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REVISIONARY COMMENTS ON THE GENUS *BOA* WITH THE DESCRIPTION OF A NEW SUBSPECIES OF *BOA CONSTRICTOR* FROM PERU

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Abstract: The taxonomy of the genus *Boa* is poorly elucidated as a result of the spotty systematic fieldwork on this wide-ranging genus. Given current suggested modifications of the species concept, the insular taxa, *nebulosa* and *orophias*, warrant specific recognition. Evidence for the occurrence of *Boa constrictor imperator* in southern Ecuador and Peru is lacking, and its retention on checklists of Peru is a literature artifact. A new *Boa*, restricted to Tumbes, Peru, merits at least subspecific recognition, as it differs from all conspecifics in length of tail and hemipenis, color pattern, and is geographically isolated.

The systematics of the species *Boa constrictor* is in a lamentably poor state considering that it has been known to the scientific community since at least the time of Linnaeus, is one of the most widely distributed terrestrial vertebrates known, and is arguably the most widely recognized snake in the world. *Boa constrictor* is polytypic on two continents comprising a geographic range of over 6 million square miles, including five known distinguishable insular populations (at least one of which has not been formally recognized) and at least two mainland forms apparently allopatric with either of the major continental subspecies. Our incomplete knowledge of this species is likely a result poor sampling over the extensive distributional range which has dissuaded investigators from pursuing any comprehensive study.

Map. The solid circle represents the type locality and known extent of the range. All specimens of *Boa constrictor longicauda* documented to date are from the town of Tumbes or vicinity of Tumbes, Peru.

Recently dissatisfaction among herpetological taxonomists with the old Biological Species Concept and suggestions for new specific and subspecific criteria does allow for more latitude in analysis of the populations and demes of *Boa constrictor*, but will, of course, fall short of satisfying the more extreme interpretations. We have chosen to base our determinations on the more conservative, traditional rule that two populations are subspecifically different if they differ in

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a suite of characters to the degree of at least 75% (full species differing at the 100% level). In many interpretations of this rule, an area of parapatry and intergradation must occur for subspecies recognition. We emphasize that time frame may create operational difficulties in this theory, as a current observation may not provide adequate data as to long term characteristics and fates of evolving populations. Nonetheless, this method of subspecific determination (with minor variations) is supported by Smith (1990), who emphasizes that recognition of dichopatric populations as different species is subjective and subject to opinion, Janis Roze (pers. comm.), and Herndon Dowling (pers. comm.).

If one accepts the Phylogenetic Species Concept of Rosen (1978, 1979), the smallest diagnosable populations of *Boa constrictor* with a derived character difference would be full species, including the undescribed pallid population from Islas de Bahia and Cayos Cochinos, Honduras, the new Peruvian population described herein, the isolated subspecies *ortonii*, and the insular Caribbean *orophias* and *nebulosa*. The somewhat more conservative, cladistically influenced Evolutionary Species Concept (ESC) of Frost and Hillis (1990) would also elevate *orophias, nebulosa*, and likely the new Peruvian population to full species, as they are allopatric and appear not be reproductively compatible with other *Boa*. Lazell (1964), in describing *nebulosus* (which should have been named *nebulosa*, as *Boa* is a feminine genus), expressed some misgivings about not according full species status to *orophias* and *nebulosa*, especially as he was concerned about their ability to interbreed with mainland forms. He stated that he would have described *orophias* as a full species had *nebulosa* not existed to form a cline from the mainland form. Proponents of the ESC consider allopatric clinal subspecies to be full species, particularly if they will be subsumed into the larger species in future. We see no reason to infer that the islands of St. Lucia and Dominica (as a single unit) will afford boas opportunity for genetic exchange with the mainland barring major tectonic catastrophe. Stull (1935) placed these Lesser Antillean forms of *Boa* in the species *orophias*, as a consequence of their insular occurrence on St. Lucia and Dominica and their substantial phenotypic differences from mainland *Boa*. We concur, these snakes being 100% genetically isolated from the mainland, although it is uncertain whether they comprise one species or two.

Insufficient data is available on the Honduran insular populations to make a determination of their proper taxonomic rank. Peters and Orejas-Miranda (1970), and Vanzolini (1986) consider the insular Panamanian *sabogae* a subspecies based on traditional methodology. The distance from Saboga Island to Panama is not sufficient for a determination of reproductive isolation to have been conclusively made. Zweifel (1960) has placed *sigma* in the synonymy of *imperator* based on traditional criteria. Again, the distance from the Tres Marias Islands to Mexico proper is insufficient for isolation or important character variation.

The Peruvian Boa Fauna

Despite the facts that *Boa constrictor* has never been reviewed in its entirety and the relationships between the two major contiguous subspecies, *constrictor* and *imperator*, are poorly elucidated, there exist several insular and/or relictual subspecies recognized by nearly all workers (*vide supra*). Several American workers

(Wilson and Meyer, 1985) have argued against the recognition of new or additional *Boa* subspecies and have, in fact, called a taxonomic system dependent on subspecies archaic. While the authors stand opposed to the naming of gratuitous or dubiously documented taxa at any level, as has recently been the case with *Lampropeltis triangulum*, and possibly with *Boa constrictor melanogaster* (Langhammer, 1983), we are compelled to formally report as new such taxon as merits identification at its proper hierarchial level. Having found a population of *Boa* which has evolved sufficiently to appear unique, we herein describe a new subspecies from a relictual area in Tumbes, Peru.

Part of problem in assessing subspeciation in Peruvian *Boa constrictor* is the lack of certain geographic ranges for the known taxa. Stimson (1969) and Peters and Orejas-Miranda (1970) both list the southernmost range of *B. c. imperator* and the only range of *B. c. ortonii* as northwestern Peru. Schmidt and Walker (1943), however, list only *B. c. ortonii* as occurring from Piura south to Libertad. Assuming acceptance of the validity of *ortonii*, only the province of Tumbes lies outside its range on the northwest coastline of Peru, and the snake inhabiting this province is unique. We would accord it specific status, were we absolutely certain that no intergradation with *B. c. imperator* occurs, although none has been documented.

With regard to *Boa constrictor melanogaster*, Langhammer's (1983) poor taxonomic procedure renders this name a nomen dubium, although it may well be a recognizable taxon. His most egregious error is his blatant disregard for the high dorsal scale counts of *B. c. constrictor* documented by such respected workers as Lazell (1964), Dixon and Soini (1977, $\bar{x}$=92.2 for 7 specimens) and Vanzolini, Ramos-Costa and Vitt (1980). These counts were later supported by Chippaux (1986) who examined 15 specimens from Guyana with 91 to 95 midbody dorsal scales. Langhammer (1983) stated that that snakes with dorsal counts in excess of 88 were most likely misidentified *melanogaster*. The inference that *melanogaster* inhabits Guyana and Caatingas, Brazil as well as Ecuador is untenable. Also worthy of note is Langhammer's (1983) contention that *melanogaster* has mid-dorsal saddles only 4–7 scales in length; his photograph of the holotype shows that while this is true for saddle number 10, saddles number 6 and 7 cover 10 scales, and saddle number twelve covers 8 scales. Langhammer admits to being unsure of the range of *melanogaster*; he states (1983) that the range should overlap into the Amazonian areas of northern Peru, where Dixon and Soini (1977) have, in fact, documented the occurrence of subspecies *constrictor*. Finally, we are left with no criterion to distinguish this population from *constrictor* except the dark ventral surface, whose status at the area of intergradation with *constrictor* remains uncertain. Nonetheless, Langhammer's tables of meristic counts are fairly complete and well documented. His assertion that *imperator* has 22 or more dorsal saddles is supported by hundreds of observations, however, his support for the traditional assumption that *B. c. constrictor* has 21 or fewer saddles is not entirely correct, as we have seen 2 specimens from Colombia with 22. This being the case, *ortonii*, which have 15–19 body saddles and the Tumbes "black boas" with 19–21 cannot be *imperator* sensu Langhammer (1983). The inference that *imperator* occurs in Peru at all thus lacks support. Its retention as a

Peruvian taxon in recent accounts (Langhammer, 1983; Peters and Orejas-Miranda 1970) is thus either artifactual or suppositional, as the Tumbes population was not well known until 1987. We thus propose a restriction of the range of *imperator* to southern coastal Ecuador, an area poorly represented in museum collections.

With regard to the "black boas" of Tumbes Province, Peru, the data for taxonomic recognition is much more convincing. These snakes differ in numerous respects from both subspecies *imperator* and *constrictor*, and are isolated from the latter by mountains almost 3000 meters feet in elevation. We thus describe them below as:

***Boa constrictor longicauda* subsp. nov.**

Holotype.—Museum of Comparative Zoology (MCZ) 176002, a subadult male, was collected on June 14, 1988, east of Tumbes, Tumbes Province, Peru, by a native collector.

Paratypes.—MCZ 176003, an adult male (illustrated on cover plate), collection data same as for holotype, is represented by a complete shed skin, the specimen still extant (RMP 551, collection of the senior author) to be donated to MCZ upon its demise. RMP 553, a subadult male, was collected in 1989 in Tumbes Province, Peru, obtained from importer, no further data available.

Diagnosis.—*Boa constrictor longicauda* may be distinguished from all conspecifics by the much longer tail (in the male) and hemipenis. Additionally, it may be distinguished from *B. c. imperator* by fewer dorsal body bloches (20–21 in *longicauda*, 22 or more in *imperator*), the longitudinal mid-dorsal band without projections to the eyes, and the generally darker head and body coloration, without tan or red color on the tail in adults; from *B. c. constrictor* by lack of red coloration on the tail, fewer midbody scale rows (a maximum of 76, usually fewer in *longicauda*, a minimum of 81, usually several more in *constrictor*), the darker body pattern without tan color, and the grey, black-spotted head in adults; from *B. c. ortonii* by the much darker overall coloration, lack of red tail color and lower ventral count (246–252 in *ortonii*); from *B. c. melanogaster* (sensu Langhammer, 1983) by the much longer tail, lack of melanistic ventral coloration, and fewer middorsal scale rows (86 or more in *melanogaster*); from *B. c. amarali* by the overall darker coloration, greater number of subcaudals (43–52 in *amarali*), and fewer dorsal body saddles (22 or more in *amarali*); and from *B. c. occidentalis* by the greater number of subcaudals (45–46 in *occidentalis*), and the very different color patterns (a blackish network or reticulum on a cream ground color in *occidentalis*).

Description of Holotype.—The following description was made postmortem on the as yet unpreserved specimen. The holotype is a small adult male 159.5 cm in length with a 23.6 cm tail. The tail/total length ratio of 0.148 is the longest documented for any specimen of *Boa*. The head is grey with a flew black-specks and a mid-dorsal longitudinal spear-shaped black band which bulges laterally at the level of the eyes. It has thick black pre-ocular stripe from the nostril narrowing at the eye, and a postocular stripe underlined with a narrow white band extending past the angle of the jaw. The tip of the snout is slightly abraded. It has 19 mid-dorsal body saddles, 7–10 scales in length at midbody. The first 4 saddles are connected by lateral bands. These saddles are almost entirely black, numbers 4 to 14 having elongate white patches in their

lateral expansions. There are 23 lateral body blotches, charcoal gray and 5 scales long anteriorly, originating on the third or fourth scale row, becoming progressively darker and longer posteriorly, reaching a maximum of 18 scales in length, originating on scale row 1 posteriorly. Several of the posterior body blotches have white centers. The flanks are grey, the interspaces between the saddles dark brown. The ventral ground color is cream and almost without spotting on the anterior 1/3 of the body, laterally spotted and flecked with black on the middle 1/3, and heavily spotted with black on the posterior 1/3 of the body. There are 4 black dorsal tail blotches with a black tail spine. The underside of the tail is cream, with 4 large black spots, each 4 to 4 1/2 subcaudals long. There is no red coloration on the tail. The ground color of the tail is yellow.

There are 247 ventrals and 62 subcaudals. The dorsal scutellation is 54 at the neck, 66 at midbody, and 38 at the tail. There are 20 supralabials and 22 infralabials. The infralabials are lightly flecked with black. The hemipenis probed 40 subcaudal scales while the animal was alive, and the right organ subtended 29 subcaudals when everted (but not fully turgid, retractor muscle not cut). The left hemipenis is partially everted.

Remarks.—The holotype is one of only 2 specimens with 19 dorsal saddles; it appears to be congenitally missing the first dorsal body saddle.

Variation.—A total of 10 males and 10 females were included in this study. Males mature sexually at about 150 cm, and both sexes attain lengths in excess of 280 cm. There are 19 to 21 black dorsal body saddles, 7–10 scales in length at midbody, often joined anteriorly by lateral stripes, but separate posteriorly. There are 4 to 6 black or brown-black dorsal tail blotches. The head surface ranges from gray to charcoal with a coal black longitudinal middorsal spear-shaped band which may send small lateral projections toward, but not reaching the eyes, and there may be a subocular black projection not reaching the upper labials. Suffusion of black on the head, snout, and infralabials is highly variable, the paratype having numerous dark flecks and spots. There is pronounced ontogenetic variation in the color of the flanks; juveniles having brown flanks which change to gray or black in a period of less than two years as maturity is reached. Adults may develop extensive white patches on the flanks and in the lateral aspects of the saddles. The interspaces between the saddles are brown in younger specimens, but become strongly suffused with black in larger snakes (see illustration of paratype). There are 50 to 58 ($\bar{x}$=54.0) dorsal scales around the neck, 60 to 76 ($\bar{x}$=67.7) at midbody, and 32 to 40 ($\bar{x}$=37.9) posteriorly. Ventrals range from 223 to 247 ($\bar{x}$=239.2), and subcaudals from 60 to 67 ($\bar{x}$=62.8) in males and 50 to 54 ($\bar{x}$=52.7) in females. The tail is long, comprising 11.1 to 12.0 percent of the total body length in females, and 12.8 to 14.8 percent in males. There is significant sexual dimorphism in tail length. The hemipenis probes 36 to 40 subcaudals.

Distribution.—*B. c. longicauda* is known only from Tumbes Province, Peru, the only coastal tropical wet forest in Peru.

Etymology.—The name *longicauda* is Latin for "long-tailed."

Discussion

Boa constrictor longicauda has a longer tail than other subspecies, and there is

significant sexual dimorphism at the .02 level by Student's t test, the males' tails averaging 14.1% of total body length, the females 11.6%. Although the literature contains inadequate analyses of tail length to total length ratio in other populations to make a statistically valid statement, it is worthy of note that there are no records for other males with tails as long as *B. c. longicauda*. Dixon and Soini (1977) list figures of 11.9 and 11.4% for males and females of *B. c. constrictor* from Iquitos, Peru, although their samples were quite small. We have found similar measurements in Colombian *constrictor*. Our ratios for 3 male specimens of Colombian *imperator* and 2 *ortonii* fall between 10.6 and 11.0%.

In the past many workers considered *Boa* to possess a proportionately small hemipenis. This may be a result of Cope's (1900) often cited 85 mm hemipenial illustration of a specimen from Brazil. Cope died before the plate section of this text was finished, however, and there is no further data or scale included with the drawing. The authors have observed an everted hemipenis estimated to be in excess of 220 mm on the specimen herein illustrated. Inverted, the same organ subtended 38 subcaudals on the 221 cm specimen. The maximum hemipenial probes we have recorded for other subspecies are: *constrictor*, 27 subcaudals; *imperator*, 23 subcaudals; *melanogaster*, 28 subcaudals; *ortonii*, 14 subcaudals. Given the differences, it is questionable whether large male *longicauda* could successfully copulate with other subspecies. The single male observed in copula shows no interest in females of other subspecies.

Boa constrictor longicauda is almost certainly confined to Tumbes Province, a wet tropical refugium surrounded to the north, east, and south by cordillera rising to at least 3000 km. The only possible access for other subspecies to Tumbes would be by Pacific coastal drift from Ecuador. The large Peruvian collection at the Museum of Comparative Zoology at Harvard University includes no *Boa* specimens from Tumbes or adjacent southern provinces of Ecuador (Jose Rosado, pers. comm.).

While the phylogeny of the subtaxa of *Boa* remains speculative, Stull (1932) implies the existence of a *constrictor* group within the genus, with *amarali* intermediate between *constrictor* and *occidentalis* geographically and with respect to the mental shield. *Melanogaster* sensu Langhammer (1983), must be added to this group based on meristic and mensural characters. An *imperator* group is also implied by Schmidt and Walker (1943) and Zweifel (1960) constisting of at least subspecies *imperator*, *sigma*, and *ortonii*. The derivation of the insular *orophias* and *nebulosa* is problematical; Lazell (1964) correctly points out that their geographically closest neighbor is *constrictor* of Trinidad and Tobago, some 350 kilometers to the south, and that a stepped cline series exists with respect to meristic and mensural characters. It must be bourne in mind that the Isthmus of Panama has only existed for 3–4 million years in recent times, therefore *imperator* may be a relative newcomer to Central America and Mexico. The likelihood that it crossed over 2000 kilometers of the Caribbean to reach St. Lucia and Dominica in such a short time is slim. The likelihood of a recent relationship between *imperator* and *longicauda* is greater, as their ranges approach parapatry and the scale meristics are close. Ultimately, many of these relationships may only be resolved through biochemical analyses, if at all.

Specimens Examined.—With the ex-

ception of the holotype, all 20 specimens examined are currently in private collections, including 7 in the collections of the authors. All counts and measurements were done at least two times on living snakes except for the holotype and shed skin of the paratype.

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要　約

ボア属の分類についてのコメントとペルーからのボアの新亜種の記載

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ボアコンストリクターに現在認められている亜種のうち，多くは島嶼等の小さな個体群であり，大陸の亜種の分布状況などはっきりしていない点が多い。ペルーの北西の端の海岸地帯である Tumbes 地域で見られるボアコンストリクターは，その南に分布する *Boa constrictor ortonii*，北に分布する *B. c. imperator*，いずれとも違った独特の形態を示すので，新亜種 *Boa constrictor longicauda* として記載した。その特徴は，尾とヘミペニスが長いこと，胴体の斑紋と体鱗列数が少ないこと，体の色彩に赤みを欠き全体に黒っぽいことなどである。分布は Tumbes 地域に限られる。

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