Figure 162. Relative abundance of Ground Skinks, *Scincella lateralis,* from two different sites (top, bottom) in scrub habitat on the Archbold Biological Station (N = 3).

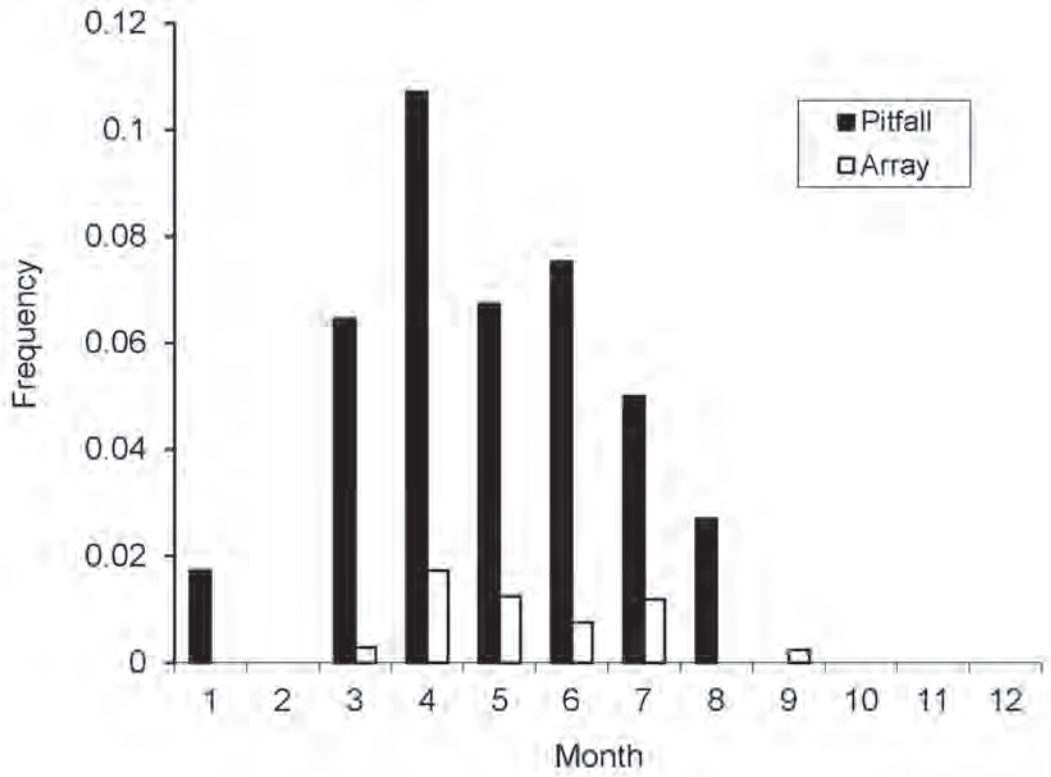

Figure 163. Seasonal activity of the Ground Skink, *Scincella latralis,* from pitfall traps in sanhill habitat and arrays in scrub habitat on the Archbold Biological Station (N = 30 pitfall, 14 array).

Florida.

Teiidae

*Aspidoscelis sexlineata (*Linnaeus, 1766)
Six-lined Racerunner

Description.—One form of the Six-lined Racerunner has been described that occurs in southern Florida: The Six-lined Racerunner, *A. s. sexlineata* (Linnaeus, 1766). The dorsum of the Six-lined Racerunner from southern Florida is smooth in texture with almost granular scales. Six distinct black longitudinal lines are present (Figure 164). The venter of males is uniformly blue in color, whereas that of females is white. Ground color is darker in individuals from the extreme southern tip of Florida than in northern populations (Burt, 1931). Number of femoral pores is lowest in southern mainland Florida and highest in northern Florida and the lower Florida Keys (Duellman and Schwartz, 1958). Trauth (1980) found that scale counts of keys populations were more similar to those of northern Florida, and that the lateral supraocular granules were very high on lizards from the Apalachicola islands. Trauth (1980) also noted morphological distinction of several Florida populations from the Ocala National Forest, Polk and Highlands counties. The scale counts of this "central Florida race" were higher than surrounding areas but otherwise resembled eastern *A. s. sexlineata*. The regional variation of the Florida populations and the persistence of ancient sandy ridges led Trauth (1980) to propose that Florida was the evolutionary center for the species.

Distribution.—Southern Florida populations of the Six-lined Racerunner represent the southern terminus of the species' geographic range (Conant and Collins, 1998). The geographic distribution of the Six-lined Racerunner in Florida is statewide (Ashton and Ashton, 1991; Meshaka and Ashton, 2005), exclusive of the main area of the deepwater Everglades (Conant and Collins, 1998).

Body Size.—On the ABS, mean adult body size of males (mean = 67.4 ± 5.6 mm SVL; range

= 58−79; n = 44) was similar to that of females (mean = 65.6 ± 4.0 mm SVL; range = 58−73; n = 33). Mean body sizes of adults of both sexes did not differ between burned and long-unburned sites on the ABS. Regardless of burn regimes, lizards at a sandhill in Tampa (Mushinsky, 1985) were smaller than those of southern Florida, which in turn were more similar to those of northern sites. For example, in Virginia, males (mean = 64.9 ± 5.5 mm SVL; range = 52−72; n = 49) were slightly smaller than females (mean = 66.8 ± 6.5 mm SVL; range = 52−76; n = 61) (Mitchell, 1994). In Indiana, males (65.3 mm SVL; range = 59−74; n = 28) were slightly larger than females (64.8 mm SVL; range = 58−77; n = 20) (Minton, 2001).

Habitat and Abundance.—Across Florida the Six-lined Racerunner was a species strongly associated with open sandy sites (Carr, 1940a; Duellman and Schwartz, 1958; Campbell and Christman, 1982; Ashton and Ashton, 1991), including that of tidal wrack (Neill, 1958). On the ABS, individuals used Gopher Tortoise burrows in sand pine scrub and burned sections of scrubby flatwoods exclusively during the summer (Lips, 1991). From small mammal trapping grids on the ABS, number of days this species was observed/trap/month was estimated in the following habitats: Bayhead (0), low flatwoods-palmetto (0.025), low flatwood- grass (0.033), mature sand pine scrub- oak phase- (0.007), scrubby flatwoods- inopina oak phase (0.013).On the ABS, whereas the frequency of captures of the Six-lined Racerunner were low in two unburned sites (0.021 and 0.036), frequency of capture spiked for a short period immediately following a burn in two adjacent sties (Figure 165, 166). Collectively, in those arrays we found a 50:57 ratio of males to females, and 33 juveniles comprised 24% of the population. In the long unburned sandhill habitat of Redhill, the Six-lined Racerunner persisted by exploiting small open sandy patches within what were large home ranges (Meshaka and Layne, 2002). In contrast to the scrub site, males on Redhill outnumbered females 69:11, and 65 juveniles comprised 45% of the population, suggesting fewer adults and low adult survivorship in this suboptimal habitat. At a Tampa sandhill, this species was also persistent in a long-unburned plot with highest abundance reported in more frequently burned plots (Mushinsky, 1985). Likewise, Campbell and

Figure 164. A Six-lined Racerunner, *Aspidocseis selineata sexlineata,* from Highlands County, Florida. Photographed by R.D. Bartlett.

Christman (1982) found the Six-lined Racerunner to be most abundant in younger more open scrub. Corroborating these findings, the Six-lined Racerunner was found to be highly abundant in sandhill and absent in a xeric hammock in Hernando County (Enge and Wood, 2001). Elsewhere in Hernando County, this teiid was most abundant in sandhill (Enge and Wood, 2000). In scrub habitat in Avon Park, the Six-lined Racerunner was very abundant and the second most abundant lizard captured (Branch and Hokit, 2000).

Overwintering animals dug their own burrows or used suitable refugia. For example, on the ABS an individual was found overwintering in an Oldfield Mouse burrow on 2 Dec 1941. Association of the Six-lined Racerunner with sandy open areas in southern Florida and in Florida generally was a life history trait consistent throughout the geographic range of this species (Mount, 1975; Mitchell, 1994; Palmer and Braswell, 1995; Minton, 2001).

Diet.—On the ABS, individuals were routinely observed actively foraging in open sandy areas. There, they would move about, stopping to poke their noses under leaves, scratch at objects and look around for terrestrial arthropods like grasshoppers. In this way, prey were stirred or found moving about and chased down, such that this species was quite adept at capturing grasshoppers (Orthoptera). In Tampa, the Six-lined Racerunner fed mostly on beetles, isopterans, and orthopterans (Punzo, 1990). These findings did not conflict with diet of Maryland the Six-lined Racerunner (McCauley, 1939).

Reproduction.—In south-central Florida, eggs were laid during May−August (S.E. Trauth, unpubl. data). In Tampa, gravid females first appeared in May, and the first young-of-the-year appeared two months later, with most juveniles entering the population during July−September (Mushinsky, 1985). Whereas nesting season in southern Florida was longer than that in the Northeast, it was similar to that out west. For example, most nesting occurred during May−June in North Carolina (Palmer and Braswell, 1995) and occurred during June in

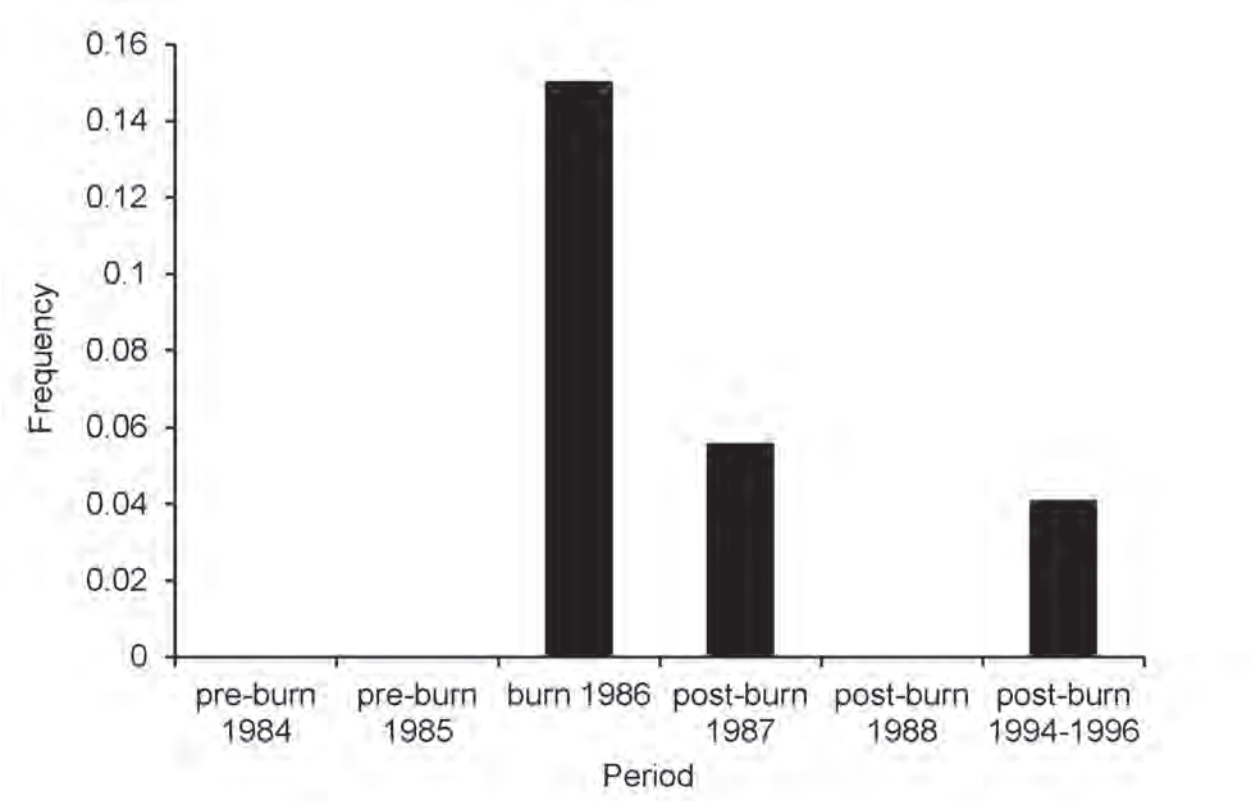

Figure 165. Relative abundance of the Six-lined Racerunner, *Aspidoscelis sexlineata sexlineata,* from scrub habitat on the Archbold Biological Station (N = 29).

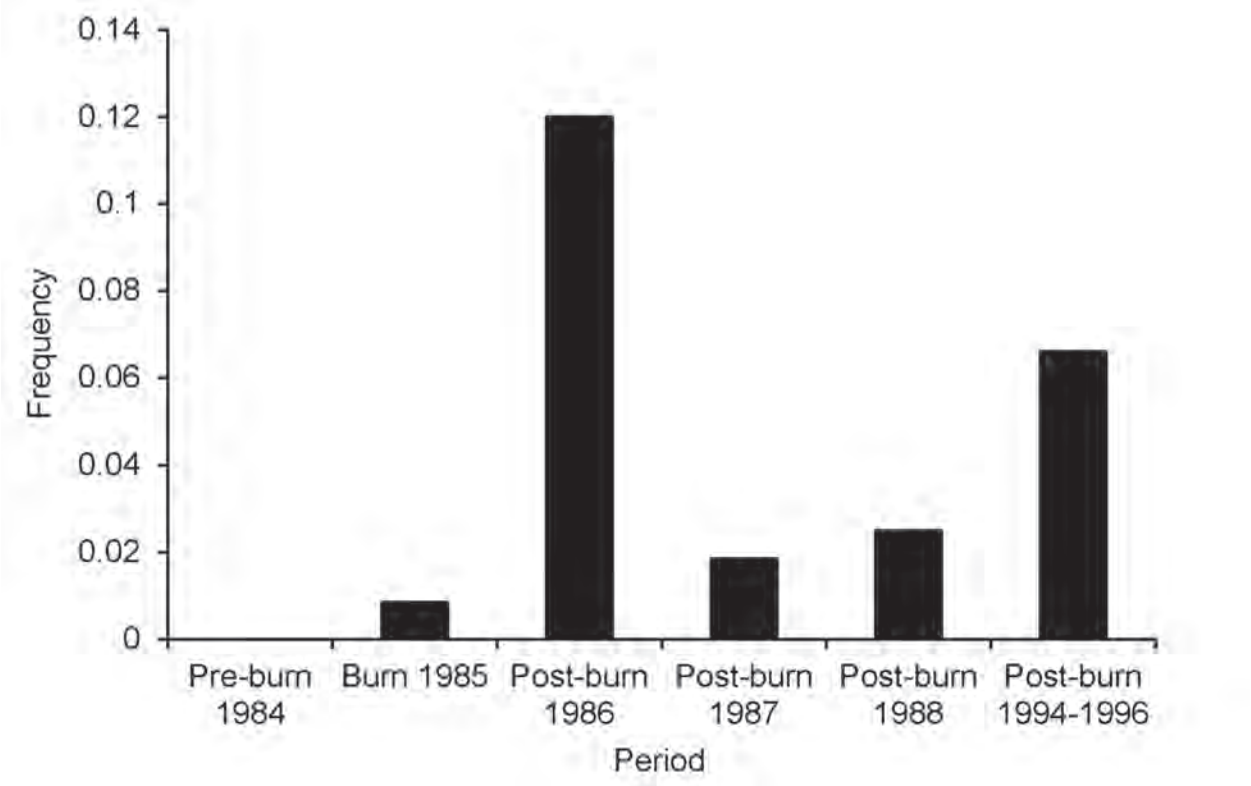

Figure 166. Relative abundance of the Six-lined Racerunner, *Aspidocselis sexlineata sexlineata,* from scrub habitat on the Archbold Biological Station (N = 30).

Wisconsin (Vogt, 1981); however, nesting occurred during May−August in Oklahoma (Carpenter, 1960) and Kansas (Fitch, 1958).

Growth and Survivorship.—On the ABS, hatchlings (31−32 mm SVL) were apparent during June−October (Figure 167). Body size at maturity did not appear to differ geographically. On the ABS, individuals smaller than 50 mm SVL grew from 1.5 to 4.7 mm/ mo. Those growth data and the monthly distribution of body sizes (Figure 167) suggest that sexual maturity occurred in less than one year. Similarly, in Tampa sexual maturity was achieved the following May or June (Mushinsky, 1985), and in the Interior Highlands Region, sexual maturity occurred in about 10−11 months (Trauth, 1983). The longest survivorship values of three adults (65−68 mm SVL) ranged 11.4−11.8 mo. From this long-unburned sandhill site on the ABS, low survivorship (mean = 6.6 ± 4.8 mo.; range = 1.0−11.8) was reported for 13 of 72 individuals whose survivorship was at least one month (Meshaka and Layne, 2002). Thus, individuals on the ABS were probably dead by the age of two years. In Tampa, the population turned over in little more than one year (Mushinsky, 1985), whereas in Kansas. Racerunners lived as long as five years of age (Fitch, 1958; Hardy, 1962).

Activity.—On the ABS, this species was active during March−November, with most activity during April−July (Figure 168, 169). Seasonal activity in southern Florida varied little as one proceeded northward until the very edges of its range. For example, in Tampa the Six-lined Racerunner was active during April−October (Mushinsky, 1985). Specifically, adults were uncommon during July−October, juveniles were the last to disappear for the season, and all re-appeared in mid−April (Mushinsky, 1985). In northern Florida, the Six-lined Racerunner was active during March−November, but most activity occurred during April−August (Franz et al., 1995). In Alabama and Georgia, individuals were generally active during April−August in (Etheridge et al., 1986) but may have extended as late as March−November (Etheridge et al., 1983). Among the most northern populations, the active season was during March−December, with most activity having occurred during May−August in North Carolina (Palmer and

Braswell, 1995), April−September in Virginia (Mitchell, 1994), May−October in Indiana (Minton, 2001), and May−September in Wisconsin (Vogt, 1981). Mean home range size was large for males (515.4 m) and females (365.8 m) from a long-unburned sandhill on the ABS (Meshaka and Layne, 2002). As elsewhere in its geographic range (e.g., Mushinsky, 1985; Mitchell, 1994; Palmer and Braswell, 1995; Minton, 2001), the Six-lined Racerunner in southern Florida was diurnal in its activity.

Predators.—On the ABS, the Southern Black Racer, Scarlet Kingsnake, and Eastern Coachwhip were predators of the Six-lined Racerunner, and the American Kestrel both ate this lizard and fed it to its nestlings. In Georgia, a putrefying individual was found to have been eaten by an Eastern Coachwhip (Stevenson and Dyer, 2002). In North Carolina, this species was subject to the depredations of the Eastern Coachwhip (Brown, 1979; Palmer and Braswell, 1995) Eastern Kingsnake (Palmer and Braswell, 1995), and the Carolina Pigmy Rattlesnake (Palmer and Williamson, 1971; Palmer and Braswell, 1995).

Threats.—The Red Imported Fire Ant was probably the greatest threat to eggs and seasonally torpid individuals. The latter threat was greater in southern populations where the warmer winter temperatures provided this ant with more foraging days.

Amphisbaenidae

Rhineura floridana Cope, 1861
Florida Worm Lizard

Description.—Uniformly pinkish−white in color, the Florida Worm Lizard resembles a night crawler in its absence of legs and appearance of a segmented body (Figure 170). Morphologically different populations of this species exist between the Lake Wales Ridge and

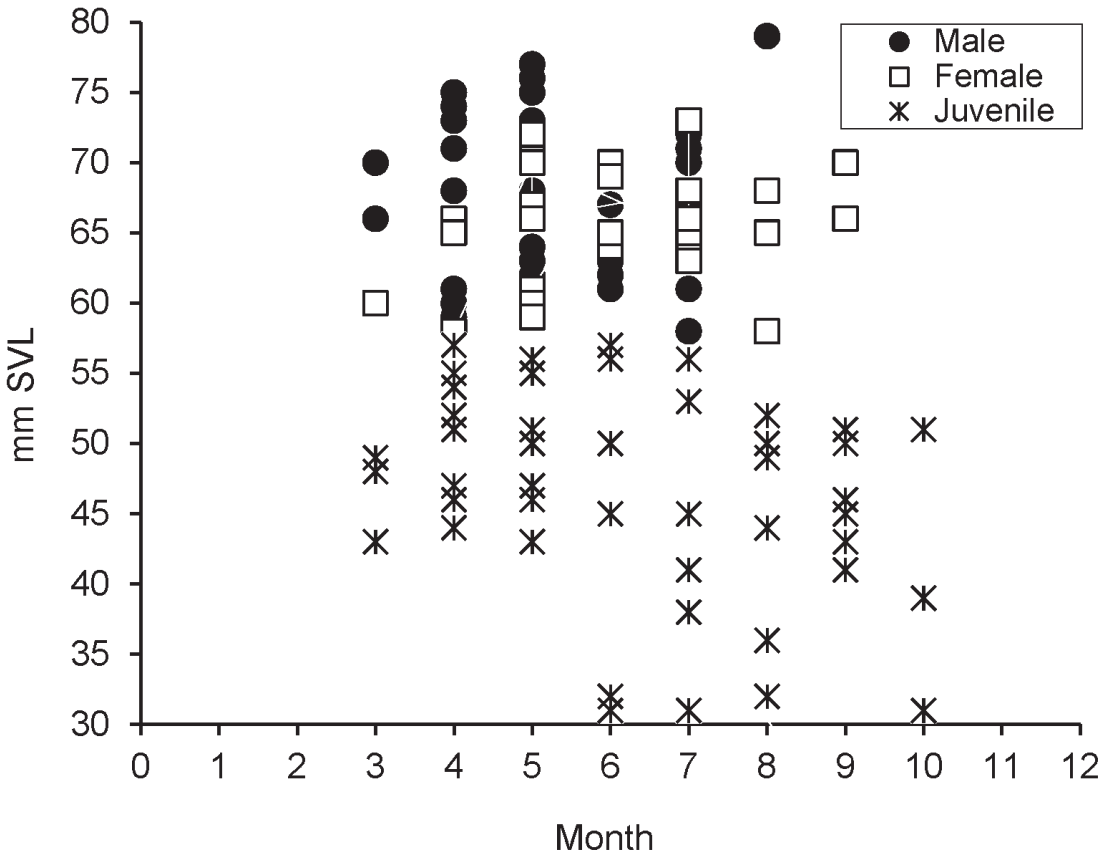

Figure 167. Monthly distribution of body size of the Six-lined Racerunner, *Aspidoscelis sexlineata sexlineata,* from the Archbold Biological Station (N: male = 44, females = 33, juveniles = 50).

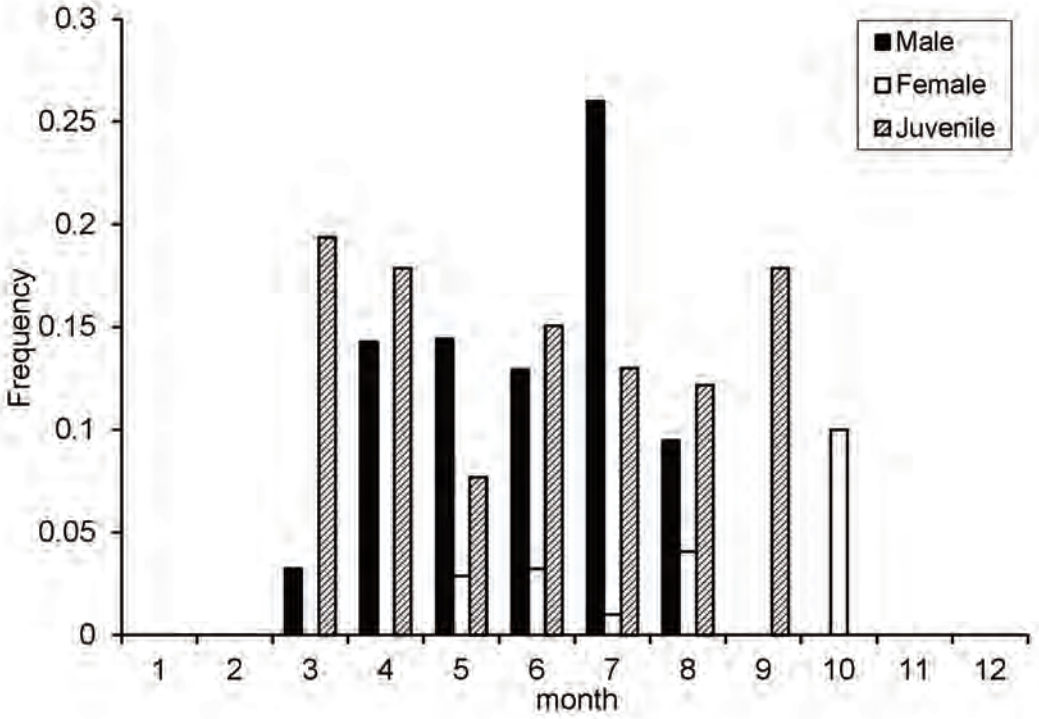

FIGURE 168. Seasonal activity of the Six-lined Racerunner, *Aspidoscelis sexlineata sexlineata,* from sandhill habitat on the Archbold Biological Station (N: male = 69, females = 11, juveniles = 65).

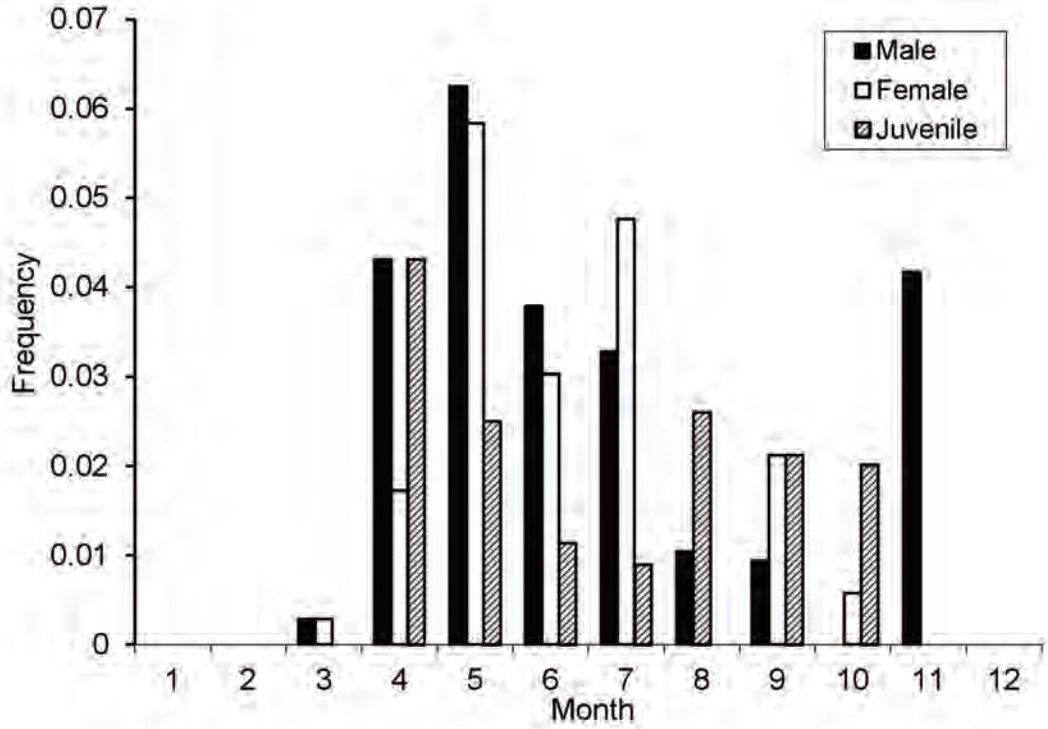

FIGURE 169. Seasonal activity of the Six-lined Racerunner, *Aspidoscelis sexlineata sexlineata,* from scrub habitat on the Archbold Biological Station (N: male = 50, female = 57, juvenile = 33). .

the north-central remainder of its geographic range (Zug, 1968). Winter Haven and the Auburndale and Lakeland region probably represent the zone of intergradation (Zug, 1968). Sea level fluctuations best explain the isolation. Principally, Zug (1968) asked, what factor(s) was responsible for the reduction in scutellation in the Lake Wales Ridge population? Mitochondrial DNA sequence data revealed differences between north-central and south-central populations, with the latter populations having the greater genetic distances (Mulvane et al., 2006).

Distribution.—Southern Florida populations of the Worm Lizard represent the southern terminus of the species' geographic range (Conant and Collins, 1998). A Florida endemic, the Florida Worm Lizard is restricted to sandy upland habitat from south-central to northern Florida (Gans, 1967; Ashton and Ashton, 1991; Conant and Collins, 1998; Meshaka and Ashton, 2005).

Body Size.—An adult male from Lake Placid measured 246 mm SVL, and an unidentified individual from the ABS measured 205 mm SVL. In Gainesville, mean body sizes of males (mean = 251.7 ± 3.77 mm SVL; range = 245−256; n = 10) were similar to that of females (mean = 248.6 ± 2.91 mm SVL; range = 244−254; n = 10) (Zug, 1968).

Habitat and abundance.—Our observations at the southern end of the Lake Wales Ridge mirrored those of others (Carr, 1940a; Ashton and Ashton, 1991), that the Florida Worm Lizard was closely associated with sandy upland habitat.

Diet.—Beetle larvae were recovered from an individual found dead on the ground on the ABS in sand pine scrub on 13 October 1978. Ants and termites have also been reported in the diet of this species (Ashton, 1976).

Reproduction.—The testis length and width of left and right testes of a 24.6 cm SVL male captured in Lake Placid on 3 March 1983 measured 12 X 3 and 11 X 2 mm, respectively.

Predators.—On the ABS, an individual was recovered from the stomach of a Nine-banded Armadillo on 24 July 1967. This species has been reported to be subject to the depredations of the Eastern Coral Snake (Jackson and Franz, 1981),

Threats.—The population dynamics of this Florida sandy upland endemic species was not well known anywhere in its geographic range and its ecology has received very little attention in southern Florida. As what appeared to be narrowly suitable habitat diminishes in acreage in Florida so will disappear the chance to understand the biology of this very curious species.

Summary of the Southern Florida Lizards and Amphisbaenian

The 12 lizard species accounted for 14.8 % of the total non-marine native herpetofauna in southern Florida. Southern Florida endemism existed in two species, a morphological cline was apparent in one species, and regional distinction in morphology was apparent in four species. A Florida Keys−north Florida connection in morphology was detected in two skink species. Southern Florida was the southern terminus of the geographic range for all but one species, whose geographic range reached its northern limit in southern Florida. One species was reported to be exotic in the West Indies. Adult body size of males of one species was larger in the southern Everglades than elsewhere, and frequently-burned habitats were associated with mean body size differences in two species but not in the males or both sexes of two other species. Too few data were available to detect patterns with respect to reproduction and growth of southern Florida lizards, with one species each producing larger, smaller or similar absolute clutch sizes compared to northern populations, and other species maturing at larger (one species), smaller (one species), or similar (one species) body sizes than populations outside of southern Florida. Four species matured at earlier ages in southern Florida, the activity season was longer in three species, and the same in three other species compared to northrn populations.

Serpentes

Colubridae

Cemophora coccinea (Blumenbach, 1788)
Scarlet Snake

Figure 170. Florida Worm Lizard, *Rhinerua floridana,* adults (top, middle) and juvenile (bottom) from Highlands County, Florida. Photographed by R.D. Bartlett.

Description.—One form of the Scarlet Snake has been described that occurs in southern Florida: The Florida scarlet snake, *C. c. coccinea* (Blumenbach, 1788). This species is distinguished by a shiny white venter and long red dorsal blotches alongside smaller black−yellow−black blotches (Figure 171). In peninsular Florida, number of blotches decreases along a north-south geographic cline and is accompanied by a likewise broadening of those blotches (Duellman and Schwartz, 1958). Christman (1980b) did not corroborate that pattern but detected a north-south cline in the sum of ventral and caudal scales. Long red bands tended to be bimodally distributed between northern Florida and southern Florida, and red body bands were fewer in number among snakes in northern Florida, just south of Tampa, and in the Everglades (Christman, 1980b).

Distribution.—Southern Florida populations of the Florida Scarlet Snake represent the southern terminus of the species' geographic range (Conant and Collins, 1998). A Florida endemic, the geographic distribution of the Florida Scarlet Snake extends southward from the northern peninsula through extreme southern mainland Florida (Ashton and Ashton, 1988b; Conant and Collins, 1998; Meshaka and Ashton, 2005).

Body Size.—From southern Florida, two males measured 39.2 and 62.4 cm SVL. Seven females averaged 38.2 ± 4.1 cm SVL (range = 32.8−43.8). In Virginia, Northern Scarlet Snake (*C. c. copei* Jan, 1863) males (45.0 cm SVL; 29.5−57.5) averaged larger than females (36.2 cm SVL; 26.0−48.3) (Mitchell, 1994).

Habitat and abundance.—In southern Florida, the Florida Scarlet Snake occurred in pinewoods, rosemary scrub, and in mesophytic hammocks, but avoided the Everglades and the Keys (Duellman and Schwartz, 1958). The three records of this species from ENP, all females, came from pine-prairie ecotone, marsh near Mahogany Hammock and, most unexpectedly, immediately south of West Lake among the mangrove forests (Meshaka et al., 2000). Two individuals, also captured in ENP, were both from prairie and none was captured elsewhere (Dalrymple, 1988). On the ABS, individuals were encountered in scrubby flatwoods and between low and scrubby flatwoods. Excepting the record from mangrove forest, perhaps in

Figure 171. A Florida Scarlet Snake, *Cemophora coccinea coccinea* from Highlands County, Florida. Photographed by R.D. Bartlett.

association with imbedded tropical hardwood hammocks, this species did not otherwise differ in its habitat association of well−drained uplands with populations elsewhere. For example, at a site in Hernando County, this species was more abundant in a sandhill than in a xeric hammock (Enge and Wood, 2001). Elsewhere in Hernando County, individuals were caught in similar numbers in both of these habitats but were most often caught in scrub (Enge and Wood, 2000). In Florida, Ashton and Ashton (1988b) associated this species with sandy soils and thought it common in pine flatwoods. In contrast, Carr (1940a) reported this species to be generally distributed but usually associated with fairly moist soil and noted that specimens had been dug out of sphagnum beds. In Alabama (Mount, 1975) and Virginia (Mitchell, 1994), this species was most abundant in habitats of loose well−drained soil. This species was associated mostly with sandhills and sandy pine flatwoods of the coastal plain (Martof et al., 1980). In Texas, both the Northern Scarlet Snake and the Texas Scarlet Snake (*C. c. lineri* Williams, Brown, and Wilson, 1966) were known from habitats of loose sandy soil, apparently regardless of the vegetation (Werler and Dixon, 2000).

Reproduction.—Two females captured in ENP on 28 June 1998 and 27 July 1998 were spent. A female captured on 11 February 1999 contained seven developing ova, the largest of which was 4.1 mm. A gravid female was collected on 2 June from northern Florida (Sumpter County) (Carr, 1940a). Recently captured females laid eggs in July (Ashton and Ashton, 1988b). Similarly, nesting began no earlier than June outside of Florida, and the latest nesting record was for August in North Carolina (Palmer and Tregembo, 1970). In Virginia, eggs near hatching were collected in September (Woolcott, 1959).

Growth and Survivorship.—In southern Florida, the smallest individual (12.9 cm SVL) was collected in November.

Activity.—In southern Florida, activity was strongly seasonal with most activity occurring during the summer (Dalrymple et al., 1991). We captured most individuals in July and examined specimens collected during January – November. In Palm Beach, a DOR individual was taken in January (Cochran, 2003). Elsewhere in Florida, activity occurred throughout the year but with a strong seasonal element (Enge and Sullivan, 2000). Activity was seasonally constrained but was likewise unimodal in South Carolina during spring−summer (Nelson and Gibbons, 1972; Gibbons and Semlitsch, 1987). In Virginia, activity was reported during April−November (Mitchell, 1994).

Our observations of its general activity closely mirrored those of Carr (1940a): Fossorial and often above-ground at night. The same was true of populations elsewhere (Mount, 1975; Martof et al., 1980; Mitchell, 1994).

Predators.—In southern Florida, the Eastern Coral Snake ate this species (Heinrich, 1996). On the ABS, a Florida Scrub Jay was observed pecking at a dead individual on 9 June 1980, although it was unknown if the bird had killed it.

Threats.—In light of historically diminished uplands in southern Florida and present−day destruction of much of the remaining patches, the status of this species warrants attention

Coluber constrictor Linnaeus, 1758
Eastern Racer

Description.—Two forms of the Eastern Racer have been described that occur in southern Florida: The Everglades Racer (*C. c. paludicola* Auffenberg and Babbitt, 1955) and Southern Black Racer (*Coluber constrictor priapus* Dunn and Wood, 1939) (Figure 172). Lower Florida Keys populations are more similar in markings to those of northern Florida than to those of southern mainland Florida (Duellman and Schwartz, 1958; Christman, 1980b). Venter color, however, is similar among northern Florida, lower Florida Keys, and Everglades populations, and a north-south cline was found in the ventral and caudal scale counts in Florida specimens (Christman, 1980b). Morphological differentiation of the lower Florida Keys populations was considered by Christman (1980b) to be as distinctive as the other recognized subspecies. Duellman and Schwartz (1958) had likewise seen these differences between a regionally distinct Everglades form and a more widespread form on the rest of the mainland and on the Florida Keys. Intergradation occurred on the upper Florida Keys (Duellman and Schwartz, 1958). The pale color of the Everglades Racer, reminiscent to us and to Carr (1940a) of the Yellowbelly Racer (*C. c.*

flaviventris Say, 1823), appeared to be a similar adaptation to a treeless environment (Christman, 1980b). The similarity between these two forms could also have reflected a close relationship (Auffenberg, 1955; Wilson, 1970; Christman, 1980b).

Distribution.—A Florida endemic, the Everglades Racer is essentially an Everglades form whose geographic distribution extended southward from the northern Lake Okeechobee to the upper Florida Keys (Duellman and Schwartz, 1958; Ashton and Ashton, 1988b; Conant and Collins, 1998; Meshaka and Ashton, 2005). This form is replaced by the Southern Black Racer on the middle and lower Florida Keys and elsewhere on the mainland. Duellman and Schwartz (1958) noted the Southern Black Racer on the coasts as far south as Marco Island on the west and in Broward County on the eastern rim. We have found intermediate individuals on the eastern rock rim of southern Miami-Dade County.

Body Size.—Florida Keys specimens seldom exceeded one meter in length (Lazell, 1989) and were considered smaller than mainland individuals (Bell, 1952). In southern Florida, average adult body size was smallest in scrub and was largest in wet areas (Table 18). In north-central Florida, body size of the Southern Black Racer was larger in hammock than in high pine and was largest in mesic habitats (Dodd and Franz, 1995). Geographically, the Eastern Racer of the Northeast and Florida was larger than congeners of the arid west and southern Texas (Rosen, 1991). The presence of racer-like subguild members was positively associated with maximum body size in this species (Rosen, 1991); however, in Florida, we found that individuals were smallest where they co-occurred with the Eastern Coachwhip; a species with which it may or may not have competed but from which was certainly at risk of predation. Body sizes of Kansas populations of the Eastern Racer varied in relation to food supply (Fitch, 2004a). As elsewhere in its geographic range, sexual dimorphism in body size among southern Florida populations was weak if evident (Table 18).

Habitat and abundance.—In southern Florida, the Everglades Racer occurred in the Everglades and the upper Florida Keys, where it was found in prairies and sometimes in mesic hammocks (Duellman and Schwartz, 1958). On the other hand, the Southern Black Racer was found in pine forest, scrub and hammock (Duellman and Schwartz, 1958). In ENP, the Everglades Racer was most abundant in pineland, equally abundant in tropical hardwood hammock and disturbed (Brazilian pepper forest), and least common in prairie (Dalrymple, 1988). Specimens were available from mangrove forest in ENP (Meshaka et al., 2000), and we collected an individual from Matheson Hammock.

On the ABS, the Southern Black Racer was found evenly, but not abundantly in Gopher Tortoise burrows of turkey oak, sandpine scrub, and burned and unburned sections of scrubby flatwoods (Lips, 1991). Most captures in those burrows occurred during the summer (Lips, 1991). From small mammal trapping grids on the ABS, number of days this species was observed/trap/month was estimated in the following habitats: Bayhead (0.006), low flatwoods-palmetto (0.011), low flatwood- grass (0.011), mature sand pine scrub- oak phase- (0.008), scrubby flatwoods- inopina oak phase (0.010).On the ABS, frequencies of captures in two arrays in unburned scrub (0.033 and 0.028) approximated values for two later post-burn sites (Figure 173, 174). However, the very highest values of capture preceded the burn at those sites. We wonder if mortality incurred from the fire suppressed future abundances. On BIR, this snake was abundant along brushy edges of watercourses (Table 1). The rate of moisture loss was low for Southern Black Racers from southern Florida (Bogert and Cowles, 1947).

Excepting mangrove forest, habitats of southern Florida populations of this snake did not differ substantially with those from elsewhere. For example, in north-central Florida the Southern Black Racer was more abundant in closed xeric hammock and sandhill than in open xeric hammock but was most abundant in mesic hammock. This species was considered to be an upland habitat generalist (Dodd and Franz, 1995). Individuals were trapped in similar abundances in sandhill and xeric hammock in Hernando County (Enge and Wood, 2001). Elsewhere in Hernando County, this snake was more abundant in xeric hammock and mesic flatwoods than it was in sandhill (Enge and Wood, 2000). For Florida generally, the Southern Black Racer was considered to be most abundant in open upland hammock and old fields but

Figure 172. An Everglades Racer, *Coluber constrictor paludicola*, from Miami-Dade County (top left) and a Southern Black Racer, *C. c. priapus* from Lee County (top right), Florida. Photographed by B.K. Mealey. A juvenile Eastern Racer, *C. constrictor*, from Miami-Dade County (bottom), Florida. Photographed by B.K. Mealey.

occasionally it was found in salt marsh (Carr, 1940a). Although widely distributed in Florida, this species was considered most common in brush-covered cutover areas near water (Ashton and Ashton, 1988b). Generally open areas, such as open woods, fields, and forest edge, and proximity to water was associated with the Southern Black Racer in Texas (Werler and Dixon, 2000) and with the Northern Black Racer (*C. c constrictor* Linnaeus, 1758) in Alabama (Mount, 1975), North Carolina (Palmer and Braswell, 1995), and Indiana (Minton, 2001). The Northern Black Racer was found in tall grass of coastal dunes in South Carolina (Lewis, 1946) and North Carolina (Obrecht, 1946). In the Northeast, the Northern Black Racer showed no real association with water (Hulse et al., 2001). In Virginia this form was found in xeric habitat of open woods and grassy fields (Mitchell, 1994). Similarly, Klemens (1993) found that it avoided deep woods in favor of open woods, fields, meadows, and rocky slopes.

Diet.—In southern Florida, individuals ate the Green Treefrog (Allen and Neill, 1950a), the Cuban Treefrog (Meshaka and Ferster, 1995) and the Striped Crayfish Snake (O'Brien, 1998). On the ABS, a frog was recovered from the stomach of an individual on 30 July 1980, and another individual had a large Southern Leopard Frog in its mouth at 1130 hrs on 11 March 1992. One Ground Skink was recovered from the stomach of a 21.2 cm SVL individual on 30 November 1978. A 53.3 cm SVL individual regurgitated by an Eastern Coral Snake contained the remnants of a Southeastern Five-lined Skink in its stomach on 13 July 1979. A 40 mm SVLSoutheastern Five-lined Skink was recovered from the stomach of an 81.8 cm female on 2 April 1985. A Southern Black Racer was encountered in the field with a Southern Ringneck Snake held midway in its mouth on 20 June 1984. One Southern

Table 18. Body size (cm SVL) and body size dimorphism of adult Eastern Racers, *Coluber constrictor*,from selected sites. For our study, means are followed by standard deviation, range, and sample size. For literature values, means are followed by range.

Location	Males	Females	M:F	Clutch Size
ENP (this study)	86.4 ± 8.5; 70.2 - 92.0; 15	90.3 ± 12.2; 70.0 - 120.0; 15	0.96	
Southern Florida (this study)	81.4 ± 13.1; 49.7 - 105.3; 45	89.6 ± 14.6; 61.8 - 120.0; 36	0.91	6.5; 4 - 9
BIR (this study)	84.4 ± 7.2; 74.0 - 94.0; 9	81.7 ± 14.7; 61.0 - 93.0; 3	1.03	
ABS (this study)	73.6 ± 15.0; 49.7 - 105.3; 15	85.8 ± 17.5; 61.8 - 120.0; 6	0.86	
ABS arrays, necropsy (this study)	72.4 ± 11.6; 58.0 - 109.6; 66	75.1 ± 11.1; 60.4 - 105.0; 37	0.96	
Virginia (Mitchell, 1994)	103.6 (63.1 - 139.5)	102.0 (75.0 - 136.0)	1.02	21.0; 12 - 36
Pennsylvania (Hulse et al., 2001)	95.7 (74.1 - 112.7)	100.1 (74.9 - 112.7)	0.96	13.7; 6 - 19
Indiana (Minton, 2001)	91.7 (77.5 - 109.0)	98.3 (80.0 - 118.7)	0.93	
Michigan (Rosen, 1991)	101.3 (min = 48.3)	101.3 (min. = 83.9)	1.00	15
Connecticut (Klemens, 1993)	99.7 (68.0 - 127.5)	88.5 (63.5 - 108.7)	1.13	
Kansas (Fitch, 1999)	71.5 (50.0 - 111.0)	82.2 (60.0 - 121.0)	0.87	11.8; 5 - 26

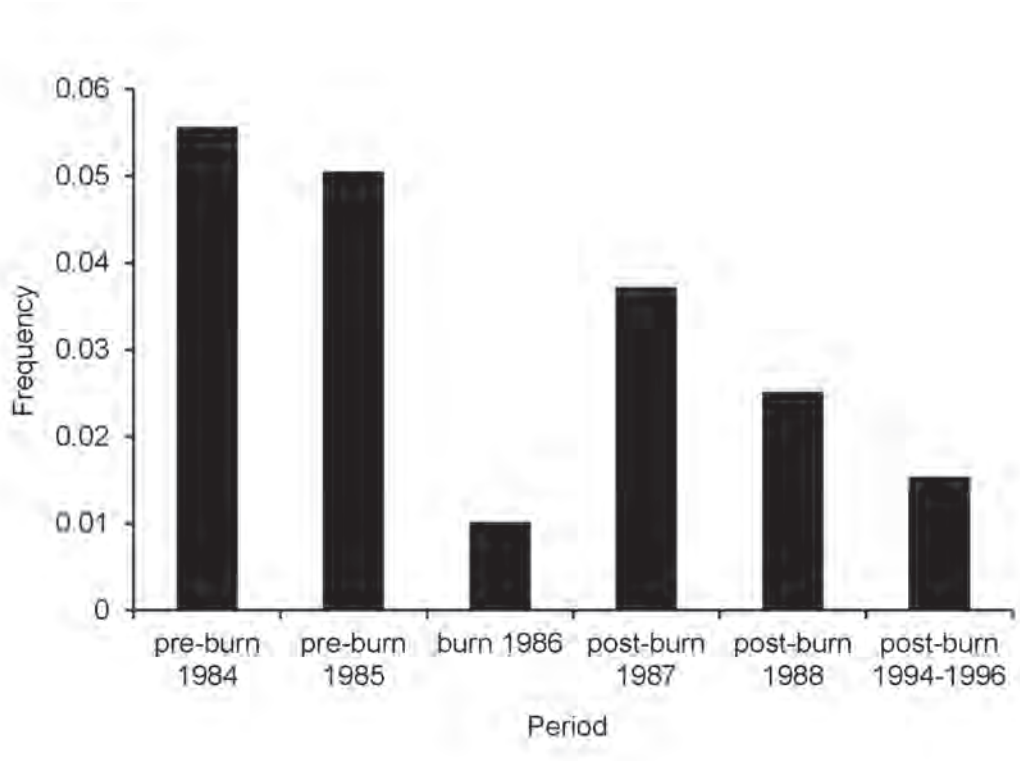

Figure 173. Relative abundance of the Southern Black Racer, *Coluber contrictor priapus,* from scrub on the Archbold Biological Station (N = 19).

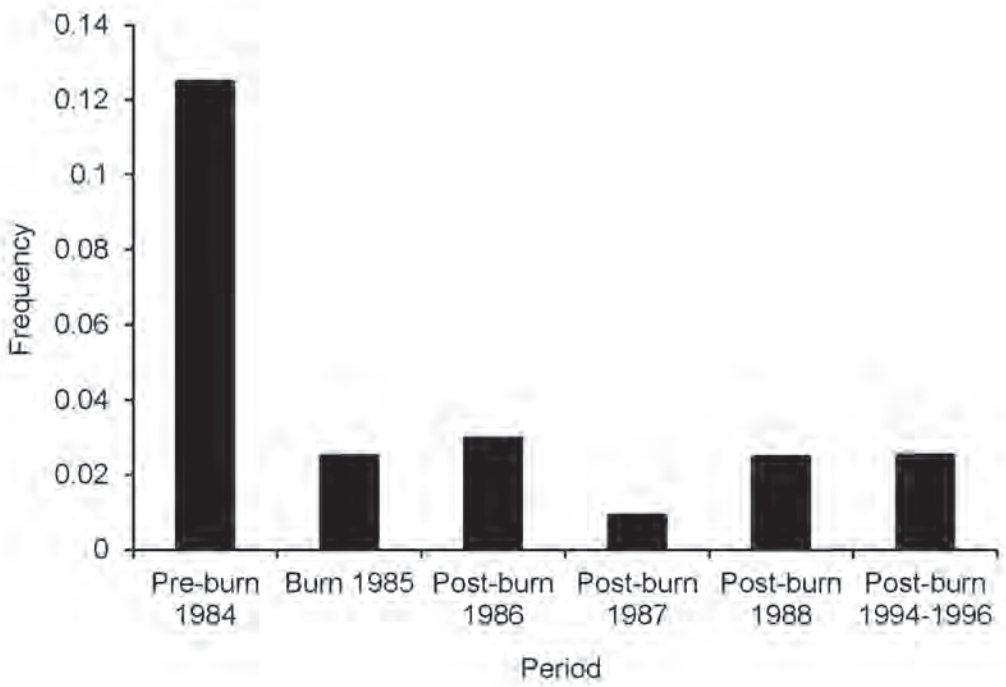

Figure 174. Relative abundance of the Southern Black Racer, *Coluber constrictor priapus*, from scrub habitat on the Archbold Biological Station (N = 22).

Leopard Frog was palpated from a 115.0 cm TL individual on 19 October 1968, and another from a 109.6 cm SVL male on 18 June 1980. One Southeastern Five-lined Skink was palpated from a 76.6 cm SVL female on 4 March 1980. One Green Anole was palpated from a 62.6 cm SVL male on 19 April 1981. One Six-lined Racerunner was palpated from an 80.0 cm SVL female on 7 June 1981. Southern Florida Eastern Racers also ate Green Treefrogs. We were unsure if southern Florida racers relied on invertebrate prey anywhere near to the extent it did in western locations. Rather, southern Florida populations, like those of North Carolina (Palmer and Braswell, 1995), were more so predators of amphibians and reptiles. For example, farther north in Florida the Southern Black Racer ate the Dusky Pigmy Rattlesnake (Printiss, 1994). In Florida, racers were reported to have fed on Southern Leopard Frogs (Carr, 1940a) and Florida Scrub Lizards (Jackson and Telford, 1974). In Northern Louisiana, racers ate vertebrates (Clark, 1949). In Georgia, the primary prey of this species was lizards (Hamilton and Pollack, 1956). In Michigan, the Blue Racer (*C. c. foxii* Baird and Girard, 1853) preyed more so on mammals and anurans than on insects, and insects were more common in small individuals than in larger ones (Rosen, 1991). One Yellowbelly Racer from Oklahoma regurgitated a Rough Green Snake and another regurgitated a Camel Cricket and a grasshopper (Carpenter, 1958). In contrast, the Mormon Racer (*C. mormon* Baird and Girard, 1852) was primarily insectivorous in Canada (Shewchuck and Austin, 2001). Vertebrates eaten by the Mormon Racer were almost exclusively mammals and eaten mostly by females, which were the larger-bodied sex (Shewchuck and Austin, 2001). In Kansas, orthoperans dominated the diet of the Yellowbelly Racer by occurrence, but mammals dominated its diet by weight (Fitch, 1963a). Ontogenetic shifts in diet occurred from soft−bodied orthopterans, lizards, and snakes among small individuals to grasshoppers and voles by increasingly large individuals (Fitch, 1963a). Mammals and lizards were important prey for the Eastern Racer throughout its geographic range, and the large individuals of the Northeast tended to ophiophagy (Fitch, 1963a).

Reproduction.—In southern Florida, the testis was at its maximum size in the fall and winter

for winter−spring mating (Figure 175) rather than in the summer for summer breeding as in northern populations of temperate snakes (Saint Girons, 1982). This subtropical adjustment was noted in tropical populations of the Diamondback Water Snake, *Nerodia rhombifer* (Hallowell, 1852) (Aldridge et al., 1995).

For south Florida, we have January−June mating records for Highlands County. Mating occurred earlier in the season in southern Florida than in northern locations, where it began in April and/or May farther north in the geographic range of this species (Conant, 1938b; Anderson, 1942; Wright and Wright, 1957; Fitch, 1963a; Rosen, 1991; Klemens, 1993; Palmer and Braswell, 1995; Minton, 2001).

In southern Florida, vitellogenesis began in late winter (Figure 176), which represented a departure from the spring vitellogenesis the spring that was typical for north temperate colubrid snakes (Aldridge, 1979). For example, in Arkansas, females began to ovulate in May (Trauth et al., 1994). Likewise, egglaying in southern Florida occurred earlier than in northern populations. Southern Florida females were gravid during April−June (Figure 176) (Dalrymple et al., 1991). Iverson (1978b) reported gravid female during April in Gainesville, and eggs near hatching were discovered in April in Gainesville (Wright and Wright, 1957). In North Carolina (Palmer and Braswell, 1995), Virginia (Mitchell, 1994), Arkansas (Trauth et al., 1994), Michigan (Rosen, 1991), females were gravid during May−June. In Pennsylvania for the Northern Black Racer (Hulse et al., 2001) and Kansas and the Yellowbelly Racer (Fitch, 1999) egglaying occurred during June−July. In southern Texas, similar in latitude to southern Florida, the Mexican Racer, *C. c. oaxaca* (Jan, 1863), laid its eggs during June−July (Werler and Dixon, 2000).

In southern Florida, mean clutch size was larger based on number of enlarged follicles (mean = 8.3 ± 2.6; range = 6−14; n = 6) than by number of shelled eggs (mean = 6.5 ± 1.9; range = 4−9; n = 8). These values were smaller than the 11.4 eggs reported for the Yellowbelly Racer in Kansas (Fitch, 1999) or the 14.1 eggs reported for the Northern Black Racer in North Carolina (Palmer and Braswell, 1995). An ANCOVA revealed a significant location effect on clutch

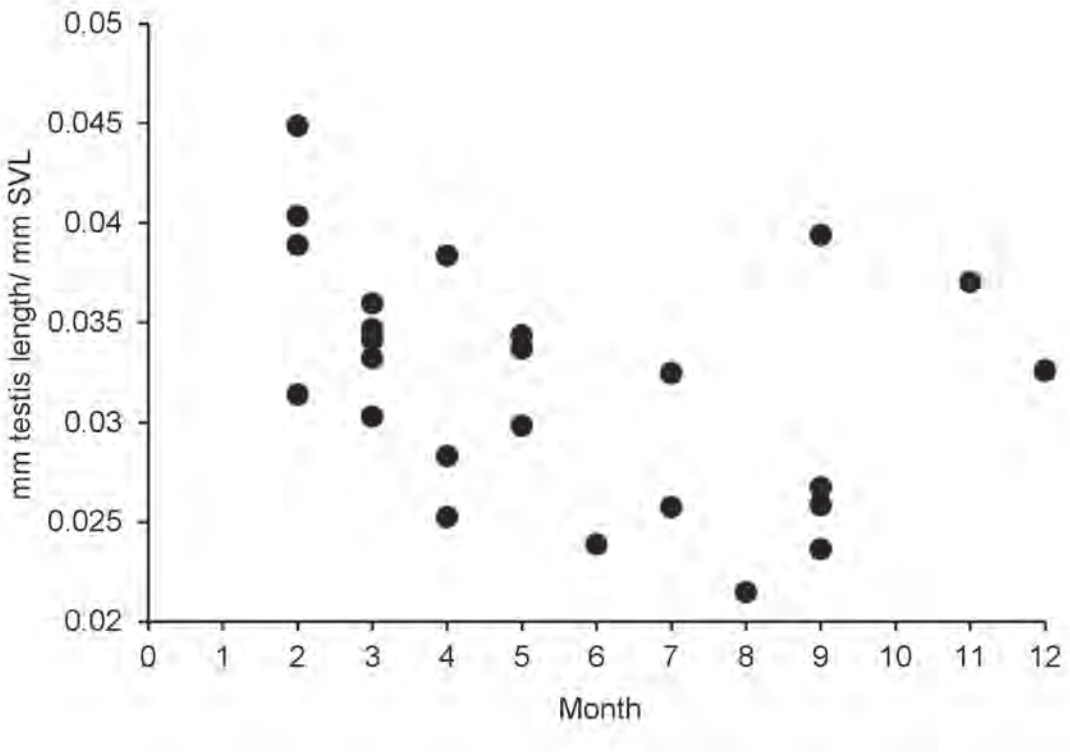

Figure 175. Monthly distrubution of testis sizes of the Eastern Racer, *Coluber constrictor,* from southern Florida (N = 26).

size, whereby southern Florida females produced the smallest clutch sizes per unit body size (Table 19).

Female body size was a strong predictor of clutch size as estimated by number of enlarged follicles but not number of shelled eggs (Figure 177). The mean egg dimensions for a 79.2 cm SVL female were 42.2 (± 4.2 mm; range = 34.0−46.4; n = 7) X 16.2 (± 1.2 mm; range = 14.0−18.0; n = 7). The mean egg dimensions for a 65.3 cm SVL female were 44.9 (± 2.6 mm; range = 42.0−47.3; 4) X 13.2 (± 0.2 mm; range = 13.0−13.4; n = 4). In southern Florida, Extensive fat development was noted in females collected in March.

Growth and Survivorship−In southern Florida (Figure 178) and on the ABS (Figure 179), smallest individuals (21.2−30.1 cm SVL) appeared during June−December. In Kansas, hatchlings appeared during August (Fitch, 1999). Minimum body size at sexual maturity varied, but did not appear to do so geographically (Table 18). In southern Florida, sexual maturity occurred during the first year of life (Figure 178, 179), and this estimate fitted Rosen's (1991) observed pattern of a decrease in age at maturity as one proceeded southward from Utah to Kansas to Michigan. For example, the Blue Racer in Michigan was mature by the age of one year for males and two years for females (Rosen, 1991), whereas in Kansas Yellowbelly Racers, males matured at two years of age, and females matured at two or three years of age (Fitch, 1999). In a Utah population of the Mormon Racer, males matured in just over one year of life and females began to mature at two years of life, although for most females maturity was first evident at three years of age (Brown and Parker, 1984).

Activity.—Across southern Florida, individuals were active throughout the year (Figure 178, 179, 180, 181) with a unimodal spring−summer pulse in ENP (Dalrymple et al., 1991) and a bimodal activity pattern of summer and a lesser peak in fall on the ABS (Figure 180, 181). However, we are unsure how to interpret the unusually high numbers of males captured in January on the ABS (Figure 180). Its activity was

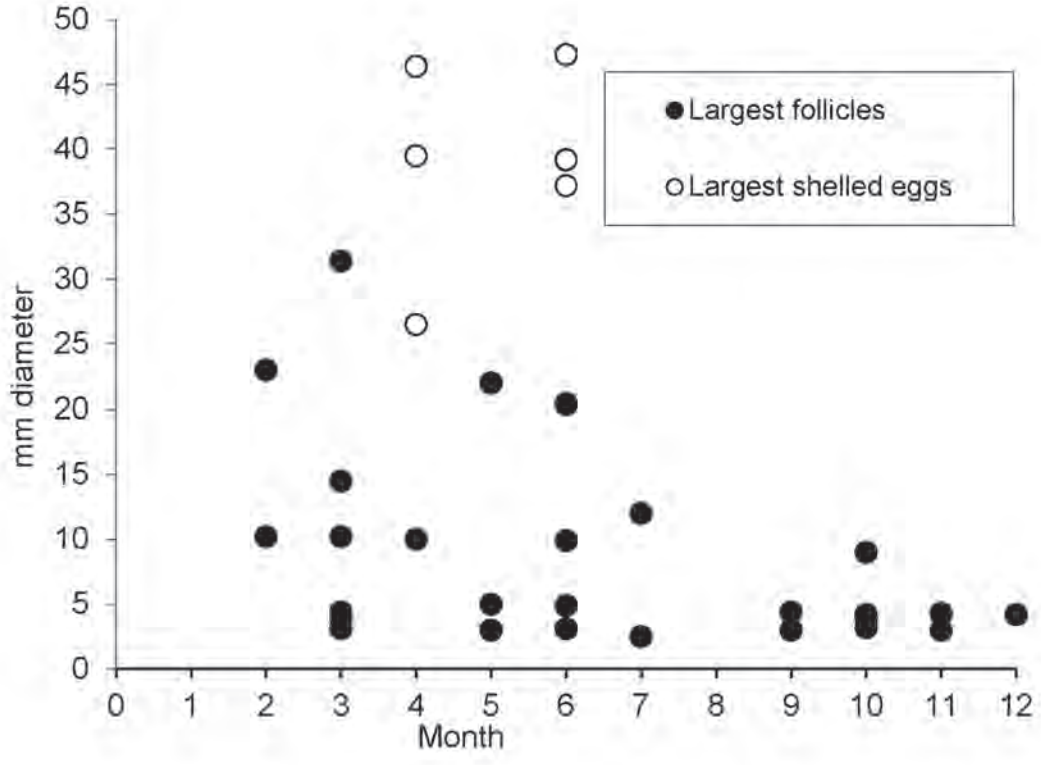

Figure 176. Ovarian cycle of the Eastern Racer, *Coluber constrictor,* from southern Florida (N: largest follicles = 28, largest shelled eggs = 6).

associated with rainfall (Dalrymple et al., 1991). In north-central Florida, the Southern Black Racer was likewise active throughout the year, with most individuals captured during April−June in a unimodal pulse (Dodd and Franz, 1995). In South Carolina, seasonal activity also exhibited a late spring−early summer unimodal pulse (Gibbons and Semlitsch, 1987). In Virginia seasonal activity occurred usually during April−September) but could range from late March to the end of November (Mitchell, 1994). In Pennsylvania, activity began in late March or April and ended in October or early November (Hulse et al., 2001). In Connecticut seasonal activity occurred during mid−March−end of October (Klemens, 1993). In Kansas, the Yellowbelly Racer was active during April−November with preferred body temperatures of 29−36 ^{0}C (Fitch, 1956, 1963a). In Ohio, the Yellowbelly Racer was active during January−September, with an April−June peak (Conant, 1938a).

Across its geographic range, this species was diurnal and most active on warm or sunny days when it could maintain a hot body temperature. Thus, it was not surprising that southern Florida individuals were active earlier and later in the day during the summer months than in the winter when activity was restricted to the middle of the day (Figure 182). Arboreal hunting by the Everglades Racer was observed in the southern Everglades (Rosen, 1989), and we have watched Southern Black Racers forage as high as 1.5 m above the ground. Generally, however, in Florida these snakes were less arboreal than in northern regions (Carr, 1940a). We have seen both the Everglades Racer and Southern Black Racer hunting along watercourses in southern Florida and chase Southern Leopard Frogs. In central Florida an individual was captured in an aquatic drift fence (Bancroft et al., 1983).

Predators.—In southern Florida, the Indigo Snake is a predator of the Eastern Racer (Layne and Steiner, 1996). In southern Florida (Jackson and Franz, 1981) and on the ABS (this study), this species was eaten by the Eastern Coral Snake. Racers were subject to hawk predation in southern Florida (this study) as they were elsewhere in the United States (Ernst and Barbour, 1989). In North Carolina, the Eastern Kingsnake (Palmer and Braswell, 1995), Cottonmouth (Palmer and Braswell, 1995), and the Carolina Pigmy Rattlesnake, *S. m. miliarius* (Linnaeus, 1766) (Palmer and Williamson, 1971; Palmer and Braswell, 1995) were documented as predators of this species.

Ernst and Barbour (1989) summarized predators of this species that included snakes such as the Eastern Coral Snake, the Timber Rattlesnake (*Crotalus horridus* Linnaeus, 1758), Rat Snake, Prairie Kingsnake, Common Kingsnake, Coral Snake, and Copperhead, *Agkistordon contortrix* (Linnaeus, 1766).

Table 19. Analysis of variance and adjusted least square means of clutch size of the Eastern Racer, *Coluber constrictor*, from four locations.

Analysis of Variance					
Source	Sum of Squares	df	Mean square	F-ratio	P
SVL (cm)	334.489	1	334.489	27.882	< 0.001
Location	101.917	3	33.972	2.832	0.048
Location*SVL	139.660	3	46.553	3.881	0.014
Error	599.835	50	11.997		
	Adjusted Least Square Means	SE	N		
Southern Florida	8.184	1.106	11		
Kansas	11.674	0.818	19		
North Carolina	12.411	1.176	12		
Arkansas	17.447	0.894	16		

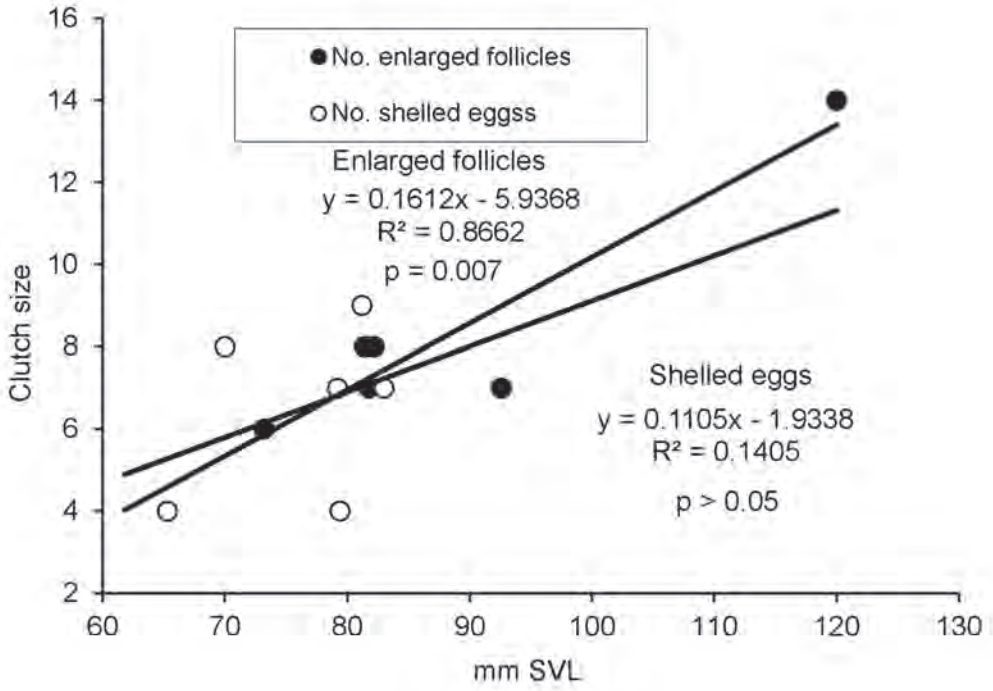

FIGURE 177. Relationship of clutch size and body size of the Eastern Racer, *Coluber constrictor,* from southern Florida (n = 6).

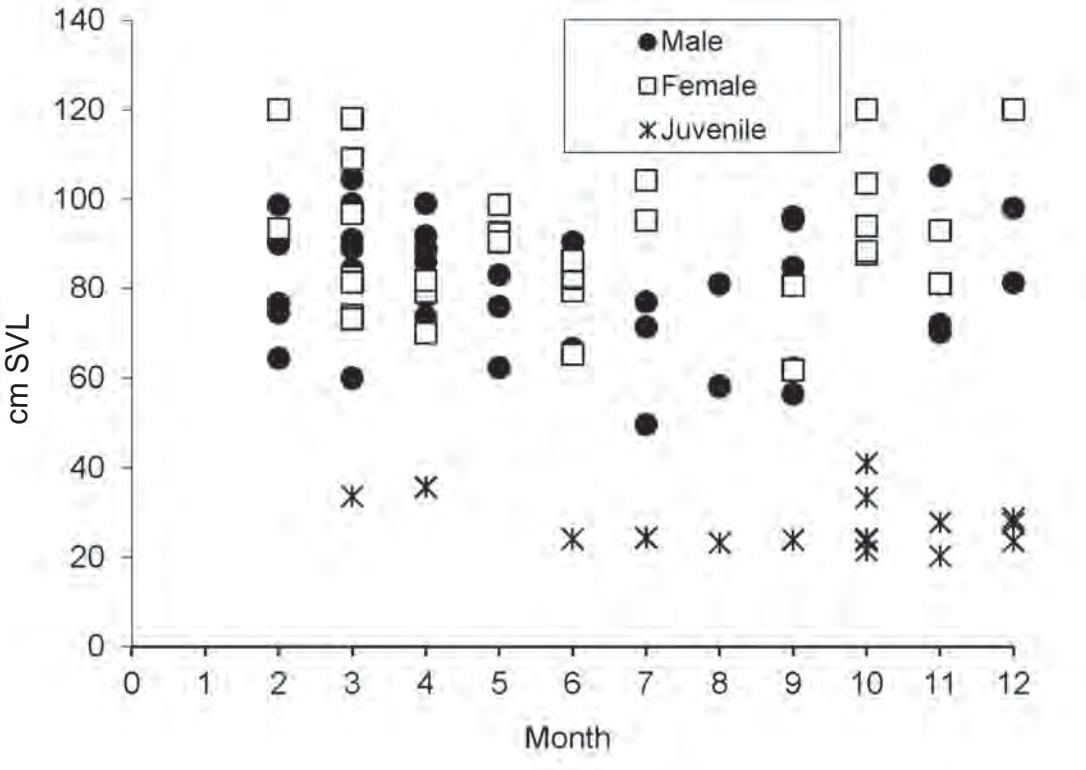

FIGURE 178. Monthly distribution of body sizes of the Eastern Black Racer, *Coluber constrictor*, from southern Florida (N: male = 45, female = 36, juvenile = 17)

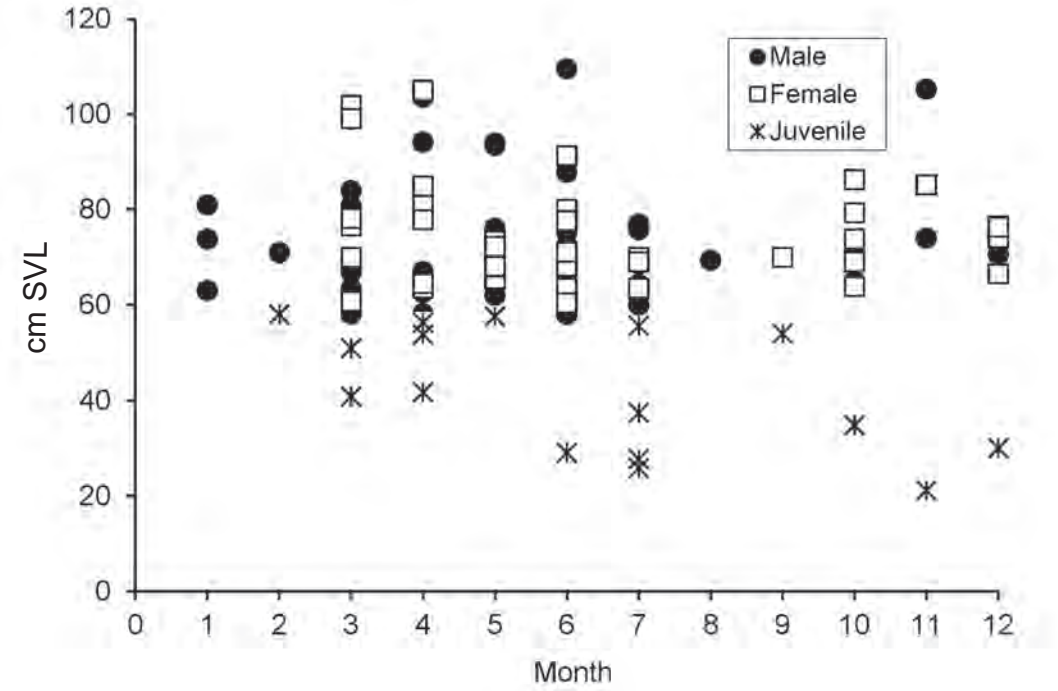

FIGURE 179. Monthly distribution of body sizes of the Southern Black Racer, *Coluber constrictor priapus,* from the Archbold Biological Station (N: male = 66, female = 37, juvenile = 17).

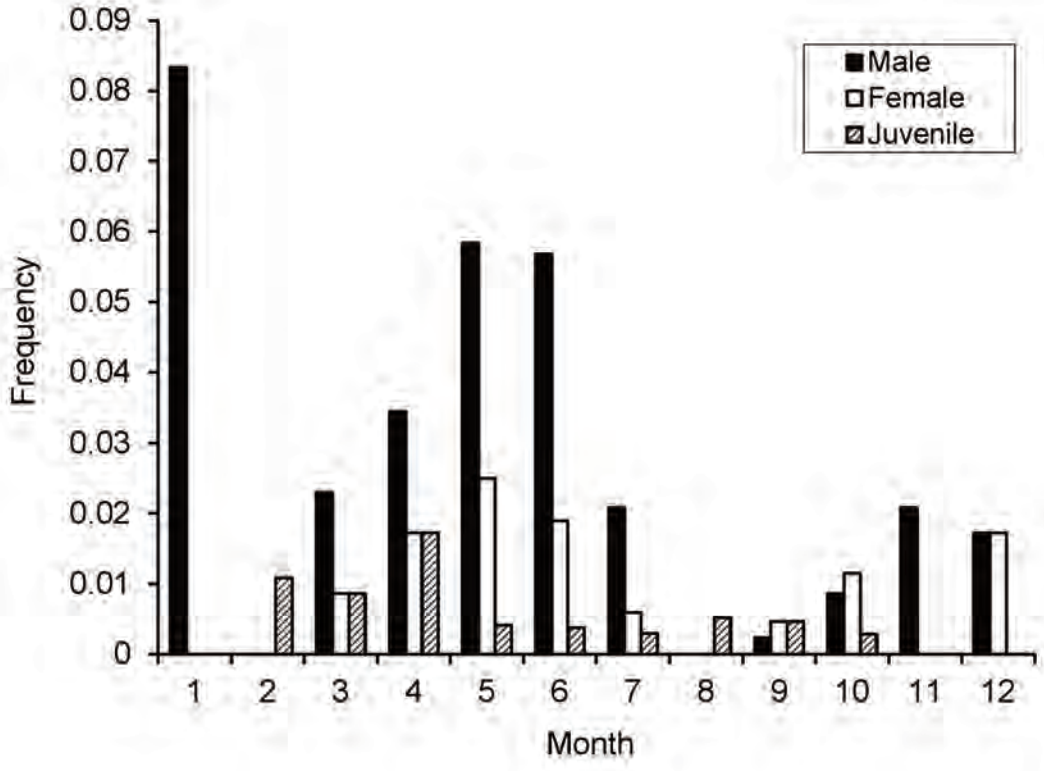

FIGURE 180. Seasonal activity of the Southern Black Racer, *Coluber constrictor priapus,* from scrub habitat on the Archbold Biological Station (N: male = 59, females = 26, juveniles = 13). .

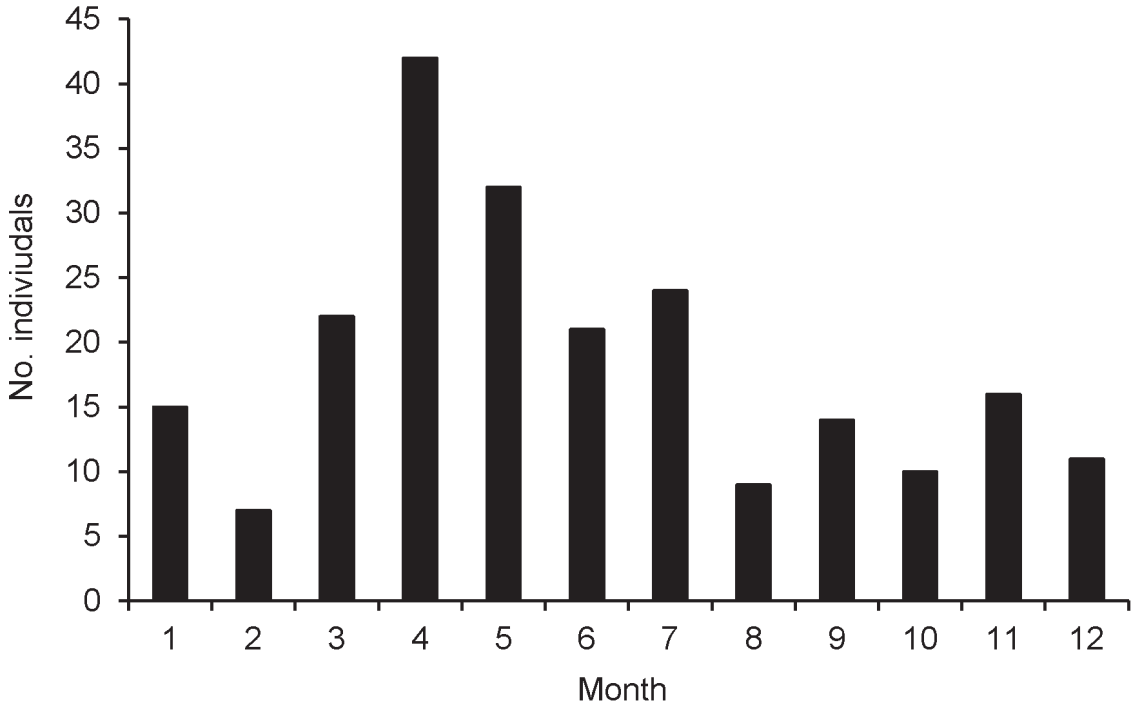

Figure 181. Seasonal activity of the Southern Black Racer, *Coluber constrictor priapus,* from the Archbold Biological Station (N = 223).

Threats.—An ecological generalist, racers are among the most persistent of what were really but a handful of native snake species that tolerate many kinds of human−mediated changes in the environment. Of greatest concern to us, however, was the large number of individuals killed on increasing numbers of roads. With this in mind, a radiotelemetric study that measuress so simple a parameter as home range would provide a great deal of information that quantifies how much fragmentation this species can tolerate.

Diadophis punctatus (Linnaeus, 1766)
Ringneck Snake

Description.—Two forms of the Ringneck Snake have been described that occur in southern Florida: the Key Ringneck Snake (*D. p. acricus* Paulson, 1968) and Southern Ringneck Snake, *D. p. punctatus* (Linnaeus, 1766) (Figure 183). Lower Florida Keys populations were found to be more similar in markings to those of northern Florida than to those of southern mainland Florida (Duellman and Schwartz, 1958). North-south clines were detected in ventral and caudal scale counts and a coastal pattern in labial pigmentation (Christman, 1980b). Also, a Suwannee Straits, panhandle, Everglades pattern was detected in ring separation (Christman, 1980b). Lazell (1989) considered the Key Ringneck Snake to be a relict form of extremely limited geographic range and population density. The near absence of a collar distinguishes the Key Ringneck Snake from the southern form whose collar is interrupted. Dorsum color of the Key Ringneck snake is gray. The dorsum of the Southern Ringneck Snake is brown or black. The venter is an especially vibrant red posteriorly and the venter has dark half-moons running down the center of the venter.

Distribution.—A Florida endemic, the geographic distribution of the Key Ringneck Snake in Florida is restricted to the lower Florida Keys (Ashton and Ashton, 1988b; Conant and Collins, 1998; Meshaka and Ashton, 2005). The Southern Ringneck Snake occurs throughout the remainder of Florida (Ashton and Ashton, 1988b; Conant and Collins, 1998; Meshaka and Ashton, 2005) and is an exotic species in the West Indies (Lever, 2003).

Body Size.—In southern Florida, adult males

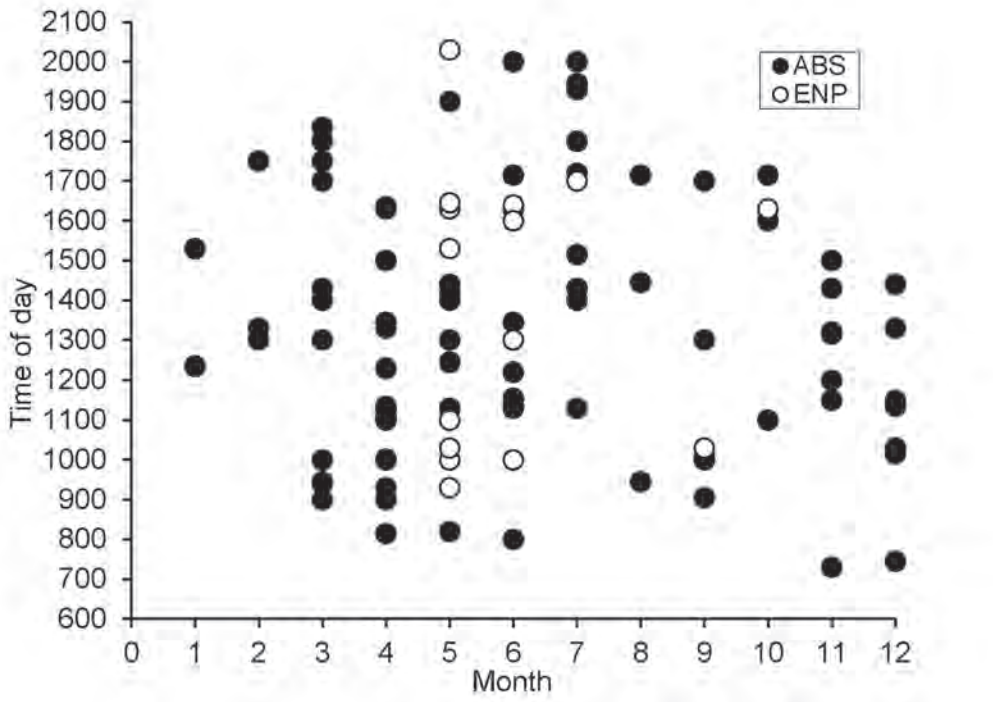

Figure 182. Diel activity pattern of the Eastern Racer, *Coluber constrictor,* from Everglades National Park (ENP; N = 18) and the Archbold Biological Station (ABS, N = 98).

and females were similar in body size, and southern Florida populations were smaller in average adult body size than those from locations farther north (Table 20). With respect to habitat, Ringneck Snakes in Kansas were larger in long-unburned tallgrass prairie than in more frequently burned treatments (Wilgers and Horne, 2006). Body sizes of Kansas populations of the Ringneck Snake varied in relation to food supply (Fitch, 2004a) and habitat variation (Fitch, 2004b). We detected no noticeable trend in otherwise weakly developed body size dimorphism in this species (Table 20).

Habitat and Abundance.—On the Florida Keys, the Key Ringneck Snake was closely associated with tropical hardwood hammock and its associated freshwater, and appeared to be rare (Lazell, 1989). In southern Florida, the Southern Ringneck Snake was most abundant in mesic habitats, often in pinewoods and hammocks (Duellman and Schwartz, 1958). In ENP, this form was most abundant in hammocks (Dalrymple, 1988) and was reported from pineland, hammock and Brazilian Pepper stands (Meshaka et al., 2000). WEM observed an individual swimming across a canal during the day in Florida City. From small mammal trapping grids, number of days this species was observed/trap/month was estimated in the following habitats: Bayhead (0.002).

In Florida, it has been reported this species from Water Hyacinth mats (Carr, 1940a) and has been associated with low wet pine flatwoods (Myers, 1965) and moist areas (Carr and Goin, 1955; Ashton and Ashton, 1988b). Not too surprisingly then, very few Southern Ringneck Snakes were trapped in either sandhill or xeric hammock in Hernando County (Enge and Wood, 2001). Elsewhere in Hernando County, most of the few individuals were captured in hydric hammock and basin swamp (Enge and Wood, 2000). Elsewhere, the Southern Ringneck Snake was similarly associated with some degree of moisture (Mount, 1975; Mitchell, 1994; Palmer and Braswell, 1995). In Kansas, Ringneck Snakes preferred long-unburned tallgrass prairie (Wilgers and Horne, 2006).

Diet.—In ENP, an individual (12.0 cm SVL) collected by the Daniel Beard Center contained a Greenhouse Frog (20 mm SVL). On the ABS, an individual captured underneath litter on 19 April 1977 regurgitated an adult Ground Skink.

Figure 183. Key Ringneck Snakes, *Diadophis punctatus. acricus* (top, middle) from Monroe (Florida Keys) County. (Photographed by R.D. Bartlett). A Southern Ringneck Snake, *Diadophis p. punctatus,* from Collier County, (Bottom) ; Photographed by R.D. Bartlett..

North of southern Florida, where worms were more abundant, the Southern Ringneck Snake shifted towards increasing frequency of this prey item. To that end, its diet was found to be primarily earthworms but one that also included the Ground Skink, Coastal Plain Dwarf Salamander, Northern Two-lined Salamander, *Eurycea bislineata* (Green, 1818), Eastern Narrowmouth Toad, and Southern Leopard Frog (Myers, 1965). In Georgia, stomachs contained Slimy Salamanders, *Plethodon glutinosus* (Green, 1818), Ground Skinks, and a worm (Hamilton and Pollack, 1956). Farther north, the Ringneck Snake fed primarily on salamanders (Barbour, 1950). In the Carolinas, the Southern Ringneck Snake ate earthworms and salamanders (Brown, 1979; Palmer and Braswell, 1995). In Pennsylvania, the Northern Ringneck Snake, *D. p. edwardsii* (Merrem, 1820), ate principally plethodontid salamanders but also earthworms (Hulse et al., 2001). In Kansas, the Prairie Ringneck Snake (*D. p. arnyi* Kennicott, 1859) fed almost exclusively on earthworms (Fitch, 1999), an abundant fusiform prey in lieu of small elongate vertebrates that occurred more commonly elsewhere.

Reproduction.—In southern Florida, the distribution of ova size from a very small sample suggested that egglaying occurred during a short period in the summer (Figure 184). In Florida, eggs were laid during May or June (Myers, 1965)−September (Iverson, 1978b), which was longer than the June−July egglaying period of northern populations such as North Carolina (Palmer and Braswell, 1995) and Pennsylvania (Hulse et al., 2001). Mean clutch size in Florida was 5.2 eggs (Myers, 1965). A clutch of six eggs from Alachua County were found and hatched in September (Iverson, 1978b). A 32.4 cm SVL female from Alachua County laid five eggs in September and they hatched in October (Iverson, 1978b). Clutch size was most often four or five eggs in Alabama (Mount, 1975) and averaged 4.2 eggs in Virginia (Mitchell, 1994), 4.1 eggs in North Carolina (Palmer and Braswell, 1995), 3.8 eggs in Pennsylvania (Hulse et al., 2001), 3.5 eggs in Michigan (Blanchard, 1937), and 3.4 in Kansas (Fitch, 1999).

Growth and Survivorship.—In southern Florida, a hatchling (10.3 mm SVL) was found as late as November (Figure 185). A September hatchling was reported for Maryland (Wright and Wright, 1957). Hatchlings of the Northern Ringneck Snake were found during August−September (Blanchard, 1926). Southern Florida individuals matured at slightly smaller body sizes than elsewhere (Table 20). Monthly body size distributions (Figure 185) were suggestive of sexual maturity within one year of life. Myers (1965) determined that sexual maturity in both sexes was reached during their second spring of life. In Kansas, males matured

Table 20. Body size (cm SVL) and body size dimorphism of adult Ringneck Snakes, *Diadophis punctatus*, from selected sites. For our study, means are followed by standard deviation, range, and sample size. For literature values, means are followed by range.

Location	Male	Female	M:F
Southern Florida (this study)	20.7 ± 2.6; 16.8 - 26.2; 19	21.7 ± 18.8 - 27.7; 7	0.95
Virginia (Mitchell, 1994)	26.2; 18.3 - 35.8	30.0; 21.9 - 40.0	0.87
Pennsylvania (Hulse et al., 2001)	27.2; 21.0 - 32.5	28.6; 21.7 - 43.3	0.95
Connecticut (Klemens, 1993)	25.3	27.2	0.93
Indiana (Minton, 2001)	24.0; 21.1 - 30.6	27.2; 22.0 - 32.8	0.88
Kansas (Fitch, 1999)	25.4; 17.3 - 39.6	28.8; 22.5 - 38.2	0.88

in their second year and females in their third year (Fitch, 1999).

Activity.—In ENP, activity of the Southern Ringneck Snake was unimodal, which peaked in summer and was associated with rainfall (Dalrymple et al., 1991). Most individuals were found in March (Figure 185) in southern Florida and in April on the ABS (Figure 186). In northern Florida, activity was greatest during spring and least during summer (Myers, 1965). Seasonal activity was progressively shorter in northern latitudes: May−October in southern New England (Klemens, 1993), April−October in Kansas, Indiana, New York, and Virginia (Wright and Wright, 1957; Mitchell, 1994; Fitch, 1999; Minton, 2001).

In southern Florida, these snakes were active when air temperatures were warm and could be found away from cover day or night but especially so during dusk-dark. Nocturnal activity was reported for the Northern Ringneck Snake in Virginia and (Mitchell, 1994) and West Virginia (Green and Pauley, 1987). In New England most but not all activity away from cover was nocturnal (Klemens, 1993). In Florida City, WEM observed an individual swim across the canal to him during the middle of the day. In Florida generally, this species was known to exhibit aquatic behavior (Carr, 1940a)

Predators.—In southern Florida, the Eastern Indigo Snake (Layne and Steiner, 1996), Eastern Coral Snake (Jackson and Franz, 1981) and the Southern Black Racer (this study) were predators of the Southern Ringneck Snake. In Florida, this species was consumed by the Eastern Coral Snake (Schmidt, 1932). In North Carolina (Palmer and Braswell, 1995) and Virginia (Mitchell, 1994), the Eastern Kingsnake was reported as a predator of this species.

Threats.—Loss of habitat on the lower Florida Keys is presently a greater threat to the Key Ringneck Snake than it is to the Southern Ringneck Snake.

Drymarchon couperi (Holbrook, 1842)-
Eastern Indigo Snake

Description.—Among large individuals from the mainland and Florida Keys, the dorsum is black, the venter is bluish, and the labials are reddish brown. Young adults that have acquired the dark dorsum, are reddish brown color on the sides of their heads and may still have a venter that is completely yellowish in color or reddish brown (Figure 187). The ontogenetic change in

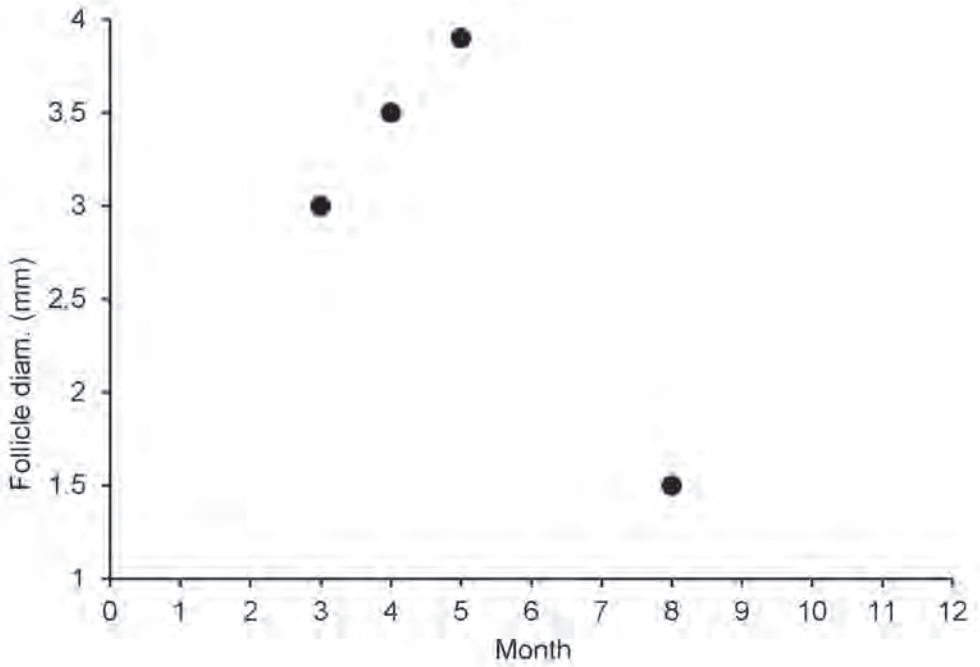

Figure 184. Ovarian cycle of the Southern Ringneck Snake, *Diadophis punctatus punctatus,* from southern Florida (N = 4).

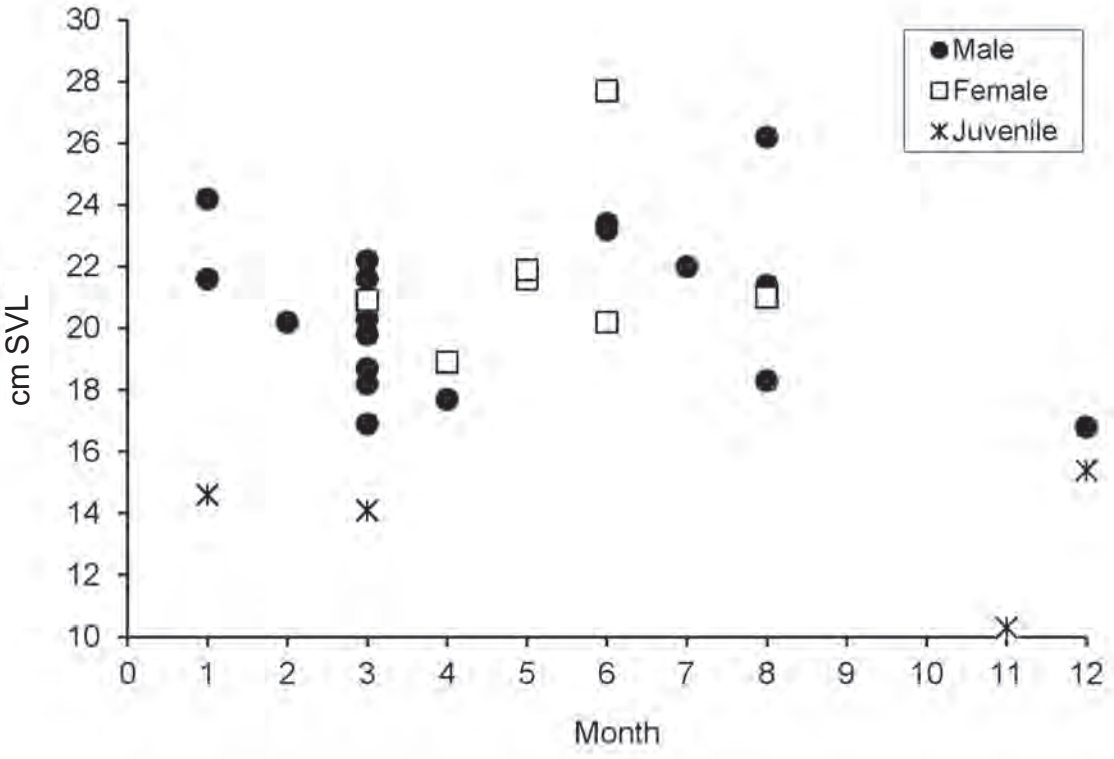

Figure 185. Monthly distribution of body sizes of Southern Ringneck Snake, *Diadophis punctatus punctatus,* from southern Florida (N: male = 19, female = 7, juvenile = 4).

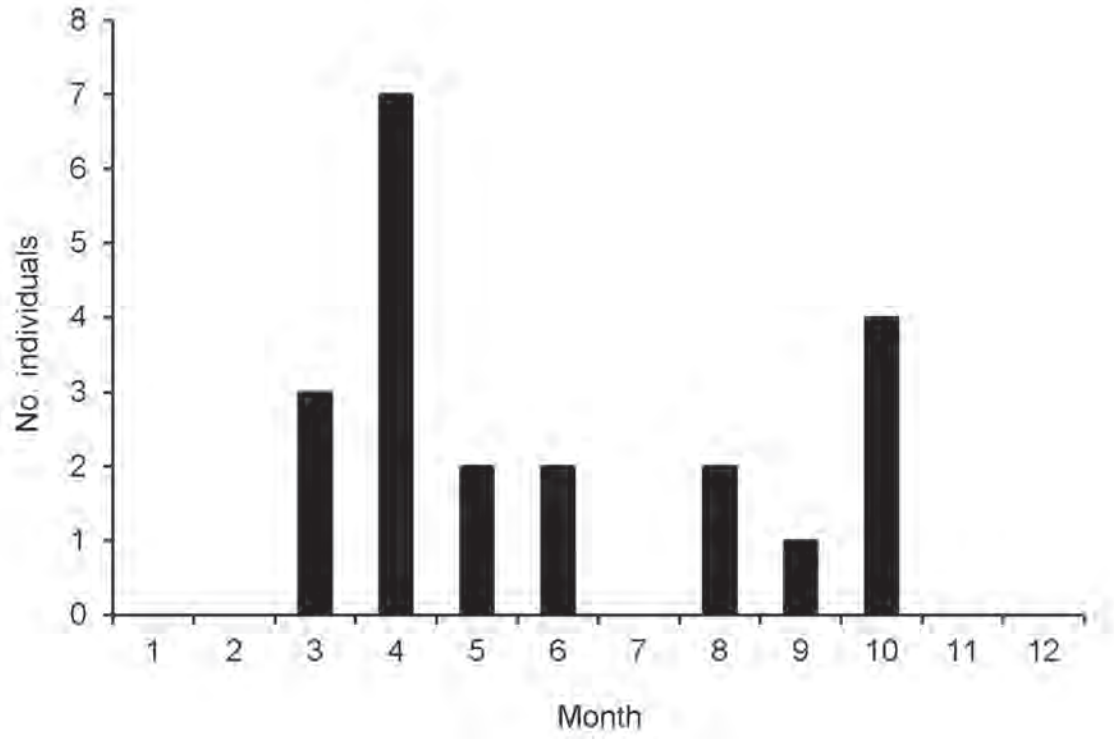

Figure 186. Seasonal activity of Southern Ringneck Snake, *Diadophis punctatus punctatus,* from the Archbold Biological Station (N = 21).

ventral color occurs in a postero-anterior direction (Duellman and Schwartz, 1958; also see Layne and Steiner, 1996,). Unlike any other of Florida's native snakes, only the Eastern Indigo Snake will laterally compress the anteriormost portion of its body and slowly flick its tongue when immediately threatened.

Distribution.—Southern Florida populations of the Eastern Indigo Snake represent the southern terminus of the species' geographic range (Conant and Collins, 1998). In Florida, the Eastern Indigo Snake occurs throughout the mainland (Ashton and Ashton, 1988b; Conant and Collins, 1998; Meshaka and Ashton, 2005), on the northern portion of the upper Florida Keys, and in a disjunct lower Florida Keys population (Steiner et al., 1983).

Body Size.—Eastern Indigo Snakes were reportedly very large in the area between Cape Sable and Paradise Key (Carr, 1940a; Steiner et al., 1983). From southern Florida, mean body size of six males (191.9 cm SVL) was larger than that of three females (169.8 cm SVL) (Steiner et al., 1983). The mean body size of seven large adults of unknown sex from southern Florida was also large (187.4 cm SVL) (Steiner et al., 1983). We found a 140 cm SVL male found dead on the road in February near Flamingo. On the ABS and the adjacent area, mean body size of males (112.7 cm SVL) was smaller than that of females (127.8 cm SVL); however, the largest male in their study measured 218.0 cm SVL (Layne and Steiner, 1996).

Habitat and Abundance.—In southern Florida, this species was considered most abundant in mesic habitats (Duellman and Schwartz, 1958) and present in dry glades, tropical hammock, and muckland fields (Carr, 1940a). In ENP, individuals were reported from pineland, hammock, mangrove, and dune (Meshaka et al., 2000). In the national parks of extreme southern Florida, the Eastern Indigo Snake was widely distributed in ENP and Biscayne National Park, where it was considered relatively common in pineland and tropical hardwood hammocks and present in coastal habitats and freshwater marshes (Steiner et al., 1983). Indeed, hardwood hammocks were considered an important habitat for this species in ENP (Steiner et al., 1983). In ENP, it was trapped in prairie, pineland, and hammock (Dalrymple, 1988). On the ABS, Eastern Indigo Snakes occupied Gopher Tortoise burrows (Lips, 1991). We found it to have been

Figure 187. An Eastern Indigo Snake, *Drymarchon cooperi* from Okeechobee County, Florida

ubiquitous on the ABS and a commonly encountered snake in the immediately surrounding area, including immediately off of the Lake Wales Ridge near the ABS.From small mammal trapping grids on the ABS, number of days this species was observed/trap/month was estimated in the following habitats: Bayhead (0.0007), low flatwoods-palmetto (0), low flatwood- grass (0.033), mature sand pine scrub-oak phase- (0), scrubby flatwoods- inopina oak phase (0). On BIR, it was uncommon but was observed in scrubby flatwoods in th southwest corner.

Allen and Neill (1952a) noted its association with "live-oak stands, along the borders of river swamps, big hardwood forests, in the dry stands of turkey-oak and longleaf pine, and in the drier glades and mucklands of southern Florida". Although mature xeric upland habitats of sand pine scrub−oak phase and ridge sandhill−turkey oak phase as the predominant habitat of the Eastern Indigo Snake, an increased number of habitats used and available to it in southern Florida decreased its dependence on Gopher Tortoise burrows (Layne and Steiner, 1996). Thus, its extensive use of mesic forests in southern Florida was a departure from a more typical association with mesic or xeric open habitat, especially during the winter when it relied on Gopher Tortoise burrows in northern areas (Moler, 1992).

The Eastern Indigo Snake was found to have been sensitive to desiccation (Bogert and Cowles, 1947). Consequently, whereas elsewhere in its geographic range the species was associated with Gopher Tortoise burrows in sandy upland habitat, in the southern Everglades solution holes may have provided the same moisture retaining properties and served to replace Gopher Tortoise burrows this far south (Steiner et al., 1983). This species marginally used adjacent farmland, mangrove forest, and coastal prairie, except on Cape Sable, where the Gopher Tortoise was present. In southern Florida, crab burrows were also used as reugia in the absence of Gopher Tortoise burrows (Lawler, 1977). In central Florida, it was trapped in-frequently burned sandhill (Mushinsky, 1985) and was associated with high pine in northern and central Florida (Carr, 1940a). In Florida, it was associated with dry habitats that bordered water (Ashton and Ashton, 1988b) and was occasionally present in salt marsh and mangrove (Carr, 1940a). In Georgia, most sightings of this snake occurred in longleaf pine−turkey oak associations (Diemer and Speake, 1983). Generally speaking, the Eastern Indigo Snake preferred dry areas near water (Ernst and Barbour, 1989), and the description of habits and habits provided for its close relative, the Texas Indigo Snake, *D. melanurus erebennus* (Cope, 1860), varied little from those of the eastern form (Wright and Wright, 1957). Layne and Steiner (1996) noted that boils found on the bodies of Eastern Indigo Snakes were most often associated with individuals found in moister habitats, which further corroborated its primary association with drier habitats. Like the Eastern Indigo Snake, the Texas Indigo Snake was found to prefer semi−arid habitats in close proximity to water (Werler and Dixon, 2000).

Diet.—In southern Florida, the Eastern Indigo Snake ate a wide range of vertebrates, including the Everglades Ratsnake (Allen and Neill, 1950a), Southern Toad (Steiner et al., 1983; Layne and Steiner, 1996), Southern Leopard Frog (Layne and Seiner, 1996), live and a road-killed Eastern Corn Snake, Brown Water Snake, Rough Green Snake, Eastern Coral Snake, and Cotton Rat (*Sigmodon hispidus*) (Steiner et al., 1983). In ENP, a large individual was found to have eaten two Dusky Pigmy Rattlesnakes and four turtle eggs (Babis, 1949). A predation record also exists for the Mangrove Salt Marsh Snake (Dilley, 1954). The Eastern Indigo Snake was known to be a predator of the Florida Scrub Jay (Westoctt, 1970; Mumme, 1987). Summarizing the data on this species, Layne and Steiner (1996) noted a wide taxonomic range of prey eaten by the Eastern Indigo Snake in southern Florida, with the highest frequencies having been reptiles; Peninsula Cooter eggs, Gopher Tortoise (hatchlings and eggs), Glass Lizard species, EasternRacer, Southern Ringneck Snake, Eastern Rat Snake, Eastern Hognose Snake, Eastern Coachwhip, Eastern Coral Snake, and Eastern Diamondback Rattlesnake), and mammals, with four identified species. Layne and Steiner (1996) also noted the Southern Toad and Southern Leopard Frog as prey. On the ABS, the Yellow Rat Snake (Layne and Steiner, 1996), the Island Glass Lizard (this study), and Florida Cottonmouth (this study) were prey of this snake. A dietary concentration on reptiles by this species in southern Florida was also apparent elsewhere. A single Eastern Coachwhip was disgorged by a large individual from Citrus

County (Carr, 1940a). A fondness for Corn Snakes in its diet was noted for this species in Florida (Ashton and Ashton, 1988b). A freshly captured Eastern Indigo Snake from Alabama regurgitated remains of a toad, an Eastern Hognose Snake, a Pigmy Rattlesnake, and a hatchling Gopher Tortoise (Mount, 1975). In general, this form preyed heavily on reptiles (Ernst and Barbour, 1989). With the exception of a report of fish in the diet of juvenile Texas Indigo Snakes, the diet of the western form appeared similar to that of the Eastern Indigo Snake (Werler and Dixon, 2000).

Reproduction.—In southern Florida, mating occurred during June−February (Steiner et al., 1983; Layne and Steiner, 1996). Mating of the Texas Indigo Snake occurred during January−April in Texas (Werler and Dixon, 2000).

Growth and Survivorship.—In southern Florida, eggs hatched during August−October (Layne and Steiner, 1996), although a juvenile with a prominent umbilical scar was collected from Immokalee in January (Neill, 1951e). In Alachua County, hatching was noted in July (Iverson, 1978b) and, from Silver Springs juveniles with prominent umbilical scars were collected during September−October (Neill, 1951e). In southern Florida, both sexes were sexually mature after one year of life at approximately 90 cm SVL (Layne and Steiner, 1996).

Activity.—In southern Florida. Individuals were active throughout the year, with a slight May peak in movements (Dalrymple et al., 1991). Peak activity was noted during late summer - fall (Layne and Steiner, 1996), and 75% of all observations in the Everglades were reported to have occurred during November−March (Steiner et al., 1983). The opposite pattern to seasonal activity was reported in Georgia (Speake et al., 1979). In the lower Rio Grande Valley area of Texas, the Texas Indigo Snake was active throughout the year (Werler and Dixon, 2000).

In southern Florida, this species was strictly diurnal (Steiner et al., 1983; Layne and Steiner, 1996), with morning and afternoon peaks (Layne and Steiner, 1996) and was considered a diurnally active snake generally (Ernst and Barbour, 1989). In Texas, the Texas Indigo Snake was also diurnal (Werler and Dixon, 2000). Southern Florida individuals were primarily but not at all exclusively terrestrial, occasionally ascending great heights in search of avian and ophidian prey (Layne and Steiner, 1996). Individuals also swam in freshwater and saltwater (Steiner et al., 1983). Thought to have been hunting, a large indivdividual was observed moving steadily in and out of Water Hyacinths in a ditch in Lake Placid (WEM). In Texas, the Texas Indigo Snake likewise showed some arboreal tendencies and would also take to the water at times (Werler and Dixon, 2000).

Although a wide range of refugia were used by southern Florida individuals, they were most commonly found in Gopher Tortoise burrows (62.0%), Nine-banded Armadillo burrows (8.2%), and under leaflitter (7.4%) (Layne and Steiner, 1996). Burrow diameters of the latter two refugia averaged 17−21.2 cm (Layne and Steiner, 1996). Both sexes averaged uninterrupted stays in burrows for 3.5 days, the duration of which was longest during the winter and shortest during the summer (Layne and Steiner, 1996).

Minimum home range size averaged much larger in males (74.3 ha) than in females (18.6 ha) (Layne and Steiner, 1996). Likewise, the largest home range values were larger in males (199.2 ha) than in females (48.6 ha) (Layne and Steiner, 1996). At peak activity, home range size ranged 50−100 ha (Moler, 1992).

Threats.—Steiner et al. (1983) noted a severe threat of habitat loss to this species on the Florida Keys and suggested habitat preservation, public awareness, and protection from illegal collection for populations in Big Cypress Preserve. On a broader scope, we echo concerns by Ernst and Barbour (1989) that much of its behavior in the wild may never be known as this species becomes evermore threatened across its geographic range.

Farancia abacura (Holbrook, 1836
Mud Snake

Description.—One form of the Mud Snake has been described that occurs in southern Florida: The Eastern Mud Snake, *F. a. abacura* (Holbrook, 1836). Southern Florida individuals have fewer lateral red bars, which extended farther dorsally onto a black background than those from northern Florida (Duellman and

Schwartz, 1958) (Figure 188).

Distribution.—Southern Florida populations of the Eastern Mud Snake represent the southern terminus of the species' geographic range (Conant and Collins, 1998). The Florida distribution of this species, exclusive of the Florida Keys, is almost statewide on the mainland where it intergrades with the Western Mud Snake (*F. a. reinwardti* Schlegel, 1837) in extreme western panhandle of Florida (Ashton and Ashton, 1988b; Conant and Collins, 1998; Meshaka and Ashton, 2005).

Body Size.—Southern Florida males (mean = 86.0 ± 14.2; range = 69.9−112.0; n = 11) were smaller in mean body size than were females (mean = 106.1 ± 12.2 cm SVL; range = 90.0−129.0; n = 9). In Virginia, mean body size of adult males (90.1 cm SVL; 72.5−110.6) was smaller than of females (109.8 cm SVL; 86.3−135.0) (Mitchell, 1994). Across its geographic range, mean adult body size of males (mean = 71.6 cm SVL) was smaller than that of females (mean = 93.1 cm SVL) (Lutterschmidt and Wilson, 2005). Degree of sexual dimorphism in body size was similar among these sites.

Habitat and abundance.—In southern Florida, Eastern Mud Snakes were reported from the Everglades and sloughs, and some were found in Water Hyacinth beds (Duellman and Schwartz, 1958). In ENP, individuals were found in slough, canal, and marsh (Meshaka et al., 2000). On BIR, we found Eastern Mud Snakes in vegetated ditches (Table 1). In common with this observation, individuals were found in Water Hyacinths in Alachua County (Goin, 1943). Its habitat associations in southern Florida did not differ from elsewhere. For example, in central Florida this species was associated with densely vegetated shorelines having muddy bottoms (Bancroft et al., 1983) Interestingly, an individual was found near the ocean in St. Johns (Neill, 1958) sand Volusia (Neill, 1951e) counties. For Florida populations, this species was noted from marshes, alluvial swamps, and drainage ditches, and juveniles could be numerous in mats of vegetation (Carr, 1940a). Shallow aquatic habitats were used by this species in Florida (Ashton and Ashton, 1988b). Elsewhere, the Eastern Mud Snake was likewise found in generally still, well-vegetated water (Mount, 1975; Mitchell, 1994; Palmer and Braswell, 1995), including brackish situations in coastal Georgia, South Carolina, and among Western Mud Snakes in Texas (Neill, 1958; Werler and Dixon, 2000).

Figure 188. An Eastern Mud Snake, *Farancia abacura abacura,* from Okeechobee County, Florida. Photographed by R.D. Bartlett.