

A reassessment of the Virgin Islands *Typhlops* with the description of two new subspecies

by

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A recent collecting trip to the Virgin Islands, in which I was fortunate to be able to participate, acquired specimens of *Typhlops* from several islands including three (Anegada, Virgin Gorda and Beef Islands) from which no *Typhlops* have been reported previously. I wish to thank Dr. Albert Schwartz for his support of the field work and study and Mr. David C. Leber for his active, enthusiastic assistance. Appreciation is also due to Miss A. G. C. Grandison of the British Museum (Natural History) (BM) for loan of specimens in her care, and to Dr. Charles F. Walker and Mr. George R. Zug for loan of specimens in the University of Michigan Museum of Zoology (UMMZ). I wish also to thank Mr. George A. Seaman of St. Croix for the gift of a specimen of *Typhlops* from that island. Dr. Carl E. Balli and Mr. Charles N. Ruble of North Shore Hospital, Miami, Florida, enabled me to obtain x-rays of specimens of *Typhlops*, for which I tender my sincere appreciation. Mr. Neil D. Richmond helpfully read and criticized the penultimate edition of the manuscript. Types and paratypes of the forms described herein have been donated to the following collections: Museum of Comparative Zoology at Harvard (MCZ), United States National Museum (USNM), American Museum of Natural History (AMNH), and the Carnegie Museum (CM). ASFS designates the Albert Schwartz Field Series and RT Richard Thomas private collection.

The standard method of indicating scale row reduction was found to be inadequate. A population may be characterized by a far anterior reduction from 22 to 20 scale rows, for example; but in the course of normal variation the reduction may not take place at any one particular spot, or even in a particularly narrow zone, in all specimens. This population might then be indicated as having both 22-20-18 and 20-20-18 specimens; another population which typically reduced to 20 rows somewhat further posteriorly might be indicated as hav-

ing specimens with both 22-20-18 and 22-22-18 formulas. By such a notation the true difference between populations may well be missed. Fortunately reduction in at least this group of *Typhlops* takes place very simply; it typically occurs by fusion of the two paramedian ventral rows; occasionally the midventral row is involved, fusing with one of the paramedian rows. I have therefore found it convenient to indicate the level of reduction from 22 to 20 rows by recording the number of the midventral scale, counted from the mental posteriorly, at which the reduction takes place. For the level of reduction from 20 to 18 rows the count is taken from the reduction along the midventral row to and including the last scale of the cloacal flap. Each reduction actually occurs in two steps which are not as a rule precisely symmetrical; i.e., reduction from 22 to 21 (or 20 to 19) typically takes place a short distance anterior to the final reduction from 21 to 20 (or 19 to 18). In a detailed description all reductions are indicated, but for descriptions of variation or comparative purpose (Figs. 1 and 2) only the level of the final reduction is given (21 to 20 or 19 to 18) as being the level of that particular major reduction (22 to 20 or 20 to 18).

Differences between populations of these *Typhlops* are frequently reflected in differences in the shape of head scales, particularly the rostral; these differences may be large and obvious or relatively slight. It is treacherously difficult to remember the variation of a large series and compare it with that of another, particularly when the difference involved is a matter of a slight variation in curvature or width. I have found certain ratios derived from measurements taken with an ocular micrometer to be of help in quantifying some of these differences. The first I call "labial flare" (Fig. 3) of the rostral; it is the ratio of the width of the rostral scale at its narrowest part (best seen in ventral aspect) over its width at the labial border expressed as a decimal fraction. The higher the fraction the lower the degree of labial flare; a labial flare of 1.0 indicates no narrowing of the rostral anterior to the labial border, both points measured having been of equal width. The second is called apical flare of the rostral and is the ratio of the width of the rostral at the level of the meeting of the nasal and the rostro-nasal sutures over the width of the head at the eyes; this too is expressed as a decimal fraction (Table 1). These ratios cannot, of course, express the total shape of the rostral; they merely help to express precisely certain aspects of it. Labial flare might be much more abrupt in some forms than in others; such a difference would not be indicated by the ratio, although the degree of flaring might be the same.

The Virgin Islands, referred to at times as "greater Puerto Rico", are for the most part both geologically and faunistically an extension of Puerto Rico. Essentially the fauna is a depauperate Puerto Rico one. Most of the Virgin Islands forms are relatively slightly differentiated from their Puerto Rican relatives, notable exceptions being *Amphisbaena fenestrata* and an undescribed species of *Sphaerodactylus* (THOMAS, 8) (*Eleutherodactylus lentus* apparently does not have its closest relative on Puerto Rico). *Alsophis nicholsi* and *Sphaerodactylus macrolepis* are forms whose relationships to their nearest Puerto Rican relatives are presently unresolved. St. Croix, which is somewhat set apart to the

south of the other Virgins, has four endemic reptiles (*Sphaerodactylus beattyi*, *Anolis acutus*, *Ameiva polops*, and *Alsophis sancticrucis*) not closely related to neighboring forms.

Typhlops richardi, described from St. Thomas by Dumeril and Bibron, has also been known from the islands of St. John, Tortola, and St. Croix: *T. richardi* is a member of the *jamaicensis* group of West Indian *Typhlops*, of which there are also forms known from Jamaica (*jamaicensis*) and Puerto Rico, Caja de Muertos, Vieques and Culebra (*platycephalus*). This group is characterized by possession of 22 scale rows at least anteriorly, relatively large size, relatively high number of middorsal scales (300+ to 400+), sharply contrasting dorsal and ventral colorations which meet in an irregular, saw-toothed juncture (this character is not invariable), and the preocular contacting only the third supralabial. Although both COCHRAN (1) and PARKER (5) have considered all of the forms of the group to pertain to the one species, *jamaicensis*, (the latter as a temporary convenience), SCHMIDT (7), RUTHVEN and GAIGE (6), and more recently LEGLER (1) have considered all named forms of the group to represent separate species. Ruthven and Gaige's study of the group was the most thorough, and was based on considerable series from Puerto Rico and Virgin Islands. The characters with which they distinguished *richardi* and *platycephalus* were average difference in middorsal scale counts and differently shaped rostral scales; due to their insularity the forms were recognized as separate species.

TABLE 1

Averages and ranges of middorsal scales, vertebrae and apical flare for various populations of *jamaicensis* group *Typhlops* as follows: I, Puerto Rico; II, St. John, St. Thomas, Tortola; III, Virgin Gorda; IV, Anegada; V, St. Croix; VI, Antigua; VII, Montserrat; VIII, Jamaica. Data for vertebrae of Montserrat *Typhlops* are from EVANS (2).

	Middorsals	Vertebrae	Apical flare
I	379.9 (361-417)	223.0 (217-230)	29.8 (22.4-34.8)
II	347.4 (314-383)	204.5 (194-215)	23.6 (21.6-26.7)
III	364.6 (345-390)	219.9 (213-228)	25.7 (22.2-31.3)
IV	385.8 (376-409)	234.0 (226-238)	29.2 (27.6-31.8)
V	334.6 (318-344)	—————	31.5 (25.8-34.8)
VI	356.8 (347-367)	—————	30.6 (29.4-33.4)
VII	378.5 (360-392)	203.0 (200-205)	33.1 (31.6-35.2)
VIII	405.7 (380-442)	225.6 (217-236)	40.2 (36.2-45.5)

My observations on the recently acquired Virgin Islands *Typhlops* roughly confirm the data of Ruthven and Gaige. There is a strong average difference between specimens from Puerto Rico and those from St. Thomas, St. John and Tortola taken as a group. The rostral scale of *platycephalus* does not flare strikingly at the labial border, whereas in *richardi* it typically does (labial flare for *richardi* .75-.92, for *platycephalus* .86-1.0) (Figs. 3 and 4). The expansion of the rostral on the tip of the snout is typically greater in *platycephalus* than in *richardi*, although there is some overlap in this character. In size *richardi* is smaller (*vide infra*) and the dorsal and ventral colorations are not sharply demarcated from one another but merge gradually over a narrow zone; the

opposite condition, characteristic of the *jamaicensis* group, is typical of *platycephalus*. Because of the difference in number of vertebrae observed by LEGLER (4) between small samples of *platycephalus* and *richardi* (220-233 versus 197-205 respectively), x-rays were made of larger series of both forms; Legler's data were confirmed. For nine specimens of *platycephalus* x-rayed, the range of vertebrae was 217-230; for 14 specimens of *richardi* (St. John, St. Thomas, Tortola) the range was 194-215. (EVANS, 2) obtained a much narrower range of vertebrae (200-205) for 17 "*jamaicensis*" from the island of Montserrat, which were stained and cleared; it is possible that the inherently less revealing x-rays resulted in greater error and therefore greater apparent variation). The level of difference between *platycephalus* and *richardi* thus appears to warrant only subspecific recognition. Further support of this is found in the specimens from Anegada and Virgin Gorda, which, though different in themselves, bridge the gap between *platycephalus* and *richardi* in some characters and in others are closer to *platycephalus*. Recognition of *richardi* and *platycephalus* as separate species would demand recognition of the Anegada and Virgin Gorda forms as either races of *platycephalus* or as a separate species (see discussion). The latter alternative obscures obvious relationships; the former would be geographically absurd. By page priority, the Virgin Island form is the nominal race, *Typhlops richardi richardi*; the Puerto Rican subspecies is thus *Typhlops richardi platycephalus*. Ruthven and Gage are followed in considering *platycephalus* to pertain to the *Typhlops* of the islands of Vieques and Culebra.

Typhlops jamaicensis is here regarded as a species separate from *richardi*. It differs from the latter in the pronouncedly wide rostral in dorsal aspect with considerable apical flare and no labial flare (Fig. 4), and in having 22 scale rows the length of the body (with rare exceptions which reduce to 20 just anterior to the vent). Although some of these differences seem to be bridged by specimens of this group from the Leeward Islands, there are also striking hemipenial differences. The hemipenis of *jamaicensis* is heavy, fleshy and trumpet-shaped, while that of *richardi* is extremely attenuate and undifferentiated apically (Fig. 5).

Typhlops has not been previously recorded from the "out islands" of the Virgins, which lie to the east of Tortola. The *Typhlops* of Anegada, the "drowned" island, at the northeast extremity of the Virgin group is here named in allusion to its home island.

Typhlops richardi catapontus, new subspecies

HOLOTYPE: MCZ 77220, collected from the island of Anegada, British Virgin Islands, in the vicinity of the Settlement, 18 August 1964, by Richard Thomas.

PARATYPES: ASFS V3938, V3940-41, CM 39611, USNM 152448, same data as type.

DIAGNOSIS: A subspecies of *Typhlops richardi* characterized by far anterior reduction of scale rows, a low degree of labial flare, a high number

of vertebrae (226-238), large size, and a low number (nine) of pigmented scale rows.

DISTRIBUTION: The island of Anegada, B. V. I.

DESCRIPTION OF HOLOTYPE: An adult, total length 265 mm, tail 7 mm. Rostral elongate, almost straplike, less than one-half as wide as long in dorsal aspect, about one-fourth as wide as head at level of eyes, posterior extent to level of ocular; labial flare of rostral .90; expansion at tip of snout slight. Nasals divided by suture from second labial to rostral, nearly in apical contact behind rostral. Preocular roughly triangular, with pronounced indentation at level of eye; ocular-preocular suture not sinuate. Ocular nearly twice as high as wide. Two pairs of enlarged parietals, both extending ventrally to level of top of eye; two postoculars, both of equal height, approximately as large as anterior body scales. Middorsal scales between rostral and caudal spine 382; scale rows anteriorly 22 reducing to 21 at level of 29th midventral scale posterior to mental and to 20 at 33d midventral; reduction from 20 to 18 scale rows symmetrical at level of 151st midventral anterior to vent.

COLORATION (in alcohol): Dorsal coloration grayish brown, pigmented scales occupying nine dorsalmost rows of the length of the body; contact of dorsal and ventral coloration irregular, involving only one scale row (except in neck region); ventral coloration pale pinkish. Parietals, supraoculars, frontal, prefrontal and posterior portions of rostral and nasals with dark centers; zone of lighter brown body scales behind parietals forming a lighter ring across labials with ventral coloration. Tail with two invasions of ventral color onto dorsum forming "rings" which isolate a dark patch on middle of tail and at tip; terminal spine light.

VARIATION: The details of the head scalation of the five paratypes are much the same as that of the type; labial flare of the rostral is either .90 (three) or 1.0 (two). Middorsal scales range from 376 to 409. Reduction from 22 to 20 scale rows occurs at level of 35th to 131st ventral scale behind mental; one specimen (ASFS V3938) is abnormal, reduction first occurring at 68th and 77th midventral, but the scale rows continue to redivide and re-fuse intermittently for a considerable distance; reduction to 18 rows occurs from level of 124th to 152nd midventral anterior to vent. Vertebrae range from 226 to 238 for the type series. COLORATION: Coloration of the paratypes is similar to that of the type; dorsal pigmented rows are uniformly nine, faint traces of ventral pigmentation rarely extend beyond fourth scale rows (ventral to mid-dorsal row) on isolated scales. The light nuchal zone occurs in every specimen; no other specimen has the pronounced invasion of ventral color onto the dorsum of the tail as in the type. Four, however, have a slight to moderately prominent degree of invasion of light ground color onto the dorsa of the tails (caudal notching).

The specimens from the island of Virgin Gorda to the south of Anegada are also distinct from other races of *richardi* and may be known as

Typhlops richardi naugus, new subspecies

HOLOTYPE: MCZ 77221, collected on the island of Virgin Gorda, British Virgin Islands, on the hillside above Pond Bay, 11 August 1964 by David C. Leber.

PARATYPES: USNM 152449, Virgin Gorda, just north of Garden Rock, 11 August 1964, D. C. Leber; CM 39612, Virgin Gorda, north of Pond Bay, 13 August 1964, D. C. Leber; ASFS V3789-90, Virgin Gorda, just north of Garden Rock, 14 August 1964, Richard Thomas; UIMNH 55629-30, AMNH 92829, Virgin Gorda, SW slope of Gorda Peak ca 800', 16 August 1964, R. Thomas; KU 79857, RT 948, Virgin Gorda, inland margin of Salt Pond behind St. Thomas Bay, 17 August 1964, R. Thomas.

DIAGNOSIS: A subspecies of *Typhlops richardi* characterized by far anterior reduction of scale rows, relatively high labial flare, large size, and a relatively high number (mode 11) of pigmented scale rows.

DISTRIBUTION: Known only from the island of Virgin Gorda, B. V. I.

DESCRIPTION OF HOLOTYPE: An adult male, total length 243 mm, tail 8 mm. Rostral elongate, one-half as wide as long in dorsal aspect, about one-fourth as wide as head at level of eyes, posterior extent to level of ocular; labial flare of rostral .78; expansion at tip of snout slight. Nasals divided by suture from second labial to rostral and narrowly separated from contact behind rostral. Preocular roughly, triangular, with indentation at level of eye; ocular-preocular suture not sinuate. Ocular nearly twice as high as wide. Two pairs of enlarged parietals, both extending ventrally to level of top of eye; two post-oculars of equal height, approximately as large as anterior body scales. Mid-dorsal scales between rostral and caudal spine 357; scale rows anteriorly 22, reducing to 21 at level of 29th midventral scale posterior to mental, to 20 at 51st midventral scale; reduction from 20 to 18 symmetrical at level of 145th midventral anterior to vent. COLORATION (in alcohol): Dorsal coloration dark (chestnut), pigmented scales occupying the 11 dorsalmost rows; contact of dorsal and ventral coloration irregular with only one scale row typically occupied by both. Ventral coloration gray with pinkish tinge anteriorly, whitish posteriorly. Light nuchal coloration noted for *catapontus* is faintly evident; snout and upper labials light, faintly yellowish; tail with slight caudal notch on one side; terminal spine partially pigmented.

VARIATION: In details of head scalation the paratypes are similar to the type; labial flare of the rostral varies from .70 to .82. Middorsal scales range from 345 to 390. Reduction to 20 scale rows occurs from 28 to 80 ventral scales behind the mental; reduction to 18 rows occurs from 132 to 151 midventral scales anterior to the vent. Vertebrae for the type series range from 213 to 228. COLORATION: The dark dorsal and anterior ventral coloration noted for the type is consistent in the paratypes, as is the presence of the nuchal light zone. Pigmented scale rows vary from nine (two) to 12 (mode 11). Caudal notching occurs in eight of the nine paratypes. Dark centers to the scales of most specimens give a striate pattern bolder in some than in others.

COMPARISONS

T. richardi catapontus differs from *naugus* primarily in possessing less labial flare (.90-1.0 versus .70-.82 respectively); the darker coloration of *naugus* appears to differ uniformly from the faded coloration of *catapontus*. The number of pigmented scale rows is nine in all *catapontus*, whereas only two of the ten *naugus* have nine pigmented rows. In the far anterior scale row reduction of these two forms, they form together a group separate from the other races of *richardi*. Of interest is the similarity in size and coloration (sharply defined dorsal and ventral coloration and presence of caudal notch or ring in some specimens) of *catapontus* and *naugus* to *platycephalus*. Of 20 *T. r. richardi* examined by me and 16 in the University of Michigan Museum of Zoology examined by Mr. George R. Zug, the largest measures 232 mm total length, while of the specimens at hand of *platycephalus*, *catapontus* and *naugus* (34 specimens) 16 measure more than 232 mm, the largest being 302 mm (a specimen of *platycephalus*). Probably in some degree correlated with size are higher average counts of middorsal scales vertebrae for these three populations. In labial flare the extreme northeastern form, *catapontus*, is closer to *platycephalus*, while in this character (and in coloration) *naugus* is somewhat closer to *richardi*. This intermediacy of *naugus* is slightly but further demonstrated by slightly lower average middorsal scale counts and number of vertebrae. In both reductions the Beef Island specimen is intermediate in value between the St. Thomas, St. John, Tortola *richardi* and the two easternmost races (Figs. 1 and 2). The Beef Island specimen may well represent a "frozen" intergradient population; that is, the population may have been truly intergradient when the Virgins were a more or less continuous land mass. Aside from any subsequent divergences of its own, such a population would become "frozen" (isolated from genetic contact with neighbor populations) upon the formation of the Virgins archipelago.

Five specimens of *Typhlops* from St. Croix, which I have examined, are best considered to represent *T. r. richardi*. The middorsal scales of these specimens (318-344) fall in the lower part of the range of that race. Reductions from 22 to 20 rows take place from 171 to 261 ventrals posterior to the mental; none reduces to 18 posteriorly. In coloration these are more typical of *richardi* as there is no sharp demarcation between the dorsal and ventral colorations. The shape of the rostral is more typical of *platycephalus* in the lack of labial flare; however, as noted previously, these characters of the rostral form no absolute distinction between *platycephalus* and *richardi*. A larger series would doubtless show average differences between the St. Croix population and those of St. Thomas, St. John and Tortola.

Specimens of *richardi* affinities from the Leeward Islands (Antigua, St. Kitts, Nevis, and Montserrat) examined by me differ in the shape of the rostral from *platycephalus*, *richardi*, *catapontus* and *naugus*; in far posterior reduction of scale rows they are distinguishable from *catapontus* and *naugus*. As

the *Typhlops* of the Lesser Antilles are to be the subject of a separate study, more detailed discussion of these specimens is not undertaken at this time.

Anegada lies about 15 miles to the north of Virgin Gorda (Fig. 6); it is therefore set well off from the main body of the Virgin Islands (with the exception of St. Croix, which is even farther removed but to the south). Anegada is a low, flat limestone island, so low in fact that much of it is partly inundated (hence its name, meaning "drowned") forming extensive salt ponds and marshes. In the approach to the island from the south the waters are quite shallow for some distance from shore and extensively dotted with reefs. These characters are in contrast to the islands of the main body of the Virgin Islands which are primarily igneous in lithology and appear as mountain peaks, often quite precipitous, protruding from the sea. Virgin Gorda is more typical of the latter category and attains heights of over 1000 feet.

Obviously, the geological distinctness of Anegada is not closely correlated with the faunal differences as reflected in the *Typhlops* (and other species). The *Typhlops* of Anegada and Virgin Gorda, while but relatively slightly differentiated from one another, form a group in themselves set off from those of the rest of the Virgin Islands. The "return" of these easternmost races in several characters (size, middorsal scales, vertebrae, coloration, caudal ringing or notching, and lack of labial flare in *catapontus*) typical of *platycephalus* is puzzling. It is possible that the similarities are fortuitous, having turned up by chance in these populations. Because of the number of characters in which they agree, I do not favor this interpretation. That these easternmost islands may have been colonized directly and more recently from Puerto Rico does not, on the other hand, seem quite likely; there is evidence of intermediacy (the Beef Island specimen) and apparent trends of *naugus* towards *richardi*, which belies a separate colonization. Also, *catapontus* and *naugus* have certainly diverged from the others, which would not seem to indicate a more recent separation from *platycephalus*. Another alternative is that as peripheral populations, those of Puerto Rico and the easternmost Virgins have retained more primitive characters. Both in size and coloration they do seem to be more primitive, i.e., to have characters typical of the group as a whole; this viewpoint is worth considering.

SPECIMENS EXAMINED

Typhlops richardi richardi: St. Thomas: Dorothea. ASFS V7330; 1 mi. SE Water Bay, ASFS V7988; 2.7 mi. NW Charlotte Amalie. ASFS V8034. St. John: Frederickdal ruins, ASFS V8067-69. Tortola: Jackass Gut. ASFS V7900, V7979-83; Baugher's Bay. ASFS V7916-20. RT 976; Lloyd's Pond. V7978. St. Croix: Little La Grange. UMMZ 80630; Anguilla, UMMZ 80631; Experimental Station, West End, UMMZ 80632, 80782; Estate Clairmont, ca. 600'. ASFS V4153.

Typhlops richardi platycephalus: Puerto Rico: 7 m. NW Sabana Abajo. ASFS 11899; 5 mi. NE Mayagüez. ASFS 12136; 2.5 mi. SW Yabucoa. ASFS. X4062; Isla Verde. ASFS X653, X4126-28, X4938-39, X7399-402, V4147-48 RT 112.520; 0.7 mi. E Palmas Altas, ASFS X7501-02; Playa de Luquillo, ASFS X7496; 4 km. SE Isabela, ASFS V3244. Vieques:

Cayo de Afuera, easternmost of two, ASFS V4072.

Tybblops richardi catapontus: As listed for type and paratypes.

Tybblops richardi naugus: As listed for type and paratypes.

Tybblops richardi richardi × *naugus*: Beef Island, western end, ASFS V7806.

Tybblops cf. *richardi*: Nevis: St. George Gingerland Parish, White Bay, ASFS 19783; St. Christopher: Christ Church Nichola Town Parish, 3 mi. SW of Molyneux, 1600' ASF 19789. Montserrat: BM 1924.2.19.10-11, 1931.10.18.158-59, 1934.4.1.2; St. Anthony's Parish, west slope, South Soufrière, 1400, ASFS 19393, 19394 (1300'); Richmond; BM 1924.2.19.9. Antigua: BM 65.5.4.144, 94.9.20.9-10, 99.6.29.16, 1927.4.20.33; Gunthorpes, 1940.2.4.2.

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Fig. 1. Chart showing level of reduction (number of midventral scales posterior to mental) from 22 to 20 scale rows; only final reduction (21-20), is indicated. A, Anegada; B, Virgin Gorda; C, St. John, St. Thomas, Tortola; D, St. Croix; E, Puerto Rico, Vieques, F. Antigua; G, Montserrat. Arrow indicates Beef Island specimen; + 2 indicates two specimens which do not reduce to 20 rows.

Fig. 2. Chart showing level of reduction (number of midventrals anterior to vent) from 20 to 18 scale rows; only final reduction (19-18) is indicated. A, Anegada; B, Virgin Gorda; C, St. John, St. Thomas, Tortola; D, Puerto Rico. Arrow indicates Beef Island specimen.

Fig. 3. Graph showing labial flare of rostral scales; 1.0 indicates no labial flare (see text). Horizontal line show range, vertical line the mean, lower rectangles indicate one standard deviation on either side of the mean, and higher rectangles one standard error of the mean on either side of the mean. A, Puerto Rico; B, St. John, St. Thomas, Tortola; C, Virgin Gorda; D, Anegada; E, Antigua; F, Montserrat.

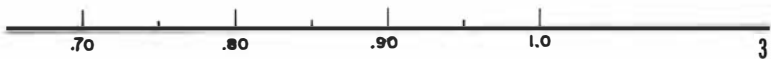
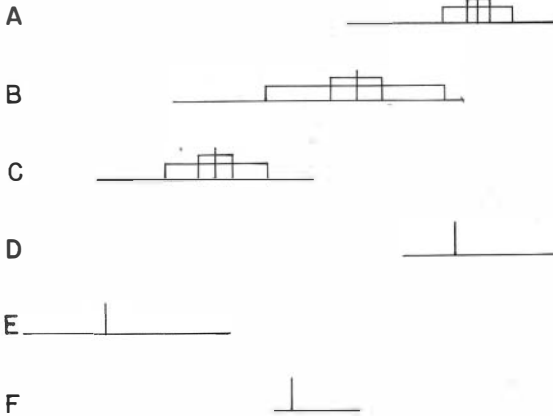
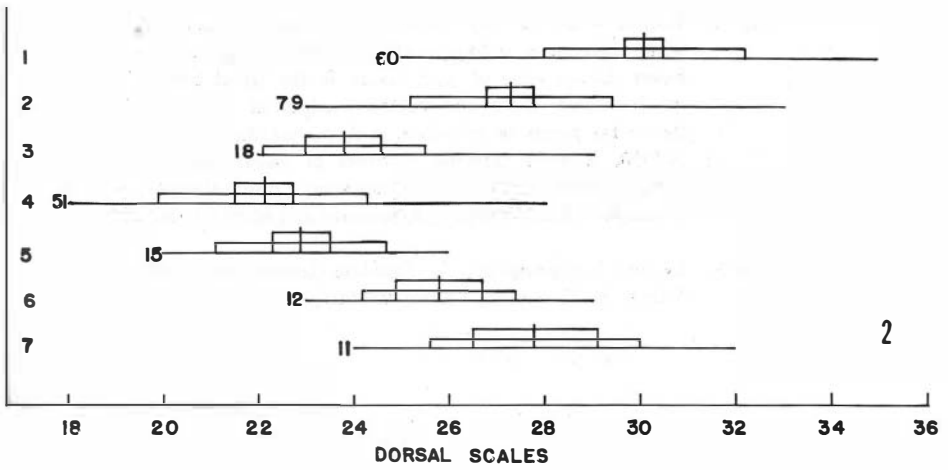
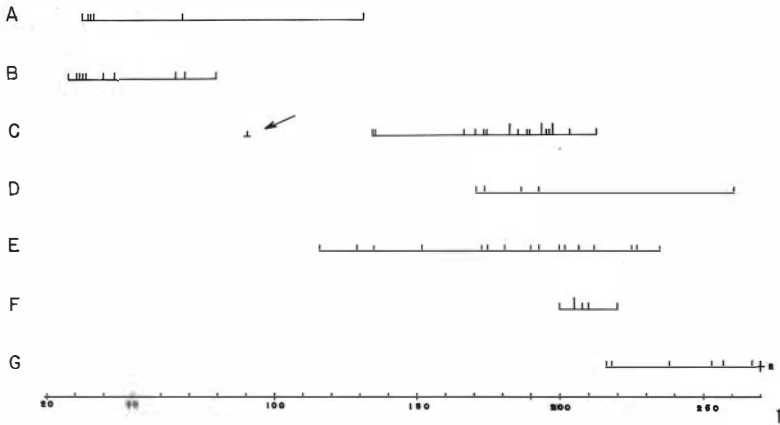


Fig. 4. Rostral scales as they would appear flattened out showing differences in shape characteristic of the various forms. Lower edge of each figure is the labial border; nasal sutures, nares and posterior edges of nasals are shown for points of reference. A-B, *platycephalus* (ASFS X4938, X7496) showing extremes of apical flare; C, *richardi* (ASFS V7917); D, *catapontus* (ASFS V3938); E. *naugus* (ASFS V3790); F. *jamaicensis* (ASFS 15296).

Fig. 5. Everted hemipenes of: A, *Typhlops jamaicensis* (ASFS 15303); B, *T. richardi* (ASFS V3790).

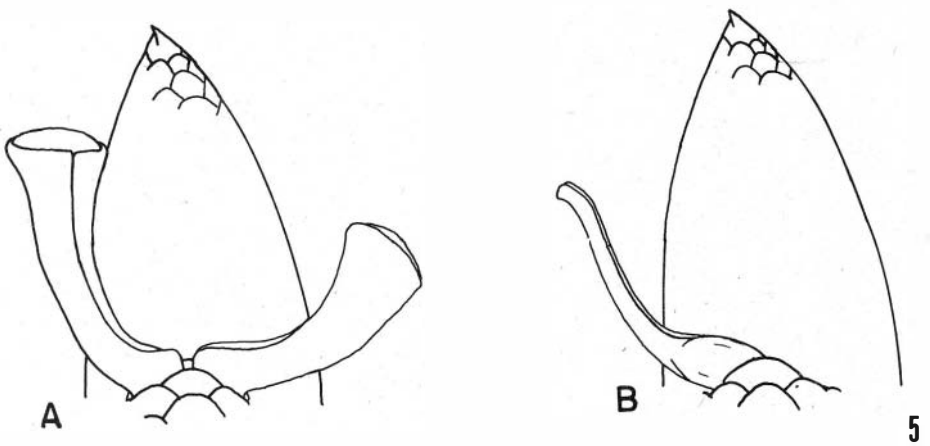
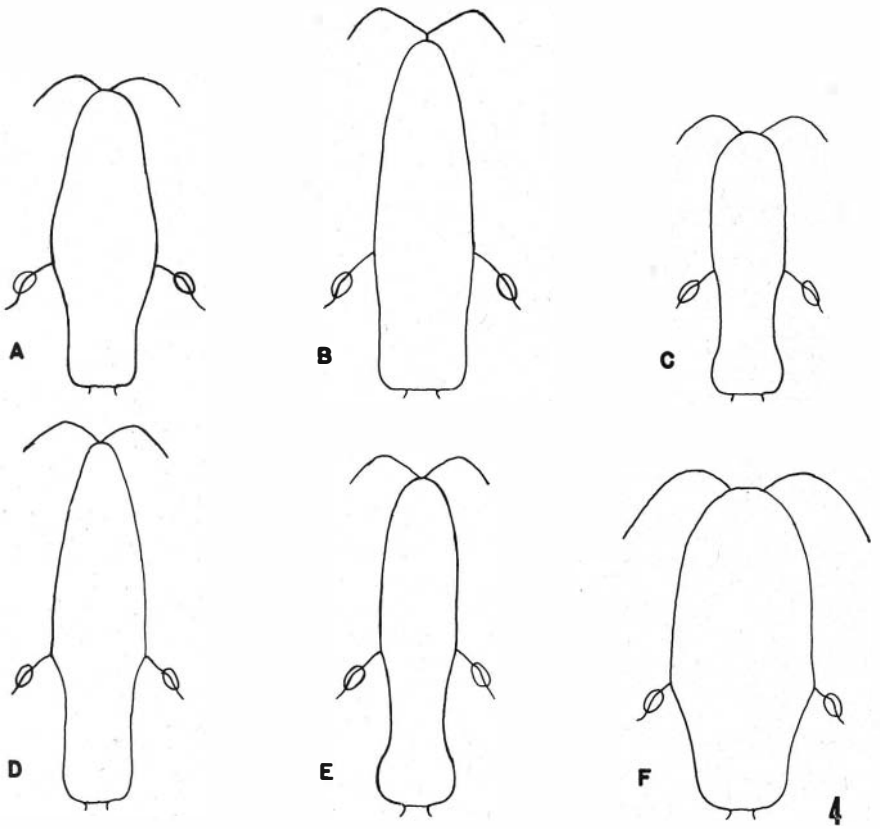


Fig. 6. Map of the races of *Typhlops richardi* showing eastern end of Puerto Rico and the entire Virgin Island group. Key to Island Abbreviations: PR (Puerto Rico), VS (Vieques), CA (Culebra), SX (St. Croix), ST (St. Thomas), SJ (St. John), TA (Tortola), BF (Beef), VG (Virgin Gorda), AN (Anegada). Crosshatching indicates *platycephalus*; dots, *richardi*; horizontal lines, *naugus*; vertical lines, *catapontus*. Beef Island is indicated with superimposed dots and horizontal lines. Ranges are shown as including entire islands except on St. Croix where evidence indicates that the range of *Typhlops* is restricted (GRANT, 3).

