

REDISCOVERY OF *OSCAECILIA OCHROCEPHALA* (COPE, 1866) (AMPHIBIA: GYMNOPTIONA: CAECILIIDAE) IN COLOMBIA, WITH COMMENTS ON ITS VARIATION AND AFFINITY TO *O. POLYZONA* (FISCHER, 1880)

REDESCUBRIMIENTO DE *OSCAECILIA OCHROCEPHALA* (COPE, 1866) (AMPHIBIA: GYMNOPTIONA: CAECILIIDAE) EN COLOMBIA, CON COMENTARIOS SOBRE SU VARIACIÓN Y AFINIDAD CON *O. POLYZONA* (FISCHER, 1880)

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Resumen.— Se reportan aquí los primeros registros de *Oscacelia ochrocephala* para Colombia desde 1942 con base en material del Darién y Urabá Antioqueño. Discutimos algunos aspectos de la variación intraespecífica de esta especie y resaltamos su gran similitud morfológica con *O. polyzona*; quien a nuestro parecer es su posible especie hermana. Por último, discutimos la utilidad de algunos caracteres supuestamente diagnósticos anteriormente empleados en la literatura—los cuales consideramos son de poca utilidad—y proponemos en cambio el uso de la coloración y la escamación para diferenciar estas especies.

Palabras claves.— Cecilias, coloración, distribución, escamación, morfología, variación.

Abstract.— We here provide the first Colombian records of *Oscacelia ochrocephala* since 1942 based on material from Darién and Urabá Antioqueño. We discuss certain aspects of intraspecific variation of this species and denote its great morphological similarity to *O. polyzona*, which we consider as its potential sister species. Lastly we discuss the usefulness of some supposedly diagnostic characters previously found in the literature—that we consider to be of limited use—and instead propose that coloration and squamation be used in order to differentiate these two species.

Key words.— Caecilians, coloration, distribution, morphology, squamation, variation.

At first glance, the caecilians of the genus *Oscacelia* Taylor, 1968 resemble those of the genus *Caecilia* Linnaeus, 1758 except for the fact that their eyes are concealed under bone, specifically the orbit where the eye lies on the maxillopalatine bone is closed, thus the eye is thought to be invisible and non-functional (Taylor, 1968) (Fig. 1). At the moment this remains the only known synapomorphy of the genus, allowing the current classification of the Caeciliidae comprising strictly of *Caecilia* and *Oscacelia* (Wilkinson et al., 2011). The phylogenetic relationships of *Caecilia* and *Oscacelia* as sister groups who share most morphological characters had been largely assumed dating back to Taylor (1968) but more recently a mitogenomic phylogeny by San Mauro et al. (2014) obtained the same results, establishing *Oscacelia ochrocephala* as the sister taxon to the clade containing *Caecilia gracilis* Shaw, 1802, *C. tentaculata* Linnaeus, 1758, and *C. volcani* Taylor, 1969. *Oscacelia* has a total of nine species, namely *O.*

bassleri (Dunn, 1942), *O. elongata* (Dunn, 1942), *O. equatorialis* Taylor, 1973, *O. hypereumeces* Taylor, 1968, *O. koepckeorum* Wake, 1984, *O. ochrocephala* (Cope, 1866), *O. osae* Lahanas & Savage, 1992, *O. polyzona* (Fischer, 1880), and *O. zweifeli* Taylor, 1968; these species occur in Central America and northern South America (Köhler, 2011).

Oscacelia bassleri, *O. ochrocephala* and *O. polyzona* are the only members of the genus that occur in Colombia, and only the latter is somewhat widely distributed in the Magdalena Valley, and well represented in some Colombian collections, whereas *O. ochrocephala* remained represented by a single specimen (MCZ 1492) from Turbo, Antioquia, for the past 80 years (Dunn, 1942; Lynch, 2000). Individuals of *O. ochrocephala* have been found on the surface after rainfall at dawn and dusk in Gamboa, Panama, and as deep as 10 meters below the ground in urban areas of



Figura 1. *Osgaecilia ochrocephala* (UVC 8351) de Juradó, Chocó, Colombia. El lado derecho de la cabeza fue parcialmente diseccionado por JDL para revelar la disposición del ojo rudimentario ubicado debajo de la piel y el músculo subyacente.

Figure 1. *Osgaecilia ochrocephala* (UVC 8351) from Juradó, Chocó, Colombia. The right side of the head was partly dissected by JDL to expose the placement of the rudimentary eye underneath the skin and underlying muscle

Panama City (Köhler, 2011), indicating that the residence largely in burrows reduces the chance of encountering them. Still, Lynch & Acosta (2004) considered *O. polyzona* to be an abundant species in La Dorada, Caldas, Colombia, as did Köhler (2011) for *O. ochrocephala* in Gamboa, and Panama City, Panama (Fig. 2).

In August 2019, while examining the caecilians deposited at Museo de Herpetología, Universidad de Antioquia, Medellín, we found a jar labelled ‘*Caecilia* sp.’ This jar contained a single specimen (MHUA 6127) from Necoclí, Antioquia, which seemingly had its eyes concealed. Intrigued by the possibility that this was “no ordinary *Caecilia*” we examined it in great detail and realized it was a misidentified *Osgaecilia*. In the ensuing days a second member of this species was also found at MHUA though pending accession to this collection because the field data associated with this individual was missing; three years later the collector would eventually fulfil his obligations with MHUA and we can now reference this specimen as MHUA 12940 from Chigorodó, Antioquia. A third specimen (UVC 8351) is

known from Juradó, Chocó, albeit incorrectly identified by Lynch (2000) as *Osgaecilia elongata*, but the terminal portion of the body is missing, ruling out the possibility of fully counting primary grooves, counting any secondary grooves, and determining its sex. Still, it is here regarded as a conspecific of *O. ochrocephala* based on its partial count of 188 primary grooves, its ochre coloration in preservative, and its provenance from a site just south of Panama, where only *O. ochrocephala* occurs.

The three aforementioned specimens of *Osgaecilia ochrocephala* were examined under a Leica EZ4 stereoscope using entomological pins to facilitate counting the primary and secondary grooves found throughout the body of the caecilians. The total groove counts were made twice by the senior author in order to avoid miscalculation. A small incision to the commissure of the mouth was made in order to access dentition when necessary (i.e. the number of teeth per series), and all teeth were examined directly with the mouth opened. All dental counts were made clock-wise from left to right postero-anteriorly; teeth



Figura 2. Coloración de *Oscacilia ochrocephala* y *O. polyzona* en vida. A-B) *O. ochrocephala* de Gamboa, Panamá, fotografías por Kaitlin Baudier; C-D) *O. polyzona* de La Dorada, Caldas, Colombia. Fotos: John D. Lynch.

Figure 2. Coloration of *Oscacilia ochrocephala* and *O. polyzona* in life. A-B) *O. ochrocephala* from Gamboa, Panama, photographs by Kaitlin Baudier; C-D) *O. polyzona* from La Dorada, Caldas, Colombia. Photos: John D. Lynch.

that were not fully exposed outside the gums were not counted. A small, ventral longitudinal incision was made to search for sexual organs, a few dermal pockets were opened with a soft pin to search for dermal scales towards the terminus, and a small portion of the skin near mid-body was dissected to search for subdermal scales. All measurements were taken using a Neiko digital calliper rounded to the nearest 0.1 mm with the exception of total body length, which was determined using a measuring tape (in centimeters) and placed along the body length of the specimen. Museum abbreviations are as follows: CZUT (Colección Zoológica Universidad del Tolima, Ibagué, Colombia), IAvH (Instituto Alexander von Humboldt, Villa de Leyva, Boyacá, Colombia), ICN (Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá D.C., Colombia), MCZ (Harvard Museum of Comparative Zoology, Cambridge,

Massachusetts, U.S.A.), MHUA (Museo de Herpetología, Universidad de Antioquia, Medellín, Colombia), MLS (Museo La Salle, Bogotá D.C., Colombia), UIS-A (Universidad Industrial de Santander, Bucaramanga, Colombia), UVC (Universidad del Valle, Cali, Colombia).

MHUA 6127, 12940, and UVC 8351, were identified as *Oscacilia ochrocephala* because they had the following measurements and meristics. An *Oscacilia* with a total body length of 485–725 mm, width at mid-body of 9.3–9.4 mm, an attenuation index (length divided by width) of 51.6–63.8 times, 179–198 primary grooves and 20–21 secondary grooves, with a ‘segmented terminal shield’ interrupted dorso-ventrally by the last 3–4 short grooves, with subdermal scales within the connective tissue of the skin, and sub quadrangular dermal scales within the dermal pockets

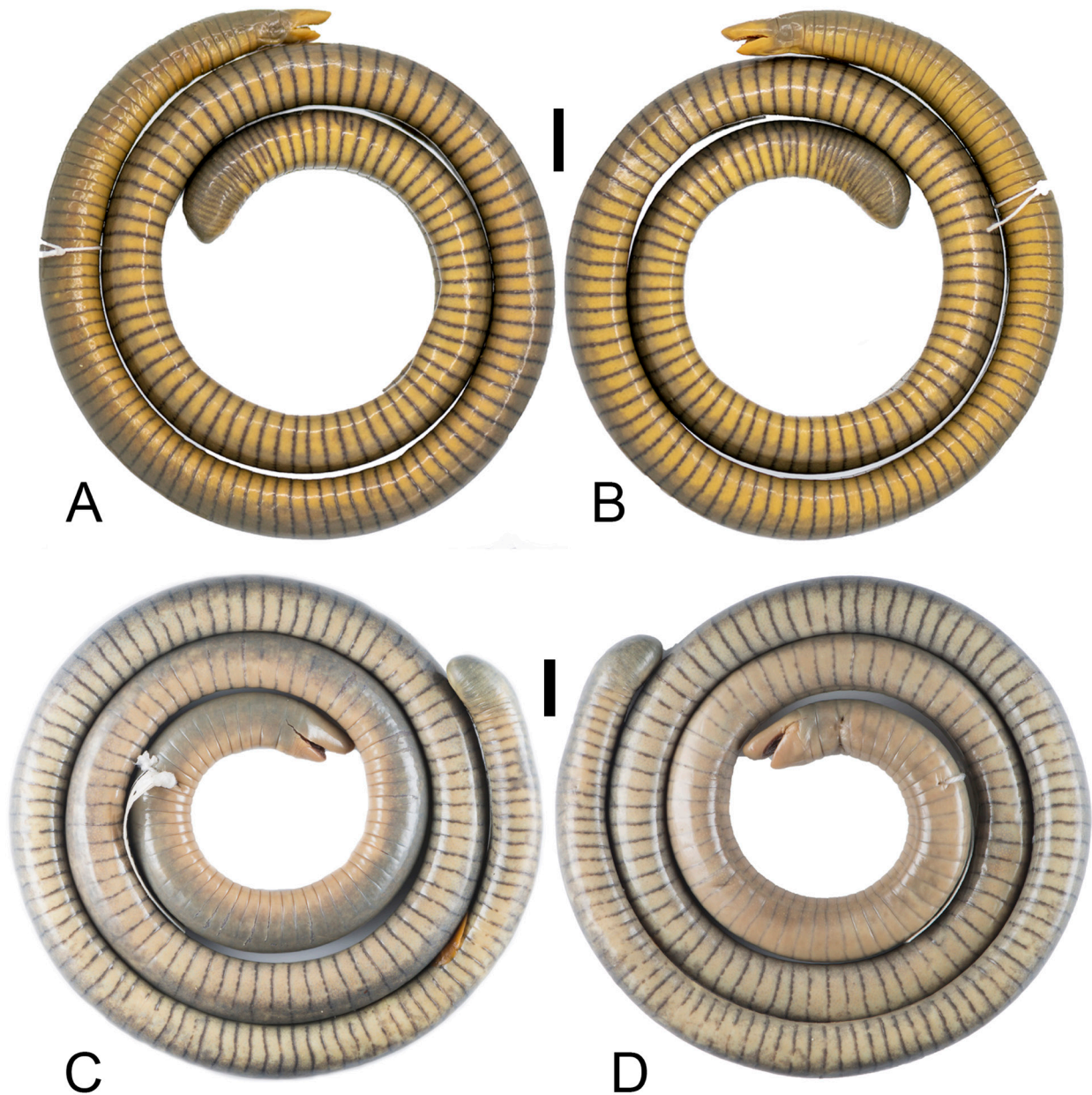


Figura 3. Coloración de *Oscsaecilia ochrocephala* y *O. polyzona* en preservativo. A-B) Vistas dorsal y ventral de *O. ochrocephala* (MHUA 6127) de Necoclí, Antioquia, Colombia; C-D) Vistas dorsal y ventral de *O. polyzona* (ICN 48002) de La Dorada, Caldas, Colombia; escala superior 9 mm, escala inferior 10 mm.

Figure 3. Coloration of *Oscsaecilia ochrocephala* and *O. polyzona* in preservative. A-B) Dorsal and ventral view of *O. ochrocephala* (MHUA 6127) from Necoclí, Antioquia, Colombia; C-D) Dorsal and ventral view of *O. polyzona* (ICN 48002) from La Dorada, Caldas, Colombia; upper scale bar 9 mm, lower scale bar 10 mm.

towards the terminus, maximum number of teeth per dental series: 8-1-8 premaxillary-maxillaries, 9-9 vomeropalatines, 10-10 dentaries and 4-4 inner mandibulars. (Table 1). We are confident of our identifications because these counts and measurements more closely associate these three specimens

with *O. ochrocephala* than with *O. polyzona* (Taylor, 1968; 1973). Furthermore, the three specimens examined share a small head (smaller than those of equivalent sized *O. polyzona*), as noted by Taylor, (1968: 612) in his account of *O. ochrocephala*, which further supports our identification (Fig. 3).

Tabla 1. Conteos y mediciones de los tres ejemplares recientemente descubiertos de *Oscacilia ochrocephala* y nueve *O. polyzona*. La posición del ojo en relación a la comisura de la boca y a la nariz solo se reporta para el ejemplar UVC 8351 porque este ya había sido parcialmente diseccionado, permitiéndonos ver el ojo rudimentario. La porción terminal del cuerpo no está y por esto el número total de surcos secundarios, surcos interrumpidos por la cloaca y el sexo del ejemplar son indeterminados.

Table 1. Meristics and measurements of the three newly discovered specimens of *Oscacilia ochrocephala* and nine *O. polyzona*. The position of the eye relative to the mouth's commissure and to the nostril was only determined for UVC 8351 because the specimen had already had its skull partly dissected, allowing us to see the rudimentary eye. The terminal portion of the body is missing, therefore the number of secondary grooves, grooves interrupted by the vent, and its sex are undetermined.

Characters/Specimens	<i>Oscacilia ochrocephala</i>			<i>Oscacilia polyzona</i>		
	MHUA 6127	MHUA 12940	UVC 8351	ICN 47998	ICN 47999	ICN 48000
Total length (mm)	485	600	570	510	415	330
Width at mid-body (mm)	9.4	9.4	9.3	10.2	6.8	6.4
Length/width (times)	51.6	63.8	61.3	50	61	51
Snout projection (mm)	2.4	2.9	2.6	2.5	2.6	2.0
Eye-mouth's commissure distance (mm)	undetermined	undetermined	3.9	undetermined	undetermined	undetermined
Eye-nostril distance (mm)	undetermined	undetermined	3.5	undetermined	undetermined	undetermined
First scale found at groove number	28	21	14	35	48	66
Primary grooves	179	198	188	204	204	209
Secondary grooves	21	20	undetermined	17	26	16
Grooves interrupted by vent	4	3	undetermined	4	4	4
Premaxillary-maxillary teeth	7-6	8-1-6	8-1-8	6-1-7	8-9	8-8
Vomeropalatine teeth	9-7	8-1-7	9-9	6-7	8-11	8-8
Dentary teeth	9-8	8-8	10-10	8-8	7-8	6-6
Inner mandibular teeth	3-3	2-1	4-4	2-1	1-1	1-1

Characters/Specimens	<i>Oscacilia polyzona</i>					
	ICN 48001	ICN 48002	ICN 54966	ICN 48040	ICN 48041	ICN 58405
Total length (mm)	480	520	600	630	510	650
Width at mid-body (mm)	8.4	9.7	8.4	9.2	8.5	10.8
Length/width (times)	57	53	71	68.5	60	60.2
Snout projection (mm)	2.4	3.7	3.1	2.6	2.4	3.2
Eye-mouth's commissure distance (mm)	undetermined	undetermined	undetermined	undetermined	undetermined	undetermined
Eye-nostril distance (mm)	undetermined	undetermined	undetermined	undetermined	undetermined	undetermined
First scale found at groove number	38	54	39	48	40	76
Primary grooves	202	200	217	207	202	198
Secondary grooves	25	13	18	18	21	26
Grooves interrupted by vent	3	4	4	3	4	3
Premaxillary-maxillary teeth	6-1-7	5-8	8-9	8-1-8	8-1-8	8-7
Vomeropalatine teeth	11-12	11-10	9-8	9-9	7-1-8	10-1-8
Dentary teeth	7-6	8-9	7-8	7-7	7-6	7-8
Inner mandibular teeth	2-2	1-1	1-1-1	3-2	1-1-1	3-2



The presence of *Oscacilia ochrocephala* in Colombia has now been confirmed by three voucher specimens obtained in the Darién and Urabá Antioqueño regions of the country plus a historic record (MCZ 1492) by Dunn (1942). Having examined all the available *Oscacilia* from the main collections in Colombia we conclude that there is no significant morphological variation between the Colombian and Panamanian populations of *O. ochrocephala* or that if there is any, it is not clearly expressed in its external morphology aside from colour variants (contra Taylor, 1969; 1973). Nonetheless, we do recognize the striking overall morphological similarity between *O. ochrocephala* and *O. polyzona*, and consider these as potential sister species that are no longer diagnosed by a lower count of primary grooves in the former and a higher one in the latter (contra Taylor, 1968; Nieto-Román & Wake, 2012), because we have found that groove counts can overlap in both species, nor by the presence of a terminal shield in *O. polyzona* and a lack of it in *O. ochrocephala*, sensu Lahanas & Savage, 1992; because we consider that both species have a 'segmented terminal shield' interrupted dorsoventrally by the last few grooves of the body. Likewise, the overlap in tooth counts, total length, body width at mid-body point, attenuation indexes (i.e. length divided by width), and the number of grooves interrupted by the vent further support our claims of high similarity between both species (Table 1).

Taylor (1968; 1973) claimed that *Oscacilia ochrocephala* and *O. polyzona* were subspecies because they are allopatric and overall very similar. However, modern views (Wilson & Brown, 1953) of trinomials require evidence of intermediacy (intergrades) to substantiate the assumption of gene flow between the allopatric populations. Such evidence is not forthcoming.

In our experience, *Oscacilia ochrocephala* and *O. polyzona* can be recognized by their coloration in life—though admittedly to a certain extent, because both share a yellow or pink head and dark-coloured grooves throughout the body—given that the former varies from slate or light gray on the dorsal surfaces of the body with gray white or light blueish gray on the flanks and ventral surfaces (Nieto-Román & Wake, 2012), while the latter's main body coloration is lavender dark purple dorsally with pinkish flanks and ventral surfaces (Fig. 2). Likewise, both species differ in their coloration in preservative, given that individuals of *O. ochrocephala* turn olive grey (Nieto-Román & Wake, 2012) or indeed ochre in ethanol at 70% (Fig. 3A–B), whereas individuals of *O. polyzona* become light cream instead (Fig. 3C–D). Squamation differs in both species because dermal scales obtained at the posterior end of the body are almost square in *O. ochrocephala* but rounded in *O. polyzona* (Taylor, 1972: 1124–1125, figs. 79–80) and we have detected that individuals

of *O. ochrocephala* have subdermal scales scattered within the connective tissue of the skin, unlike individuals of *O. polyzona*, which invariably lack subdermal scales. At the moment there are no known sympatric populations of *O. ochrocephala* and *O. polyzona*, but the western-most record of *O. polyzona* is that of ICN 54966 from Tierralta, Córdoba, while the eastern-most record of *O. ochrocephala* is that of MHUA 6127, from Necoclí, Antioquia, both sites situated merely 71 km apart, i.e. still supporting Taylor's (1968: 613) claim of *O. ochrocephala* and *O. polyzona* having a non-continuous distribution (Fig. 4).

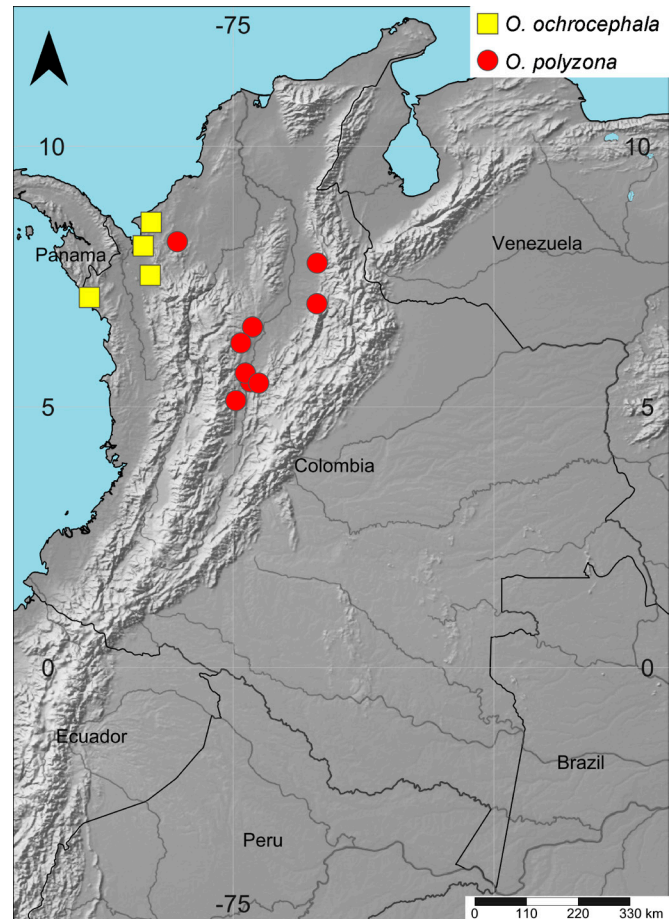


Figura 4. Mapa de Colombia mostrando la distribución geográfica de *Oscacilia ochrocephala* (cuadrados amarillos) y *O. polyzona* (círculos rojos).

Figure 4. Map of Colombia showing the geographic distribution of *Oscacilia ochrocephala* (yellow squares) and *O. polyzona* (red circles).

Oscacilia ochrocephala remains better known from Panamanian localities where the species has been historically more commonly encountered, whereas in Colombia all the records have been very few and far between; the oldest known specimen in a Colombian museum is UVC 8351 collected by Jorge

Restrepo 5 October 1984, MHUA 6127 was obtained sometime in 2008, and MHUA 12940 (the most recent specimen) obtained 7 May 2018. We consider that as more fieldwork is conducted in the Darien and Urabá regions of Chocó and Antioquia, the number of *O. ochrocephala* in Colombian museums will increase. It is worth noting that back in 2017 Universidad de Antioquia established the 'Tulenapa' field station, a natural reserve in Carepa, Antioquia, with 150 hectares, where professor Claudia P. Ceballos Fonseca found a dead caecilian that we believe could be *O. ochrocephala* according to the photographs that she shared with us and because Tulenapa field station is located within the distribution of this species.

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APPENDIX I. SPECIMENS EXAMINED

- Oscacilia bassleri*** (n = 3) COLOMBIA: AMAZONAS: La Pedrera: IAvH 2563-64; PUTUMAYO: Puerto Asís: MLS 26.
- Oscacilia ochrocephala*** (n = 3) COLOMBIA: ANTIOQUIA: Necoclí: MHUA 6127, Chigorodó, La Mejía: 12940; CHOCÓ: Juradó: UVC 8351.
- Oscacilia polyzona*** (n = 21) COLOMBIA: ANTIOQUIA: Puerto Triunfo: MLS 55, Maceo: MHUA 2026; CALDAS: La Dorada: ICN 47998-48002, Rio Manso: 48040-41 and MUJ 3373-77; CESAR: San Alberto: UIS-A 913; CÓRDOBA: Tierralta: ICN 54966; CUNDINAMARCA: Caparrapí, Volcanes: ICN 58405; Yacopí (uncatalogued), SANTANDER: Zapatoca: UIS-A 5444, UIS-A 5263 (no locality data); TOLIMA: Falan: CZUT 2266.

