SHORT COMMUNICATION

Filling distribution gap on *Sibon annulatus* and *S. ayerbeorum* (Serpentes: Dipsadidae) in Colombia

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The genus Sibon Fitzinger, 1826 comprises 17 species distributed from central Mexico to Brazil (Uetz and Hošek 2022). Some members present a variety of contrasting coloration pattern of rings or blotches that mimics coral snakes or arboreal pitvipers respectively (Solórzano 2002, Campbell and Lamar 2004). These color patterns are consistent taxonomically and used to define three species groups (sensu Peters 1960): (i) regularly blotched or banded pattern (S. annulatus group), (ii) ocellate pattern (S. argus group), and (iii) irregular small blotches, spots, or stippling, all combining to produce a highly disruptive pattern (S. nebulatus group). Despite high diversity in Central America (14 species), only five species inhabit South America: Sibon

dunni Peters, 1957 (endemic to Ecuador), S. nebulatus (Linnaeus, 1758) (widespread from Mexico to Brazil), S. annulatus (Günther, 1872) (Moreno-Arias 2010, Meneses-Pelayo et al. 2016), the recently described species S. bevridgelyi Arteaga, Salazar-Valenzuela, Mebert, Peñafiel, Aguiar, Sánchez-Nivicela, Pyron, Colston, Cisneros-Heredia, Yánez-Muñoz, Venegas, Guayasamin and Torres-Carvajal, 2018, and S. ayerbeorum Vera-Pérez, 2019.

Among the South American species, *Sibon* annulatus and *S. ayerbeorum* are mainly distributed in the lowlands of the Chocoan region between Colombia and Ecuador. The taxonomic history of *S. annulatus* has been dynamic; it was synonymized with *S. dimidiatus* (Günther, 1872), because of poor definition and the lack of available material for comparisons (Wilson and Myer 1985, Kofron 1990). However, Savage and McDiarmid (1992) later recognized *S. annulatus*

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as a unique species based on comprehensive sampling. Moreno-Arias (2010) provided the first record of S. annulatus from Colombia and South America, from Alto de la Paz, San Martin, Cesar (7.9562° N, 73.3480° W; 1,402 m a.s.l.). Subsequently, Meneses-Pelayo et al. (2016) updated its distribution in Colombia based on three newly collected specimens from San José del Palmar, Chocó (4.9684° N, 76.2277° W; 1,500 m a.s.l.); El Afirmado, Pie de Pato, Chocó (5.6419° N, 77.0755° W; 320 m a.s.l.); Serranía de los Yariguies, La Colorada, San Vicente de Chucurí, Santander (6.7925° N, 73.4795° W; 1,420 m a.s.l.). They also defined the species' distribution limits in Colombia and Ecuador based on literature records, but without detailed information (Meneses-Pelayo et al. 2016). This species may be differentiated from most of its congeners other than S. dimidiatus by having (i) dorsal bands extending across the venter and (ii) penultimate supralabial not contacting the orbit. Sibon annulatus differs from S. dimidiatus (characteristics in parenthesis) by having (i) two postmentals, partially fused or reduced to a single small scale (single large postmental) and (ii) ventral scales 161-192 (187-200) (Savage and McDiarmid 1992, Köhler et al. 2010, Lotzkat et al. 2012).

Sibon averbeorum was recently described based on four specimens (Vera-Pérez, 2019) collected from La Playa and La Cueva sites in Parque Nacional Natural Munchique, Cauca, Colombia (2.771000° N, 76.980167° W; 1,135 m a.s.l.). Later, a fifth specimen was collected at Parcela Permanente de Investigación Biológica, Chocó, Colombia (5.360° N, 76.646° W; 96 m a.s.l.) by Echevarría-Rentería and Medina-Rangel (2021), a distance of 282 km from the type locality. This species is distinguished from all other Sibon species, except from S. argus (Cope, 1875) and S. longifrenis (Stejneger, 1909), by having (i) ocellated coloration pattern; (ii) dorsal scale rows 15-15/17-15; (iii) preocular absent; (iv) six supralabial, with the penultimate supralabial in contact with the eye; (v) first pair of infralabial generally in contact behind

symphysial. But differs from *S. argus* and *S. longifrenis* by having (i) fewer ventral scales, 155 and 136–140 in males and females respectively (*S. argus:* 181–201 in males and 186–192 in females; *S. longifrenis:* 166–173 in males and 147–168 in females); (ii) fewer subcaudal scales, 93 and 78–79 in males and females respectively (*S. argus:* 112–121 in males and 186–192 in females; *S. longifrenis:* 95–106 in males and 80–101 in females); (iii) non-protuberant eyes (protuberant in *S. argus)*; (iv) postmental scale absent (can be absent or present in *S. longifrenis*) (Vera-Pérez 2019).

Herein, we fill the distribution gap of *S. annulatus* and *S. ayerbeorum* in the Colombian Chocoan lowlands based on specimens that were found in sympatry at El Salto, Buenaventura, Valle del Cauca (3.855785° N, 76.782063° W; 756 m a.s.l.: Figures 1 and 2). Additionally, we summarize the records of *S. annulatus* from Ecuador.

An uncollected juvenile of *S. annulatus* (Figure 2A) was found on a shrub at 23:00 h on 29 October 2014. We identified it by absence of contact between orbit and large penultimate supralabial (Figure 3A), postmental scales two (Figure 3A), ventral scales 168, dorsal scale rows 15-15-15 (Table 1), and coloration pattern (Figure 2A): consisting of 58 black irregular bands, extending to the venter, giving the impression of zigzag black blocks; these bands contrast with ground colour that is red middorsally, yellow laterally and pale yellow-cream ventrolaterally; eyes red with subelliptical black pupil.

An adult *S. ayerbeorum* (IMCN:REP:215, Museo de Ciencias Naturales Federico Carlos Lehmann Valencia; Figure 2B) was collected from a Pteridophyta leaf at 01:00 h on 07 January 2015. We identified it by the contact between orbit and large supralabial scale (Figure 3B), absence of postmental scales (Figure 3B); first pair of supralabials not in contact behind the symphysial; ventral scales 149; dorsal scale rows 14-15-15 (Table 1); coloration pattern (Figure 2B) consisting of yellowish-brown dorsal



Figure 1. Distribution map of *Sibon annulatus* (orange), *S. ayerbeorum* (purple) and the new record of both species. All records are provided in Appendix I.

background with several irregular ocelli in paravertebral and lateral region bordered with reddish-brown with dark brown extending to the edge of the ventral scales, Black lateral blotches in contact on the anterior and middle part of the body, creating a narrow lateral black stripe; some ocelli on the tail are connected laterally; the ventral pattern consists of alternating yellow and black blotches, similar to a chess-board; eyes brown with yellow mottling, pupil black.

Ecuadorian specimens of *S. annulatus* initially recorded by Yánez-Muñoz *et al.*

	<i>Sibon annulatus</i> (unvouchered)	<i>Sibon ayerbeorum</i> (IMCN:REP:215)
Total length (mm)	288	371
Ventrals	168	149
Subcaudals	105	93
Dorsal scale rows	15-15-15	14-15-15
Postmentals	2	0
Postoculars	2/2	2/2
Anterior temporals	2/2	1/1
Posterior temporals	2/3	2/2
Supralabials	7/8	7/8
Infralabials	7/7	6/6
Supraoculars	1/1	1/1
Preoculars	0/0	0/0
Contact eye-penultimate supralabilal	No	Yes
Anal	Entire	Entire

 Table 1.
 Scutellation counts of new Colombia specimens of Sibon annulatus and S. ayerbeorum. Left-right variation is indicated by a slash.

(2009) at Tobar Donoso, Carchi province (unvouchered: 1.184507° N, 78.488011° W; 120 m a.s.l.), exhibit similarity in coloration (Yánez-Muñoz et al. 2009: see their Anexo I) and lepidosis to the specimens recorded in Colombia (Meneses-Pelayo et al. 2016; this study). A second specimen (unvouchered) was reported as Sibon sp. (Figure 2C) at the Bilsa Biological Station (0.3591° N, 79.7005° W; Figure 1), Esmeraldas province by Ortega-Andrade et al. (2010: page 126, Figure 9B). A third specimen (MZUTI 3034) was recorded in Reserva Itapoa, Esmeralda province (0.51307° N, 79.13401° W; Figure 1) by Arteaga et al. (2018: Figure 2A). These two last specimens had similar scutelation (ventral scales 197; dorsal scale rows 15-15-14; two post-ocular scales; 5-6 supralabial scales in contact with the orbit; eight infralabial scales) and coloration pattern (42 dark bands separated by paler interspaces) with the new specimen, but differ from our new specimen in color (red with vellow tonalities and black bands vs reddish brown with green and brown bands). We believe that this difference is due to ontogenic changes documented in several species of the family [Atractus Wagler, 1828 (Passos et al. 2010a, b, c), Dipsas Laurenti, 1768 (Harvey et al. 2008, Barros et al. 2012), Oxvrhopus Wagler, 1830 (Lynch, 2009), Sibon (Lotzkat et al., 2012)]. Although Arteaga (2020) compiled the records from Ecuador without providing source (museum/collection information specimens, observation or literature), we accept that his identifications and distribution records are valid. However, we did not include them here due to the lack of specimen location information.

During the course of the examination of the *S. ayerbeorum* specimen, the contact of the first infralabial scales behind the symphysial was difficult to determine. It seems that there is more



Figure 2. Color in life of (A) Sibon annulatus from El Salto, Buenaventura, Colombia (photo by OH); (B) S. ayerbeorum IMCN:REP:215 from El Salto, Buenaventura, Colombia (photo by AFJ); (C) S. annulatus from the Bilsa Biological Station, Esmeraldas, Ecuador (photo by Julieta Bermingham).

variation than the expected "generally in contact". In our new specimen and one paratype (MHNUC-He-Se-000660; Vera-Pérez, 2019: Figure 2B) both infralabials are separated by the chinshield and mental, whereas in the holotype (MHNUC-He-Se-000659; Vera-Pérez, 2019: Figure 2A) and Chocó specimen (COLZOOCH-H 1173; Echevarría-Rentería and Medina-Rangel 2021; Figure 2C) they are in contact. The absence of contact led to the possibility that the specimen could be S. longifrenis, because this species has no contact between the first infralabials, absence/presence of tiny postmental scale, and the lower counts of ventral and subcaudal scales resemble the count of our new specimen. However, the differences between these two species are not completely clear, and we hypothesize that they are sister species due to morphological similarities. To distinguish between the two species, we proposed the use of the postmental scale condition (absent in S. averbeorum and present in S. longifrenis) rather than contact between the first infralabials to diagnose them. Savage and McDiarmid (1992) stated for S. longifrenis "almost always with single small postmental (absent in one specimen)", meaning that of their nine examined specimens from Costa Rica and Panama postmental scales were absent in only one. This may indicate that the different specimen was actually S. averbeorum. For this reason, a further study including the S. longifrenis specimens from Central America is needed to confirm or reject our observations and improve the variation and differences between both species.

Until new evidence (molecular and hemipenial data) is provided, we allocate these Chocoan specimens to *S. annulatus* and *S. ayerbeorum*, based on scale counts and coloration pattern. These records fill a gap in the known distribution of *S. annulatus* at 150 km south and 600 km north from the closest records in Colombia and Ecuador respectively. The new record of *S. ayerbeorum* is 121 km north from the type locality and 167 km south of the record provided by Echavarría-Rentería *et al.* (2021).



Figure 3. Illustration of lateral and ventral view of head in (A) *Sibon annulatus* and (B) *S. ayerbeorum* from El Salto (Buenaventura, Colombia). The large supralabial and the postmental scales are shown in red.

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References

Arteaga, A. 2020. Sibon annulatus. In A.Arteaga, L. Bustamante, J. Vieira, and J. M. Guayasamin (eds.), Reptiles of Ecuador: Life in the Middle of the World. Electronic Book accessible at www.reptilesofecuador. com.

- Arteaga, A., D. Salazar-Valenzuela, K. Mebert, N. Peñafiel, G. Aguiar, J. C. Sánchez-Nivicela, R. A. Pyron, T. J. Colston, D. F. Cisneros-Heredia, M. H. Yánez-Muñoz, P. J. Venegas, J. M. Guayasamin, and O. Torres-Carvajal. 2018. Systematics of South American snail-eating snakes (Serpentes, Dipsadini), with the description of five new species from Ecuador and Peru. *ZooKeys* 766: 79–147
- Barros, T. R., R. C. Jadin, J. R. Caicedo-Portilla, and G. A. Riva. 2012. Discovery of a rare snail-eater snake in Venezuela (Dipsadinae, *Dipsas pratti*), with additions to its natural history and morphology. *Zoosystematics and Evolution 88*: 125–134.
- Campbell, J. A. and W. W. Lamar (eds.). 2004. The Venomous Reptiles of the Western Hemisphere. Ithaca, New York. Cornell University Press. 528 pp.
- Echevarría-Rentería, J. D. and G. Medina-Rangel. 2021. Range extension of Sibon ayerbeorum Vera-Pérez, 2019 (Serpentes: Dipsadidae) in Colombia. Revista Latinoamericana de Herpetología 4: 221–225.
- Harvey, M. B., G. Rivas-Fuenmayor, J. R. Caicedo-Portilla, and J. V. Rueda-Almonacid. 2008. Systematics of the engimatic dipsadine snake *Tropidodipsas perijanensis* Alemán (Serpentes: Colubridae) and review of morphological characters of Dipsadini. *Herpetology Monographs 22:* 106–132.
- Kofron, C. P. 1990. Systematics of neotropical gastropodeating snake: the dimidiate group of the genus Sibon, with comments on the *nebulata group*. Amphibia-Reptilia 11: 207–223.
- Köhler, G., S. Lotzkat, and A. Hertz. 2010. A new species of Sibon (Squamata: Colubridae) from western Panama. *Herpetologica 66*: 80–85.
- Lotzkat, S., A. Hertz, and G. Köhler. 2012. A new species of Sibon (Squamata: Colubroidea: Dipsadidae) from the Cordillera Central of western Panama, with comments on other species of the genus in the area. Zootaxa 3485: 26–40.
- Lynch, J. D. 2009. Snakes of the genus Oxyrhopus (Colubridae: Squamata) in Colombia: taxonomy and geographic variation. Papeis Avulsos de Zoologia 49(25): 321–337.
- Meneses-Pelayo, E., J. D. Echavarría-Rentería, J. D. Bayona-Serrano, J. R. Caicedo-Portilla, and J. T. Rengifo-Mosquera. 2016. New records and an update of the distribution of *Sibon annulatus* (Colubridae: Dipsadinae: Dipsadini) for Colombia. *Check List 12:* 1931.

- Moreno-Arias, R. A. 2010. Geographic distribution: Sibon annulatus. Herpetological Review 41: 382.
- Ortega-Andrade, H. M., J. Bermingham, C. Aulestia, and C. Paucar. 2010. Herpetofauna of the Bilsa Biological Station, province of Esmeraldas, Ecuador. *Check List* 6: 199–154.
- Passos, P., M. Dobeiy, and P. J. Venegas. 2010a. Variation and natural history notes on Giant Groundsnake, *Atractus gigas* (Serpentes: Dipsadidae). *South American Journal of Herpetology 5:* 73–82.
- Passos, P., A. Chiesse, O. Torres-Carvajal, and J. M. Savage. 2010b. Testing species boundaries within *Atractus* occipitoalbus complex (Serpentes: Dipsadidae). *Herpetologica* 65: 284–403.
- Passos, P., R. Fernandes, R. S. Bérnils, and J. C. Moura-Leite. 2010c. Revision of the Atlantic Forest *Atractus* (Reptilia: Serpentes: Dipsadidae). *Zootaxa 2364*: 1–63
- Peters, J. A. 1960. The snakes of the subfamily Dipsadinae. Miscellaneous Publications, University of Michigan Museum of Zoology 114: 1–224.
- Savage, J. M. and R. W. McDiarmid. 1992. Rediscovery of the Central American Colubird snake, *Sibon argus*, with comments on related species from the region. *Copeia* 1992: 421–432.
- Solórzano, A. 2002. Una nueva especie de serpiente del género Sibon (Serpentes: Colubridae) de la vertiente del Caribe de Costa Rica. Revista de Biología Tropical 49: 1111–1120.
- Uetz, P. and J. Hošek (eds.). 2022. The Reptile Database. Electronic Database accessible at http://www.reptiledatabase.org. Capture on 14 March 2022.
- Vera-Pérez, L. E. 2019. A new species of Sibon Fitzinger, 1826 (Squamata: Colubridae) from Southwestern Colombia. Zootaxa 4701: 443–453.
- Wilson, L. D. and J. R. Meyer (eds.). 1985. *The Snakes of Honduras* .2nd Edition. Milwaukee Museum Press. 150 pp.
- Yánez-Muñoz, M., M. Altamirano-Benavides, and C. L. Oyagata (eds.). 2009. Diversidad de anfibios y reptiles de Tobar Donoso, Provincia de Carchi Ecuador [technical report]. Quito: Museo Ecuatoriano de Ciencias Naturales-SENACYT. 34 pp.

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Longitude	Latitude	Record type
-83.935635	9.826328	Sibon annulatus - Type locality
-83.53333333	10.5833333	Sibon annulatus - Literature record
-83.766666667	10.4333333	Sibon annulatus - Literature record
-83.22277778	10.2138889	Sibon annulatus - Literature record
-83.610943	9.920028	Sibon annulatus - Literature record
-82.822926	9.710193	Sibon annulatus - Literature record
-84.015	10.421946	Sibon annulatus - Literature record
-83.516668	10.087367	Sibon annulatus - Literature record
-83.973629	10.153257	Sibon annulatus - Literature record
-84.185638	10.513241	Sibon annulatus - Literature record
-83.330986	10.037173	Sibon annulatus - Literature record
-85.40195	10.99637	Sibon annulatus - Literature record
-82.86666667	9.6166667	Sibon annulatus - Literature record
-84.615769	10.365485	Sibon annulatus - Literature record
-84.566667	10.250492	Sibon annulatus - Literature record
-83.793066	9.834581	Sibon annulatus - Literature record
-83.5445	10.0396	Sibon annulatus - Literature record
-84.50787	10.18564	Sibon annulatus - Literature record
-83.626236	9.951882	Sibon annulatus - Literature record
-84.182416	10.273189	Sibon annulatus - Literature record
-85.481384	9.868858	Sibon annulatus - Literature record
-83.88573	10.324289	Sibon annulatus - Literature record
-84.164143	9.962061	Sibon annulatus - Literature record
-83.622876	9.879236	Sibon annulatus - Literature record
-83.443688	9.829227	Sibon annulatus - Literature record
-83.590692	9.936801	Sibon annulatus - Literature record
-84.377457	9.94134	Sibon annulatus - Literature record
-84.379357	10.372805	Sibon annulatus - Literature record
-84.169232	10.243636	Sibon annulatus - Literature record
-83.6	15.0833	Sibon annulatus - Literature record
-85.254026	15.34399	Sibon annulatus - Literature record
-84.95332778	15.4710528	Sibon annulatus - Literature record
-85.83038889	13.0783611	Sibon annulatus - Literature record
-85.0367	13.7517	Sibon annulatus - Literature record
-85.3267	13.9933	Sibon annulatus - Literature record
-85.2366	13.0114	Sibon annulatus - Literature record

Appendix I. Records of Sibon annulatus and S. ayerbeorum.

Longitude	Latitude	Record type
-85.23656	13.01139	Sibon annulatus - Literature record
-83.88011	11.04856	Sibon annulatus - Literature record
-85.23655556	13.0113889	Sibon annulatus - Literature record
-80.61666667	8.6666667	Sibon annulatus - Literature record
-80.666666667	8.6333333	Sibon annulatus - Literature record
-82.6901	8.9785	Sibon annulatus - Literature record
-82.4159	8.8714	Sibon annulatus - Literature record
-82.2092	8.7776	Sibon annulatus - Literature record
-82.2543	8.7553	Sibon annulatus - Literature record
-82.2185	8.6739	Sibon annulatus - Literature record
-82.2155	8.7891	Sibon annulatus - Literature record
-81.4847	8.5494	Sibon annulatus - Literature record
-81.1328	8.5249	Sibon annulatus - Literature record
-81.1193	8.5146	Sibon annulatus - Literature record
-81.121	8.5082	Sibon annulatus - Literature record
-81.0989	8.569	Sibon annulatus - Literature record
-81.0971	8.577	Sibon annulatus - Literature record
-81.0989	8.569	Sibon annulatus - Literature record
-79.92755556	8.6750278	Sibon annulatus - Literature record
-80.0666	8.6333	Sibon annulatus - Literature record
-80.61666667	8.6666667	Sibon annulatus - Literature record
-82.292758	9.116576	Sibon annulatus - Literature record
-80.131693	8.609784	Sibon annulatus - Literature record
-81.916667	9.133333	Sibon annulatus - Literature record
-80.965002	8.619461	Sibon annulatus - Literature record
-77.305385	8.182102	Sibon annulatus - Literature record
-73.479595	6.792548	Sibon annulatus - Colombia record
-73.348031	7.956254	Sibon annulatus - Colombia record
-77.0755	5.64194	Sibon annulatus - Colombia record
-76.227597	4.968406	Sibon annulatus - Colombia record
-79.70055556	0.3591667	Sibon annulatus - Ecuador record
-78.488011	1.184507	Sibon annulatus - Ecuador record
-79.13401	0.51307	Sibon annulatus - Ecuador record
-76.980167	2.771	Sibon ayerbeorum - Type locality
-76.646	5.36	Sibon ayerbeorum - Record
-76.782063	3.855785	New records

Appendix I. Continued.