

## SUBSPECIATION IN *SPHAERODACTYLUS COPEI*

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IN 1867, Steindachner described a new species of gecko, *Sphaerodactylus copei* from "Südamerika, ohne nähere Angabe des Fundortes". The name was later applied to the large geckoes of southwestern Hispaniola by Barbour (1921:259). Garman (1887) had described the same species as *S. picturatus*, a name which is presently in the synonymy of *copei* Steindachner. Finally, one of us (Schwartz, 1961), in a review of the *scaber* group of the genus *Sphaerodactylus*, regarded *copei* as racially related to the Bahaman *S. anthracinus*.

Through the courtesy of Dr. Ernest E. Williams, Museum of Comparative Zoology (MCZ), we have been able to examine not only the syntypes of *S. picturatus* Garman, but also a large lot of freshly collected material of *copei* from the southwestern peninsula of Haiti. In addition, we have been able to amass significant collections from the area ourselves. When all this material is assembled, it is quite obvious that within the population which is presently known as *S. a. copei* occur several very distinctive subspecies; an analysis of this geographic variation is the purpose of the present paper. We wish to thank not only Dr. Williams for his help in the present endeavor, but also our fellow collectors in southwestern Haiti, Miss Patricia A. Heinlein, and Messrs. Ronald F. Klinikowski, David C. Leber, and Dennis R. Paulson. The illustrations are the work of Mr. Klinikowski, and he has our sincere thanks for his efforts on our behalf. Paratypes of one new form have been deposited in the Carnegie Museum (CM), the American Museum of Natural History (AMNH), the Museum of Natural History, University of Kansas (KU), the Museum of Zoology, University of Michigan (UMMZ), and the United States National Museum (USNM).

We feel that Schwartz's action in combining *S. copei* and *S. anthracinus* was premature. Not having seen live specimens of either species, he was completely unaware of the vivid coloration and pattern of *copei*. Although *S. anthracinus* is still unknown to us in life, and there seems to be no adequate color description of the species, we feel that it is a preferable course at present to once again separate *S. anthracinus* and *S. copei*, at least until there is



definite information as to the coloration of the former. We acknowledge, however, that there is a community of characteristics between the two species—the dark collar with four pale ocelli, pale head striping on a dark ground, heavily vermiculate heads in “adult” males, escutcheon shape—which ally these two species to one another more closely than to any other described Bahaman-Hispaniolan forms. With the description of several new races of *S. copei* from Hispaniola, it seems preferable to separate the two species. It is possible that, if *anthracinus* is maintained in the same species as *copei*, the former may not have differentiated at the same level as the Hispaniolan races of the latter; this is an added reason for the separation of the two species.

*S. copei* was described from the collections made by the personnel of the Austrian frigate *Novara* in its journey around the world. Gans (1955) has shown that the *Novara* did not touch *any* West Indian island, going directly from Madeira to Rio de Janeiro. Thus the origin of the type specimen of *copei* is shrouded in mystery. Karl Scherzer, one of the expedition's members, left the vessel at Valparaiso, journeyed alone through South America, visited the island of St. Thomas, where he received a gift of zoological material from A. Riise, and rejoined the expedition at Gibraltar. It is possible, after the manner of the times, that Riise had received through exchange a single gecko from Haiti, which in turn he gave (without locality data) to Scherzer, and which in turn became part of the *Novara* collections.

Another possibility is that the name *S. copei* has been misapplied to any Hispaniolan gecko; it may indeed be a South American species (although this is extremely unlikely) or may be from elsewhere in the West Indies. Without further information (and the description is extremely detailed but uselessly so insofar as determination of the species is concerned) it is pointless to speculate further.

Assuming that *S. copei* is indeed Hispaniolan, and knowing that the species is geographically variable there, it is necessary to restrict the name to one of the four distinct Hispaniolan populations. No pertinent scale counts are given in the description. The coloration is described as “upperside of head behind the eyes brownish with gray flecks, the forehead and snout unicolor brownish; back evenly flecked with brown and gray; venter bright brownish gray with brownish scale edges.” The specimen is obviously a plain



male; it may have had a partially vermiculate head in life. The description of coloration and pattern is not distinctive, and the specimen may have come from any of the Haitian seaport towns along the southern peninsula, namely Port-au-Prince, Miragoâne, Jérémie, Les Cayes, or Jacmel, at or near all of which the species is now known to occur. Since the name has priority and has been used by various authors, it must be conserved. Purely because of convenience and the vague possibility that the type may have come from the vicinity of the Haitian capital, we restrict the type locality of *S. copei* Steindachner to the vicinity of Port-au-Prince, Dépt. de l'Ouest, Haiti.

*Sphaerodactylus copei* Steindachner

*Diagnosis.* A sphaerodactyl with a middorsal zone of granules and large keeled and imbricate dorsal scales. Ventrals smooth and round; chest scales smooth. Gulars smooth. Internasals 0 to 3 (mode 1), upper labials 3. Strong sexual dichromatism: preserved adult males dull grayish and without pattern or with indications of a salt-and-pepper pattern, although in life the dorsum is blue-gray, brown, or greenish, with scattered rusty and/or purplish-brown scales, head either yellow-green or vivid rusty-orange, in one race developing additionally a heavily black reticulate cephalic overlying pattern; female dorsal ground color varying from apparently pale grayish to blue-gray or dark brown, with one to four transverse body bands (obscure in some races) with gray scales within the bands, a black nuchal collar with normally four white ocelli, and a complex head pattern of pale (greenish or rich brown) lines on

Plate 1. Hispaniolan geckos. Fig. 1. *Sphaerodactylus copei copei*, adult female, ASFS X2371, from Diquini, Dépt. de l'Ouest, Haiti; snout-vent length 36 mm (top row, left).

Fig. 2. *Sphaerodactylus copei enochrus*, adult female, type, MCZ 65128, from Marbial, 21 km NE Jacmel, Dépt. de l'Ouest, Haiti; snout-vent length 38 mm (top row, center).

Fig. 3. *Sphaerodactylus copei picturatus*, adult female, MCZ 69971, from Place Nègre, near Jérémie, Dépt. du Sud, Haiti; snout-vent length 35 mm (top row, right).

Fig. 4. *Sphaerodactylus copei cataplexis*, adult female, type, MCZ 77161, from Camp Perrin, Dépt. du Sud, Haiti; snout-vent length 39 mm (bottom row, left).

Fig. 5. *Sphaerodactylus copei cataplexis*, adult male, AMNH 92805, from Camp Perrin, showing heavily vermiculate head which occurs in some male *cataplexis*; snout-vent length 37 mm (bottom row, right).







a drab (blue-gray or gray) background. Dorsal scales 14 to 22 between axilla and groin; ventral scales 24 to 32 between axilla and groin; 39 to 52 scales around midbody; 10 to 17 fourth toe lamellae; escutcheon 4 to 8 X 19 to 30; size large, males to 41 mm in snout-vent length, females to 40 mm.

### 1. *Sphaerodactylus copei copei* Steindachner

*Diagnosis.* A subspecies of *S. copei* characterized by high number of dorsal scales between axilla and groin, high number of scales around midbody; males pale gray-blue dorsally, dotted with rust and dark purplish-brown, head pale yellow-green with a faint rust head pattern persisting into adulthood, throat and tail yellow, ventral ground color purple, tail blue-gray basally; females usually with a black collar with four white ocelli, a more or less complete rich brown U enclosing a prominent and contrasting gray occipital spot, two complete pale nuchal bands enclosing between themselves a dark nuchal band, these three bands anterior to the black collar, dorsal ground color blue-gray, marbled with dark purple and brown, two transverse body bands (enclosing gray blotches within themselves) rather obsolete in fully adult females, tails yellow with four pale bands bordered in black, the posteriormost three white, the most proximal dull yellowish-gray.

*Distribution.* Known only from Ça Ira, Diquini, and "south-west of Port-au-Prince", along the southern shore of the Golfe de la Gonave at the base of the Tiburon Peninsula.

*Discussion.* Since females show the head pattern more clearly than do males, and since the body pattern of females is more complex than that of males, it is pertinent to describe the females of *S. c. copei* in detail. The head pattern consists of a series of rich brown (pale in preservation) markings on a blue-gray ground color, as follows: a median interorbital line stopping abruptly behind the eyes and followed by a transverse short pale bar (which may be reduced to two small dots), followed by the prominent ovoid occipital gray spot; a pair of canthal lines which proceed to the anterior border of the eye; a U-shaped figure from the posterior border of the eyes enclosing the occipital spot, and joined anteriorly to a vertical postocular stripe which proceeds from the supralabials to meet the anterior end of the U-shaped figure just behind the eye; a pair of transverse nuchal bands enclosing between them



a dark transverse nuchal band, these three bands just anterior to the black collar, the anteriormost pale nuchal line joined at times to the U-shaped figure, which in turn may be slightly fragmented posteriorly, but is always more or less complete; a black collar enclosing four white ocelli (Fig. 1); dorsum blue-gray, mottled ("salt-and-pepper") with dark purple and brown; at most two transverse body bands between the fore- and hindlimbs, usually only the more posterior persisting (if either does), the typical adult female pattern thus consisting merely of a variegated dorsum with a single transverse darker band with some gray blotching enclosed within, even this single band disappearing or obliterated in some adult females, entire ventral surface flesh. Males pale gray-blue dorsally, spotted with rust and dark purplish-brown; head pale yellow-green with remnants of the female head pattern rather indistinct rust; tail very pale yellow, throat yellow, flecked with rust; ventral ground color purple, tail blue-gray basally.

Although there is only a single male presently at hand, Schwartz (1961, p. 20) commented that male *copei* had persistent remnants of the female head pattern; all specimens examined by him were from Diquini, and are thus assignable to the nominate race. Apparently male *c. copei* are characterized by the persistence of the female head pattern into adulthood. A single juvenile does not show the body pattern appreciably more distinct than do adult females. The intensity of the transverse body bands in the females is somewhat variable, with MCZ 64921 showing these bands most prominently. Even in this specimen the clarity of the bands is much obliterated by dark scales in the interband spaces. In most females the bands are absent or only very faintly discernible. The black collar is present in all females except one young individual (ASFS X2370) which appears to lack it; in life this lizard had only two cream ocelli, outlined in brown, on the shoulders.

In scalation, *S. c. copei* (twelve specimens) has between 19 and 22 dorsal scales (mean 20.6) between axilla and groin, between 24 and 32 ventral scales (mean 27.3) between axilla and groin, between 42 and 51 (mean 46.2) scales around midbody, fourth toe lamellae from 12 to 16 (mean 14.8, mode 15), 0 or 1 internasal (mode 1), and the single male has the escutcheon 5 X 19. The male has a snout-vent length of 35 mm, the largest female a snout-vent length of 40 mm.

*Specimens examined.* Haiti, Dépt. de l'Ouest: MCZ 64921,



Ça Ira; MCZ 65108-10, 9362-63, ASFS X2369-74, Diquini; MCZ 51255-57, southwest of Port-au-Prince.

## 2. *Sphaerodactylus copei enochrus*, new subspecies

*Type.* MCZ 65128, an adult female, from Marbial, 21 kilometers northeast of Jacmel, Dépt. de l'Ouest, Haiti, collected by L. Whiteman, 21-22 April 1961.

*Paratypes.* All from Dépt. de l'Ouest, Haiti. MCZ 65118-27, same data as type; MCZ 65137, Jacmel, L. Whiteman, 19 April 1961; MCZ 65134-36, Méyer, 8 km E Jacmel, L. Whiteman, 25 April 1961; MCZ 65129-33, Bascap Rouge, 10 km NE Jacmel, L. Whiteman, 24 April 1961.

*Diagnosis.* A subspecies of *S. copei* characterized by low number of dorsal scales between axilla and groin, low number of scales around midbody, females with pale dorsal ground color, black collar and ocelli obliterated, no U-shaped cephalic figure, a pair of pale dots on each side of the occipital spot, first pale nuchal band reduced to a transverse series of dots, second pale nuchal line obscure, transverse body bands obliterated by heavy dark salt-and-pepper mottling on pale ground; male coloration in life unknown but preserved specimens uniform tan with no dorsal mottling and no remnants of female head pattern.

*Description of type.* An adult female with the following measurement and counts: snout-vent length 38 mm; tail broken; dorsals between axilla and groin 16; ventrals between axilla and groin 28; midbody scales 43; fourth toe lamellae 16; internasal 1. Dorsal ground color (in preservation) pale gray, head somewhat brownish, but nonetheless pale; head pattern consisting of a pale interorbital line, a pair of pale canthal lines, a pair of postocular lines, ending shortly posterior to the eyes, with an anteroventral extension to the supralabials; a tiny pale dot at the posterior end of the median unpaired interorbital line; an occipital spot with a pair of slightly smaller pale spots on either side, followed by a second, more or less transversely aligned row of spots, somewhat fainter than the preceeding row and representing the first pale transverse nuchal band; collar dull gray, with four white ocelli, both collar and ocelli much fragmented and inconspicuous by virtue of the dark mottling on the remainder of the dorsum (Fig. 2); a single transverse body band barely discernible behind the forelimbs; all limbs heavily



mottled with dark gray on a pale gray ground; venter immaculate pale; cheeks and neck gray with some spotting.

*Variation.* Seventeen paratypes show the following scale counts: dorsals axilla to groin, 15-18 (mean 15.7); ventrals axilla to groin, 25-31 (mean 27.4); midbody scales, 40-45 (mean 42.2); fourth toe lamellae, 14-17 (mean 15.4; mode 15); internasals, 0-1 (mode 1); escutcheon, 6-8 X 21-29. The largest male has a snout-vent length of 39 mm, the largest female 38 mm.

The seven paratypic males can be easily dismissed; they are presently dull uniform tan with slightly grayer heads. There are no pattern elements on the heads and the venters are immaculate pale. The color of these lizards in life remains unknown; we have not seen live individuals of this subspecies.

Six paratypic females are like the type in pale dorsal ground color, slightly paler heads, heavily mottled dorsa with both collar and transverse body bands much fragmented and obliterated. In head pattern they are like the type as well. Several females have the row of nuchal dots (those which represent the first pale nuchal band in *c. copei*) more regular and prominent than the type, forming a distinct transverse row of nuchal dots. There is no other significant cephalic pattern variation in the female paratypes.

Six juvenile and subadult geckoes vary from the smallest (snout-vent length 17 mm) which has a black nuchal band without ocelli, a black band across the shoulders, and three black bands between the fore- and hindlimbs, all separated from each other by pale (buffy in preservation) transverse bands. The head vaguely shows the adult female pattern of rows of transverse dots. The five remaining subadult specimens show the female head pattern in all its detail, and a black collar with four ocelli and four paler body bands, outlined with black. These body bands obviously disintegrate with increasing size, and one of the subadult specimens (snout-vent length 23 mm) already shows an almost typical dorsal female pattern. The juvenile tails are vividly banded with pale and dark bands, a condition which persists into the adult females to some degree.

*Comparisons.* The two races *copei* and *enochrus* are easily differentiable, both on the basis of scalation and pattern; likely coloration is also significant, although we have no color data on *enochrus*. The two races are separable on the basis of dorsal scales (15-18 in *enochrus*, 19-22 in *copei*). Despite the great overlap in



midbody counts (40-45 in *enochrus*, 42-51 in *copei*), the lower mean of *enochrus* (42.2) is significantly different from that of *copei* (46.2). Males of the two races can presumably be distinguished by the absence of any trace of female head pattern in male *enochrus*, this pattern persisting into adult male *copei*. The females of the two subspecies are easily distinguished by the head pattern; the U-shaped head figure, two pale nuchal bands enclosing a darker band, the black collar with ocelli of *copei* contrast strongly with the dotted head, dotted anterior nuchal "band", and poorly differentiated or obscured collar and ocelli of *enochrus*.

### 3. *Sphaerodactylus copei picturatus* Garman

*Diagnosis.* A subspecies of *S. copei* characterized by low number of dorsal scales between axilla and groin, high number of scales around midbody; males (preserved) tan, occasionally with faint remnants of female head pattern, dorsum dotted with dark scales or unicolor; females with very dark heads and dark dorsal ground color, head pattern of three longitudinal lines (described in detail below), a pair of pale nuchal bands enclosing between them a slightly darker area, black collar with four ocelli complete and distinct, usually two to four prominent transverse body bands each including gray confluent "ocelli".

*Distribution.* Known only from the vicinity of Jérémie and apparently Grande Cayemite, Haiti.

*Discussion.* Garman (1887, pp. 19-20) described *Sphaerodactylus picturatus* on the basis of four syntypes from "western Haiti"; the specimens (MCZ 3341-42) were collected by Dr. D. F. Weinland at Grande Anse River (=Rivière de la Grande Anse) which lies just to the south of Jérémie and has its mouth immediately to the southeast of that city. We have examined the syntypes and find them to be somewhat faded, but nonetheless identical to an excellent series of specimens from the Jérémie area. The syntypes include one unicolor male, two adult females, and a subadult individual.

Garman's description of the head pattern of the female syntype may well be quoted; our own terms for the various head pattern elements are included in parentheses within the Garman description: "The head is marked with white in a narrow streak (canthal line) on each side from the rostral on the canthus and over the



supraorbitals to the back of the head, in a median streak (inter-orbital line) on the forehead, a rounded spot above ear, another on the occiput and an oblique streak behind each ear upward to the back of the neck." This pleasantly detailed description agrees with the head pattern of the fifteen females at hand. The occipital spot is prominent and the postorbital lines converge toward it on either side, extending posterior to it and often joining the first nuchal pale band, thereby forming a large V which encloses the occipital spot. No specimen has a U-shaped cephalic figure; the posterior tip of the V in *picturatus* is either incomplete or formed by the junction of the two postorbital lines with one another or by the junction of these lines with the first pale nuchal band (Fig. 3). One female (MCZ 69901) has the dark head ground color spotted with pale in a rather irregular fashion, these pale spots representing the more orthodox pale head lines which have been reduced to spots. The collar is bold and contains usually four white ocelli, although one female (MCZ 69901) has but a single white ocellus surrounded by an irregular ring of black on the left side of the neck. The body bands number from two to four and those which are present are usually bold and distinct against the brown ground color, and have gray ocelli, either separate or fused, enclosed within them. The tail is banded with about four or five pale (white) bands, each bordered anteriorly and posteriorly by black. The limbs are all heavily mottled with dark brown.

Four juveniles show the adult female head pattern, and have the dorsum patterned as described for juvenile *S. c. enochrus*—a series of black transverse body bands separated by buffy bands, and a conspicuously black and white ringed tail.

Five males (including one syntype) are divided between two which show no dorsal pattern at all and three which have the tan back dotted with darker brownish scales; two of these latter also show faint indications of the female lined head pattern and the third shows it even more faintly.

In scalation, fifteen specimens of *S. c. picturatus* have between 14 and 18 dorsal scales (mean 16.5) between axilla and groin, between 24 and 31 ventral scales (mean 27.8) between axilla and groin, between 42 and 53 (mean 46.5) scales around midbody, fourth toe lamellae from 13 to 16 (mean 14.0, mode 14), 1 to 3 internasals (mode 1), and the escutcheon measures 4 to 6 X 20



to 24 scales. The largest specimens of each sex have snout-vent lengths of 38 mm.

*Comparisons.* Handicapped in that we have not seen living specimens of *picturatus*, we are unable to make comparative statements regarding coloration. However, females of the races *copei*, *enochrus*, and *picturatus* are readily distinguishable on the basis of head pattern. The U-shaped figure in *copei*, the one or two rows of dots on the heads of *enochrus*, and the V-shaped figure and posteriorly progressing postorbital lines of *picturatus* will quickly distinguish females of these three races. The dorsal ground color of *enochrus* is much paler than that of *picturatus*, and the very pale heads of *enochrus* contrast markedly with the very dark heads of *picturatus*. No male *enochrus* shows any remnants of the female head pattern, a condition which occurs in some male *picturatus*. The distinct body bands and collar of *picturatus* contrast with the indistinct collar and body bands of *enochrus*. From *copei*, female *picturatus* can be easily distinguished by the presence of transverse body bands in adults; although these bands occur in some female *copei*, they are regularly much more indistinct or faint than in *picturatus*.

Scalewise, *copei* and *picturatus* are completely separable on the number of dorsals in the axilla-groin distance (14-18 in *picturatus*, 19-22 in *copei*). *Picturatus* can be differentiated from *enochrus* on the basis of higher number of midbody scales in the former (*picturatus*, 42-52, mean 46.5; *enochrus*, 40-45, mean 42.2).

A single female from Grande Cayemite (MCZ 25414) appears to be indistinguishable in pattern from *S. c. picturatus*; the condition of the specimen precludes taking dorsal or midbody scale counts. We regard this single lizard as representing *S. c. picturatus* on Grande Cayemite.

*Specimens examined.* Haiti, Dépt. du Sud: MCZ 3341-42 (four specimens), Grande Anse River; MCZ 69898-904, 69906-21, Place Nègre, nr. Jérémie; MCZ 25414, Grande Cayemite.

#### 4. *Sphaerodactylus copei cataplexis*, new subspecies

*Type.* MCZ 77161, an adult female, from Camp Perrin, Dépt. du Sud, Haiti, one of series collected by D. C. Leber, R. F. Kliniowski, and natives, 22 July 1962. Original number X2765.

*Paratypes.* ASFS X2639-50, X2759-64, X2766-72, UIMNH



55606-20, UMMZ 125200-19, MCZ 62549-60, Camp Perrin, Dépt. du Sud, Haiti, S. Rand and J. D. Lazell, 6 August 1960; ASFS X2515-19, Camp Perrin, Dépt. du Sud, Haiti, R. F. Klinikowski, 22 July 1962; AMNH 92800-11, CM 39445-64, KU 79828-43, USNM 151755-74, Camp Perrin, Dépt. du Sud, Haiti, natives, 24 July 1962.

*Associated specimens.* All from Haiti, Dépt. du Sud. ASFS X3138, X3314, X3550, X3711, X3858-59, X4041-43, X4633, Camp Perrin—all hatchlings from eggs collected at Camp Perrin; ASFS X3274-76, Carrefour Canon, 500'; MCZ 63239-48, ASFS X3373, Les Cayes; ASFS X3792-93, 4.5 mi. NW Les Cayes; ASFS X3685-708, Cavaillon; ASFS X3556-63, Ile-à-Vache, western end.

*Diagnosis.* A subspecies of *S. copei* characterized by moderate number of dorsals between axilla and groin, moderate number of scales around midbody, females with dorsal ground color greenish-gray, speckled with rusty scales, dark head with three creamy-green longitudinal lines, prominent black collar with from two to four white ocelli, one or two creamy-green spots on each side of occipital spot, no dark nuchal band but anterior pale nuchal band either more or less complete or reduced to dots and posterior pale nuchal band absent, and one to three dark transverse body bands present and enclosing white scales; males with rusty-orange heads, at times with pale green markings; dorsum green anteriorly, becoming dark brown anterior to sacrum, anterior body dotted with rusty, tails dull blueish, throat vivid orange flecked with yellow; some males with a dark blue to black heavy reticulum over the entire top of head onto neck, and over chin and throat as well.

*Description of type.* An adult female with the following measurements and counts: snout-vent length 39 mm, tail 27 mm, regenerated; dorsals between axilla and groin 19; ventrals between axilla and groin 28; midbody scales 44; fourth toe lamellae 13; internasal 1. Dorsal ground color (in life) dull greenish-gray, including head, with some scattered rusty scales on the back; head pattern consisting of a pale (pale creamy-green) interorbital line, a pale canthal line, and a pair of short postocular lines, each of which has a dissociated pale dot at its posterior extremity, these dots followed by another dot at the same level as the large occipital spot, thus forming a transverse line of three pale dots across the occiput; a short transverse pale line between the posterior end of the interorbital line and the occipital spot; cheeks and sides of neck with three pale spots; a row of four pale spots across the neck at the



level of the first pale transverse nuchal band; black collar distinct, with four white ocelli (Fig. 4); a single fairly distinct transverse body band between the limbs, made up of two white ocelli with their surrounding black pigment; two other body bands, one axillary and one sacral, barely discernible; ventral ground color greenish-gray; center of throat clear gray, lips dull green; all limbs rather mottled dorsally with dark; regenerated tail irregularly marbled or mottled with dark brown; iris pale straw in life.

*Variation.* Forty paratypes show the following scale counts: dorsals axilla to groin, 15-22 (mean 18.3); ventrals axilla to groin, 24-31 (mean 26.9); midbody scales, 39-49 (mean 44.0); fourth toe lamellae, 10-15 (mean 13.1; mode 13); internasals 0-1 (mode 1); escutcheon, 4-8 X 22-30. The largest male has a snout-vent length of 41 mm, the largest female 40 mm.

The very large series of paratypes of both sexes reveals very little variation in pattern. In seventy-six females, the coloration and pattern are as described for the type, with a few exceptions. The head pattern is quite constant; a few individuals have a complete or almost complete first pale nuchal band instead of a series of dots as does the type. The maximum number of body bands is four; those body bands which are present are distinct and contain white scales to give an ocellate effect within each band. The black collar may be reduced, and may have as few as only a single pale ocellus present. Occasional specimens have only the ocelli and lack the black collar almost entirely. On complete and original tails there are three distal white rings, each bordered by black, and separated by wider areas of brown; the tail thus has a distinctly ringed appearance.

Thirty-nine subadults, juveniles, and hatchlings show the juvenile pattern and the transition therefrom to that of the adult female. The head markings in the young are like those of the female, even showing the same variation in the condition—*i.e.*, complete or nearly so, or dotted—of the first pale nuchal band. The collar lacks ocelli, and there are three or four dark body bands, enclosing on one hand between them dark brownish bands, and separated by pale buffy bands from one another, in an alternating pattern; the net result of this configuration is two wide dark bands including between them a brown band, these two triads separated by a pale buffy band. The collar is preceded by a pair of buff bands (the first and second nuchal bands) which enclose between themselves



a darker nuchal band. With increasing age and size, the black body bands and collar develop gray to white centers (ocelli) and the definite juvenile banding becomes more obscure until, in adults, the transverse body bands either persist as such or disappear.

Seventy-nine males show two patterns. The majority of the specimens in life had rusty-orange heads (occasionally with pale green linear female markings which are almost not apparent in the preserved specimens), dorsal ground color green anteriorly, dotted with rusty, turning to dark brown anterior to the sacrum. The tails were dull blueish, the throat a vivid orange (Pl. 4 D 12, Maerz and Paul) flecked with yellow; the ventral color was blue-gray. The balance of the males (eighteen individuals) show some sort of head markings, ranging from a dark brown spotting or reticulum to a complete blue-black reticulum covering the entire head and throat on a grayish ground color above and yellow-orange below (Fig. 5). These males are not all large, nor are they necessarily the largest specimens of the entire lot. Interpretation of this head condition is difficult. It is possible that this is a breeding coloration, although it is highly doubtful that those large males which lack it were not completely adult. The dark head cannot be interpreted as a senile or "super male" character since the series of males so marked include specimens with snout-vent lengths as small as 30 mm, well below maximum size (41 mm) for males of this race. Both one small and one large individual show what we interpret as the intermediate condition, wherein the head has a dark brown reticulum rather than a blue-black one. The specimens look remarkably like extra-large size Guadeloupe *S. fantasticus fantasticus*. No other subspecies of *S. copei* is known to have this condition, although the number of males of each of the other races is very small and lack of large series may give a fallacious impression. It is of interest to note that *S. anthracinus* males may on occasion develop a comparable dark vermiculate head pattern (Schwartz, *op. cit.*:20).

*Comparisons.* No scale counts will separate *cataplexis* from any other race. The mean for dorsals is intermediate between *picturatus* and *enochrus* on one hand and *copei* on the other; the mean for midbody scales falls between that of *picturatus* and *copei* on one hand and *enochrus* on the other. The mode of 13 (rather than 14 or 15) for fourth toe lamellae is of interest.

Female *cataplexis* can be distinguished with ease from females



of the other races. *Copei* has a U-shaped head figure, *picturatus* a cephalic V, and *enochrus* two rows of dots on a pale head. The head pattern of *enochrus* and *cataplexis* are somewhat comparable; however, the distinct body bands of *cataplexis* along with its dark dorsal color distinguish it immediately from *enochrus*. A casual glance at the color descriptions of *copei* and *cataplexis* makes it at once apparent that these two forms are very different in coloration, as well as pattern. Doubtless, if the coloration of *enochrus* and *picturatus* in life were known as well, these races would be seen to be equally distinct from *cataplexis*.

Male *cataplexis* lack the salt-and-pepper condition of *picturatus*, lack the distinct head lines of male *copei*, and may have darkly vermiculate heads, a condition which does not occur in any of the other three races. Again, coloration of living *cataplexis* and *copei* males reveals at once that these two forms are easily distinguishable in life.

A small series of eight specimens (four females, three males, one juvenile) from Ile-à-Vache does not appear to differ from specimens of *cataplexis* from Les Cayes on the adjacent mainland. None of the males in this lot shows the vermiculate head pattern. We regard these specimens as *S. c. cataplexis*.

There are twelve specimens from the vicinity of Miragoâne, as follows: MCZ 25411-13, Miragoâne, Dépt. du Sud, Haiti; MCZ 66226-28, Butète, nr. Miragoâne; MCZ 66229, Nan Corosse, nr. Miragoâne; MCZ 66230, Risque, nr. Miragoâne; MCZ 66231, Mingrette, nr. Miragoâne; MCZ 66232-34, Pemel, nr. Miragoâne. Although these specimens are intermediate geographically between the ranges of *copei* and *picturatus* they are much closer in pattern to *cataplexis*, which occurs to the southwest. The dorsal and head patterns of the females are similar to those of females from Camp Perrin; two of the males have the heads dotted with dark brown, a condition which is not precisely matched in any of the Camp Perrin series, but which may be an initial step between the orange head and the heavily vermiculate head in *cataplexis*. In scale counts these lizards are closer to *enochrus* (the range of which lies to the southeast of Miragoâne) in number of dorsals (15-17), but closer to *cataplexis* in midbody scales (41-48). Although these specimens are somewhat problematical, it is preferable to call them *S. c. cataplexis* at least until living members of this Miragoâne population can be observed.



## DISCUSSION

*Sphaerodactylus copei* has been shown to be divisible into four very distinct races on the basis of coloration, head pattern, and scalation. The species is known to occur only on the Tiburon Peninsula in southwestern Hispaniola, and presently is unknown from the affiliated Península de Barahona in the República Dominicana. *S. copei* is thus completely restricted to the south island and does not occur in, or even closely approach, the Cul-de-Sac plain. In actuality the species appears to be absent from the higher mountains in the Massif de la Selle and Massif de la Hotte; thus the northern (*copei* and *picturatus*) populations are effectively isolated from the southern (*enochrus* and *cataplexis*) populations, except that apparently *cataplexis* has crossed the mountains in the Fond-des-Nègres region and occurs on the north coast as well, between the ranges of *copei* and *picturatus*. Both *picturatus* and *cataplexis* have insular populations, the former on Grande Cayamite, the latter on Ile-à-Vache, which have not differentiated from the populations on the (more or less) adjacent mainland.

Only two species of *Sphaerodactylus* are known from the Tiburon Peninsula: *S. copei* and *S. cinereus*, although Cochran (1941, p. 112) listed a specimen of *S. stejnegeri*, collected by W. L. Abbott in "southwestern Haiti". During the period of 1917-18, Abbott did indeed collect extensively on the Tiburon Peninsula near Jérémie, Moron, and Moline, but between March 5 and 12, 1918, he collected near Etang Saumatre and Trou Caiman, (see Wetmore and Swales, 1931:25-26) both localities in the Cul-de-Sac whence *S. stejnegeri* is known. It is thus not unlikely that *S. stejnegeri*, typically a xeric region lizard, does not occur on the Tiburon Peninsula. Neither of these species (and in fact, no *Sphaerodactylus*) has been reported from the adjacent Ile de la Gonave, an island whose fauna shows some distinct relationships with that of the Tiburon Peninsula. Apparently *S. copei* has evolved on the western two thirds of the south island, has differentiated both on the north and south sides of the central mountain massifs, and has been able to cross these ranges at least in the relatively low Fond-des-Nègres area. It would not be surprising if *S. copei* were to be taken in the region of the Vallée de Trouin; specimens from this area may well be found to be intergrades between the races *copei* and *enochrus*.

At least in our experience, *S. copei* is distinctly not a gecko of xeric situations. At Camp Perrin they were extremely abundant,



occurring under almost any ground cover, and in piles of rocks and in old stone walls. At Diquini a small series was taken under rocks on the floor of the well-known cave at that locality. Camp Perrin lies at an elevation of about 1000 feet and, although not extremely wet, is certainly mesic and presumably was once forested. The Diquini area likewise is moderately mesic, with low-land cut-over forest adjacent to the cave. The altitudinal distribution of *S. copei* varies from sea level (Ça Ira, Ile-à-Vache, Les Cayes) to 1000 feet (Camp Perrin); it is possible that some of the unlocatable Miragoâne localities may be slightly higher than Camp Perrin.

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