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A NEW SPECIES OF THE GENUS *Oligodon* FITZINGER, 1826 (REPTILIA: COLUBRIDAE) FROM SOUTHERN LAOS

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Abstract

A new species of the genus *Oligodon* Fitzinger, 1826, is described based on two specimens originating from Champasak Province in southern Lao PDR. This species differs from congeners occurring in the Indochinese Region by possessing 15 dorsal scale rows at midbody, an unforked hemipenis, an entire cloacal plate, a relatively low number of ventral plates (150–159), and a dorsal pattern made of 29–30 pale (cream in life or pale yellowish-brown in preservative) crossbands on the body that are narrowly edged with blackish-brown. We compare the new species with other species of the Indochinese Peninsula and China that also have 15 dorsal scale rows, especially *O. inornatus* (Boulenger, 1914) and *O. kampucheaensis* Neang, Grismer & Daltry, 2012. Finally, we provide an updated list of the *Oligodon* species of Laos and an identification key to these species.

Key words: Distribution, Indochinese Region, Kukri, *Oligodon inornatus*, Southeast Asia, taxonomy

Introduction

The genus *Oligodon* Fitzinger, 1826 is one of the most speciose genera of Asian snakes, with 85 recognized species as of January 15th, 2022 (Uetz *et al.* 2022). The genus *Oligodon* is widespread, and especially speciose, in the Indochinese Peninsula. This region encompasses the territories of Vietnam, Cambodia and Laos, part of southern China, including Hainan Island, Thailand north of the peninsula and the northern

part of peninsular Myanmar. Over the past 15 years, several publications have addressed the systematics of the genus and most of them added new species, for example David *et al.* (2008a-b, 2011, 2012), Green *et al.* (2010), Neang *et al.* (2012), Vassilieva *et al.* (2013), Vassilieva (2015), Nguyen *et al.* (2016), N. S. Nguyen *et al.* (2017), Pauwels *et al.* (2017, 2021), Sumontha *et al.* (2017), N. H. Nguyen *et al.* (2020) and Qian *et al.* (2021). In contrast, Wang *et al.*

(2014) assigned *Oligodon ningshaanensis* Yuan, 1983 to a distinct genus, *Stichophanes* Wang, Messenger, Zhao & Zhu, 2014.

Teynié *et al.* (2004) recorded five species of *Oligodon* from Champasak Province, the southernmost province of Laos, of which four constituted new national records. Nevertheless, a juvenile specimen, with a bright banded dorsal pattern, proved to be problematical. Teynié *et al.* (2004) mentioned it as a specimen of *O. cinereus* (Günther, 1864), in which one subspecies is brightly coloured and banded, *O. cinereus pallidocinctus* (Bourret, 1935). Subsequently, Teynié & David (2010) tentatively identified this specimen as a new-born *O. inornatus* (Boulenger, 1914), based on the fact that it has 15 dorsal scale rows and not 17 as in *O. cinereus*. These authors then suggested that the pattern on new-born specimens may disappear with age in this species as the adult is unpatterned and relatively dull.

The discovery by one of us (SH), also in Champasak Province in 2004, of an adult specimen with the same dorsal colour and banded pattern and the same characters in scalation provides evidence that this new-born specimen was not a juvenile of *O. inornatus*. We show that these two specimens represent a distinct species that is described below. In addition, we provide an updated list of the species of *Oligodon* known from Laos and an identification key.

Material and Methods

The description is based on morphological characters regarded as taxonomically significant in the genus *Oligodon* according to, for example, Smith (1943), Wagner (1975), David *et al.* (2008a–b, 2011), David & Vogel (2012), Pauwels *et al.* (2017), i.e., the dorsal scalation and colour pattern, as well as the dentition of the maxilla and the morphology of the hemipenes. Measurements, except body and tail lengths, were taken with a slide-calliper. The numbers of dorsal scale rows are given at one head length behind head, at midbody (exactly at SVL/2) and at one head length before vent, respectively. Ventral plates were counted according to Dowling's (1951) method. The number of subcaudal scales excludes the tail tip's last one. Maxillary teeth were counted in removing the gums of the left maxilla. Values for symmetric head characters are given in left / right order.

Abbreviations of measurements and other characters used in the text: HL: head length (from tip of snout to angles of the jaws); MSR: dorsal scale rows at midbody, namely at SVL/2; SnL: snout length (from tip of snout to anterior margin of eye); SVL: snout-vent length (from tip of the snout to vent); TaL: tail length (from vent to tip of the tail); TL: total length; TaL/TL: ratio tail length/total length; DSR: dorsal scale rows; SL: supralabial scales. Museum abbreviations: FMNH: Field Museum of Natural History, Chicago, USA; IEBR: Institute of Ecology and Biological Resources, Hanoi, Vietnam; KIZ: Kunming Institute of Zoology, Kunming, Yunnan, People's Republic of China; MHL: Muséum d'Histoire naturelle de Lyon, Lyon, France; MNHN: Muséum National d'Histoire Naturelle, Paris, France; NHMUK (formerly BMNH): Natural History Museum, London, UK; QSMI: Queen Saovabha Memorial Institute, Thai Red Cross Society, Bangkok, Thailand; USNM: National Museum of Natural History, Smithsonian Institution, Washington, USA; VNMN: Vietnam National Museum of Nature, Hanoi, Vietnam; ZFMK: Zoologisches Forschungsmuseum Alexander König, Bonn, Germany; ZMA: Zoologisch Museum Amsterdam, Amsterdam, The Netherlands.

Results

We assign our two Laotian specimens to the genus *Oligodon* based on (1) the enlarged and compressed, blade-like posterior maxillary teeth, (2) the large rostral plate, (3) the smooth dorsal scales and (4) the overall habitus of the two available specimens, all characters being in agreement with those of the genus *Oligodon*. However, these specimens differ from all known species of this genus by a combination of scalation and colour and pattern characters. We consider the differences of these two specimens with other species to be significant enough to describe it here as:

Oligodon teyniei sp. nov.

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(Figs. 1A–B, 2A–C, 3A–B)

Oligodon cinereus (nec *Simotes cinereus* Günther, 1864) — Teynié *et al.* 2004: 45.

Oligodon inornatus (nec *Simotes inornatus* Boulenger, 1914) — Teynié & David 2010: 191 [in part]

Table 1. Main characters of the *Oligodon* species with 15 MSR (modified after David *et al.* 2012; Amarasinghe *et al.* 2021, Qian *et al.* 2021). Exceptional values are placed in parentheses. See text for explanations of the acronyms used in character; E = entire, D = divided, p = present, a = absent, ? = unknown.

Species	Hemipenes	Hemipenes length	Maxillary teeth	Anal	Ventrals	Subcaudals	Sup	Inter nasals	Loreal	Anterior temporals	TaL/total length (%)
<i>O. teyniei</i> sp. nov.	Not forked	?	11	E	150-159	29	7, 8	p	p	1	10.4-15.0
<i>O. bitorquatus</i>	Not forked	15-16	6-9	E	136-165	29-44	6, 7	p	a, p	1	17.2-19.2
<i>O. bivirgatus</i>	?	?	8	D	173-176	34-37	7	p	a	2	12.0-13.0
<i>O. brevicauda</i>	?	?	7, 8	D	158-176	25-29	7	a	a	1	?
<i>O. calamarius</i>	Not forked	9-10	7	D	127-152	20-34	7	p	p	1	?
<i>O. dorsalis</i>	Forked	11	6, 7	D	162-188	27-51	7	p	p	1	?
<i>O. erythrorhachis</i>	?	?	7, 8	D	154	46	7	p	a	1	?
<i>O. everetti</i>	Not forked	35	7, 8	E	132-154	46-72	7	p	p	1, 2	25.8-28.8
<i>O. hamptoni</i>	Not forked	11	7, 8	D	160-175	30-32	5	a	a, p	1	?
<i>O. huahin</i>	Forked	?	6	E	166-173	35-41	7, 8	p	a	1	12.3-13.9
<i>O. inornatus</i>	Not forked	10-12	10-12	E	169-174	31-43	8	p	p	1	11.2-16.6
<i>O. jintakunei</i>	?	?	6	D	189	46	7	a	p	1	17.4
<i>O. kampucheanensis</i>	Forked	11	11	E	164	39	8	p	p	1	15.1
<i>O. lacroixi</i>	?	?	8-12	D	162-178	25-33	5	p	a	1	10.1-12.5
<i>O. lungshenensis</i>	?	?	8	?	163-180	31-38	6	p	a	2	?
<i>O. melaneus</i>	Not forked	15	7	D	152-160	39-40	7	p	p	1	?
<i>O. modestus</i>	Not forked	18	7, 8	E	156-176	27-44	6	p	a	1	15.0-21.1
<i>O. nagoa</i>	Not forked	16	9, 10	E	184-193	43-47	8	p	p	?	13.5-14.6
<i>O. nihili</i>	?	?	?	D	144	33	7	p	a	1	?
<i>O. notospilus</i>	?	?	7, 8	D	136-140	35-42	7	p	p	1	19.7-21.7
<i>O. ornatus</i>	Not forked	9	6-8	D	156-182	27-44	6, 7	p	a	1	?
<i>O. petronellae</i>	Not forked	?	7, 8	E	144-163	30-42	7	p	p	1, 2	15.0-17.8
<i>O. praefrontalis</i>	?	?	?	D	193	37	7	a	a	1	12.9
<i>O. propinquus</i>	Not forked	5	8, 9	D, E	134-147	22-29	6, 7	p	p	1	12.0-14.2
<i>O. rostralis</i>	Forked	8	6	E	167	47	6	p	a	1	19.6
<i>O. signatus</i>	Not forked	25-26	7, 8	E	144-160	44-59	7	p	p	1	18.1-24.9
<i>O. sublineatus</i>	Forked	13	6-8	D	130-161	23-39	7	p	p	1	?
<i>O. taeniolatus</i>	Forked	9-11	6, 7	D	158-218	29-59	7	p	p	1	?
<i>O. tolaki</i>	Not forked	?	6, 7	E	150-169	18-26	6	p	a, p	1	6.8-11.2
<i>O. torquatus</i>	Not forked	8	15, 16	D	144-169	25-34	7	p	p	1	?
<i>O. vertebralis</i>	Not forked	?	8, 9	E	136-143	35-43	7	p	p	1	?
<i>O. waandersi</i>	Not forked	5-7	8, 9	D	144-176	20-25	6	p	a, p	1	9.1-12.0
<i>O. wagneri</i>	Not forked	18	9	E	156	41	7	p	p	1	16.2

Holotype. MNHN-RA-2003.3332, a juvenile specimen (TL 164 mm), most probably female, collected from the immediate vicinity of Ban Kiatngong (or Ban Khiet Ngong; 14°46'15"N, 106°02'16"E; alt. 90–300 m a.s.l.), at the northern limit of Xepian National Protected Area (Xepian NPA), Pathomphon District, Champasak Province, Laos, by Alexandre Teynieé on 30 May 2003.

Paratype. QSMI 1700, a male probably adult (TL 300 mm), from Don Không (or Không Island; “Don” meaning island), collected on the circular border road of the island on the side of its east bank, about 8 km north of Muang Không (a small town at 14°7'4"N, 105°50'55"E; alt. ca. 100 m a.s.l.), Champasak Province, Laos; found dead on the road in poor condition by Sjon Hauser on 6 December 2004.

Diagnosis. A species of the genus *Oligodon* characterized by the combination of (1) 15 - 15 - 15 dorsal scale rows; (2) 11 maxillary teeth in the holotype, the last three strongly enlarged; (3) hemipenis not forked, thick and bulbous, not spinose or with only minute spines; (4) cloacal plate entire; (5) 150–159 ventral plates (n=2); (6) tail short in the female holotype (ratio TaL/TL: 0.104); (7) complement of head scales complete, including one loreal on each side; (8) 7 or 8 supralabials, 4-5 or 3-4 touching the eye; (9) dorsal pattern made of a bright reddish-brown background colour (in life or freshly killed in the case of the paratype) with 29–30 pale cream or pale ochre-brown, dark-edged, narrow crossbands on the body, not extending to the ventral plates; and (10) venter uniform cream-yellow in preservative (pink in life or freshly-killed) with a few faint, blackish-brown, irregular flecks on the tips of ventral plates on the anterior part of the venter.

Comparison. Based on de Rooij (1917), Taylor (1922), Smith (1943), Leviton (1953), Wagner (1975), Manthey & Grossmann (1997), Pauwels *et al.* (2002), David *et al.* (2008a-b, 2011, 2012), Das (2010), Tillack & Günther (2010), Neang *et al.* (2012), Vassilieva *et al.* (2013), Vassilieva (2015), N. S. Nguyen *et al.* (2016, 2017), Sumontha *et al.* (2017), Pauwels *et al.* (2017), N. H. Nguyen *et al.* (2020), Amarasinghe *et al.* (2021), and Qian *et al.* (2021), and on examined specimens listed in Appendix I.

The number of dorsal scale rows around the neck (at one head length behind the head) and at midbody is a major diagnostic character in the genus *Oligodon* (see David *et al.* 2008a-b). This

number is usually constant within a given species. This character is only variable in some species complexes such as *O. purpurascens* (Schlegel, 1837), which has 19 or 21 scale rows at midbody. There are 85 species recognized in the genus *Oligodon*, of which only 33 species, including *Oligodon teyniei* sp. nov., have 15 DSR, either constantly along the length of body or at least at midbody (Table 1). All other species of the genus have 13, 17, 19, 21, or rarely 23 at midbody. Among the 33 species that have 15 rows at midbody, 27 species display the condition consistently (15 - 15 - 15), including the new species described here.

In the Indochinese Region and the whole of Thailand, there are five species with 15 dorsal scale rows at midbody: *O. inornatus*, another member of the *O. cinereus* species group, *O. kampucheaensis* Neang, Grismer & Daltry, 2012, *O. lacroixi* Angel & Bourret, 1933, *O. jintakunei* Pauwels, Wallach, David & Chanhom, 2002 and *O. rostralis* Nguyen, Tran, Nguyen *et al.*, 2020. Among these species with 15 MSR, *O. teyniei* sp. nov. primarily differs from others by the following scalation characters:

(1) a cloacal plate entire vs. divided in *O. lacroixi* and *O. jintakunei*;

(2) a loreal scale present vs. absent in *O. lacroixi* and *O. rostralis*;

(3) internasals present vs. absent (fused with prefrontals) in *O. lacroixi* and *O. jintakunei*;

(4) presence of 7 or 8 supralabials vs. five in *O. lacroixi* and six in *O. rostralis*;

(5) dorsal pattern either made of pale, dark-edged crossbands, vs. a uniform or reticulate pattern in *O. inornatus*; a distinctly dark-blotched dorsal pattern in *O. rostralis*; or a dorsal pattern mainly made of conspicuous longitudinal, dorsolateral blackish-brown stripes extending along the body with a series of red vertebral blotches in *O. lacroixi*.

By having a dorsal pattern composed of pale crossbands, *O. teyniei* sp. nov. also differs from the following species with 13, 17, 19, 21 or 23 MSR: (1) *O. cinereus cinereus*, *O. cinereus swinhonis*, *O. joysoni*, *O. macrurus* and *O. arenarius* present a uniform or reticulate pattern; (2) *O. cinereus poilani*, *O. cinereus plurimaculatus*, *O. fasciolatus*, *O. ocellatus*, *O. chinensis*, *O. cattienensis*, *O. nagao*, *O. saintgironsi*, *O. barroni* and *O. rostralis* present a distinctly dark-blotched dorsal pattern; (3) *O. cinereus tamdaoensis* presents a dorsal pattern made of conspicuous black, solid crossbands; (4)

Plate 4



Figure 1. Holotype of *Oligodon teyniei* sp. nov. (MNHN-RA-2003.3332): (A) dorsal and (B) ventral views of the full body. © Photo: Patrick David

Plate 5

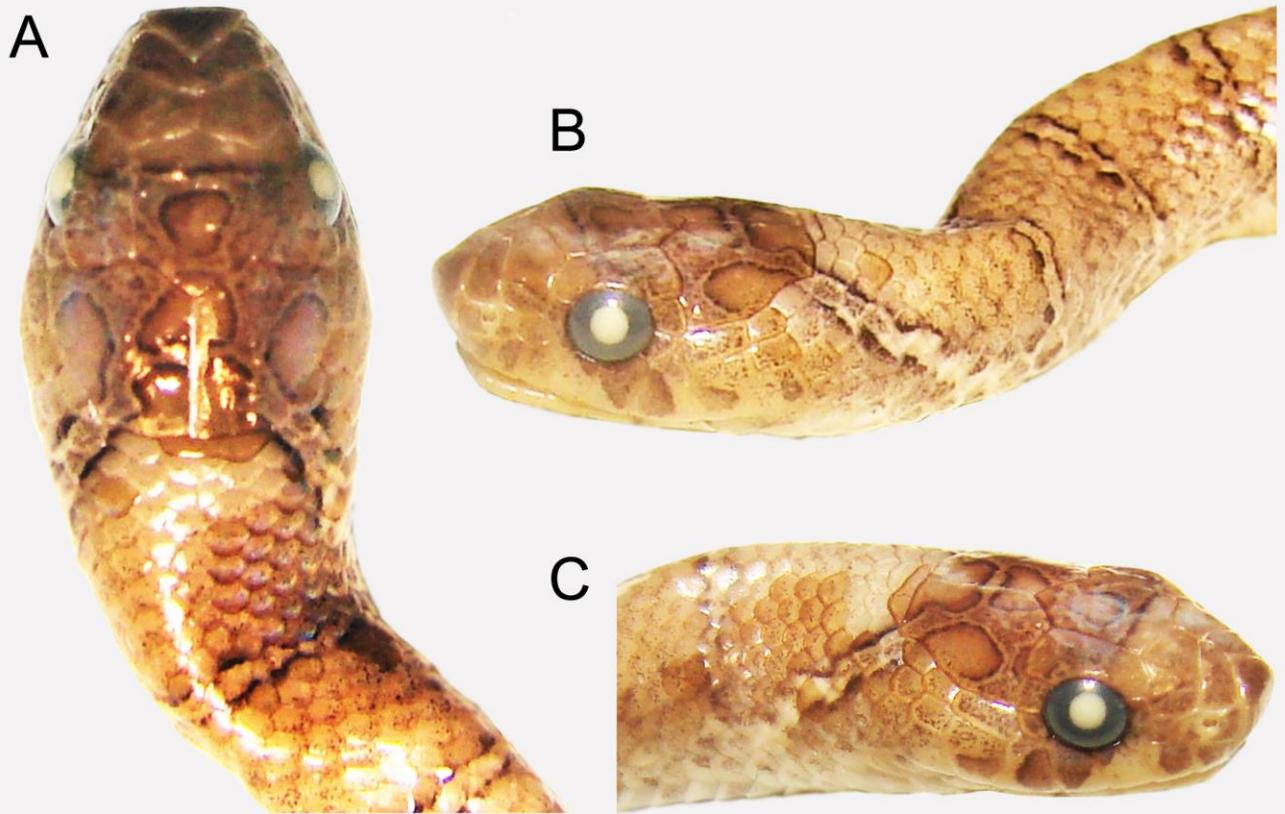


Figure 2. Holotype of *Oligodon teyniei* sp. nov. (MNHN-RA-2003.3332): (A) dorsal, (B) lateral (left), and (C) lateral (right) views of the head. © Photo: Patrick David



Figure 3. Paratype of *Oligodon teyniei* sp. nov. (QSMI 1700), freshly preserved skin: (A) anterior body and (B) posterior body. © Photo: Sjon Hauser.

O. cinereus multifasciatus presents black, wavy dorsal crossbands; and (5) most species of the *O. taeniatus* species-group, such as *O. taeniatus*, *O. pseudotaeniatus*, *O. deuvei* and *O. moricei* present a dorsal striped pattern.

Nevertheless, by its dorsal pattern, *O. teyniei* sp. nov. is more or less similar to *O. annamensis*, *O. cinereus pallidocinctus*, *O. jintakunei* (known only from southern Thailand), *O. kampucheaensis* and one colour morph of *O. albocinctus* (Cantor, 1839), an Indo-Himalayan species not present in the Indochinese Region although it has erroneously been cited from Vietnam by S.V. Nguyen *et al.* (2009).

O. teyniei sp. nov. differs from *O. albocinctus* Var. II sensu Smith (1943) by (1) the number of dorsal scale rows, 15 - 15 - 15 vs. 19 - 19 - 17 in *O. albocinctus*, (2) the number of ventral plates, 150–159 vs. 191–205, and (3) its venter uniform cream-yellow vs. lateral blotches in *O. albocinctus*.

O. teyniei sp. nov. differs from *O. annamensis* by (1) the number of DSR, 15 - 15 - 15 vs. 13 - 13 - 13 in *O. annamensis*, (2) hemipenis not forked, thick and bulbous vs. bilobed and elongate, (3) nasal scale vertically divided by a suture vs. entire, (4) loreal present vs. absent, and (5) ventral colour in life pink with a few faint, blackish-brown, irregular flecks on the tips of ventral plates on the anterior part of the venter vs. bright coral-red to bright orange with black quadrangular spots forming transverse bars in *O. annamensis* (N. H. Nguyen *et al.* 2020).

O. teyniei sp. nov. differs from *O. jintakunei* by (1) internasals present vs. absent (fused with prefrontals) in *O. jintakunei*, (2) a cloacal plate entire vs. divided, (3) 11 maxillary teeth vs. 6, (4) 150–159 ventral plates vs. 189, and (5) 29–30 crossbands on the body vs. a dorsal body pattern consisting of 11 regularly spaced, narrow whitish dorsal rings on a dark brown background colour.

O. teyniei sp. nov. is most similar in its pattern to two species inhabiting the same region of the Indochinese Peninsula, *O. kampucheaensis* and *O. cinereus pallidocinctus*. This latter subspecies, previously recorded from Vietnam (centre and south: provinces of Ba Ria - Vung Tau, Binh Phuoc, Dong Nai, Quang Binh and Thua Thien - Hue, and Ho Chi Minh City; T.Q. Nguyen *et al.* 2014) and eastern Cambodia (Pichrada; Stuart *et al.* 2006) is also present in southern Laos, from where it has been recorded from the provinces of Attapeu and Xékong (our

unpublished data; based on two examined specimens listed in Appendix I).

O. teyniei sp. nov. shares with *O. kampucheaensis* the same number of dorsal scale rows at midbody (15–15–15) and the pattern of pale crossbands. However, these species are separated by (1) the morphology of the hemipenis, unforked in the freshly killed adult paratype of *O. teyniei* vs. hemipenis deeply bifurcate in adult *O. kampucheaensis* (a member of the *O. cyclurus* species complex), (2) 150 vs. 164 ventral plates in the sole known males of each species, (3) 29–30 pale cream or pale ochre-brown, dark-edged, narrow crossbands on the body vs. only 17 in the sole known specimen, (4) dorsal crossbands separated by 5 or 6 vertebral scales throughout the body vs. 8–10, and (5) venter uniform with a few faint, blackish-brown, irregular flecks on the tips of the ventral plates on the anterior part of the venter vs. dark brown rectangular spots or blotches on the outer part of each ventral plate in *O. kampucheaensis*.

O. teyniei sp. nov. is similar in dorsal pattern to *O. cinereus pallidocinctus*, with which it shares the same number of dorsal crossbands. However, *O. teyniei* sp. nov. differs from this latter species by (1) the number of dorsal scale rows, 15 - 15 - 15 vs. 17 - 17 - 15 in 14 specimens of *O. cinereus pallidocinctus*, (2) shorter tail, with a ratio Ta/TL of 0.104 in the female holotype vs. 0.112–0.117 in six females of *O. cinereus pallidocinctus*, (3) number of ventral plates, 150 in the male paratype vs. 165–177 in 8 males of *O. cinereus pallidocinctus* and 159 in the female holotype of *O. teyniei* vs. 164–176 in 6 females of *O. cinereus pallidocinctus*, (5) dorsal crossbands separated by 5 or 6 vertebral scales throughout the body vs. usually 7–10, and (6) the pattern of the venter, creamish-yellow with a few faint, blackish-brown, irregular flecks on the tips of ventral plates on the anterior part of the venter vs. outer parts of all ventrals dark in *O. cinereus pallidocinctus*.

The number of dorsal scale rows may vary slightly in some species of the genus *Oligodon*, for example in *O. huahin* and *O. nagao* that usually have 17 - 17 - 15 rows but we found in one specimen of each species values of 17 - 15 - 15 DSR. However, in all specimens of these species, the number of scale rows is always 17 behind the neck. In more than 130 examined specimens of the *O. cinereus* species complex, which usually have 17 DSR at midbody, we have seen only three specimens with only 15

rows around the midbody, including the specimens of *O. huahin* and *O. nagao* cited above, and none with 15 rows behind the head.

O. teyniei sp. nov. has been confused by Teynié & David (2010) with *O. inornatus*, a species that inhabits the same region of Laos and which always has 15 dorsal scale rows at midbody. The new species can be distinguished from *O. inornatus* by (1) its number of ventral plates, 150–159 vs. 168–181, (2) its dorsal colour, bright reddish-brown vs. dorsal surface greyish-brown or dull reddish-brown, and (3) presence of conspicuous, pale, dark-edged crossbands vs. dark reticulations or ill-defined, short dark crossbands. Some specimens of *O. inornatus* may have 15, 16 or 17 rows behind the head but all examined specimens have 15 dorsal scale rows at midbody.

Etymology. The specific nomen is the Latin genitive noun of the last name of Alexandre Teynié, a French herpetologist, to whom we are glad to dedicate this new species for his immense contribution to the herpetology of Laos since 2003. We suggest the following common names: Teynié's Kukri Snake (English), *Oligodon de Teynié* (French) and Teynié's Kukri Natter (German).

Description of the holotype. Body elongate, cylindrical and robust; head elongate (about 5.9 % of SVL), ovoid, rather broad and moderately distinct from the neck; snout long, slightly rounded, extending beyond lower jaw, about 1.6 times as long as eye horizontal diameter; nostril large, round, piercing laterally on the upper forward part of the postnasal, next to the suture between the prenasal and the postnasal; eye with a round pupil, rather large, its diameter slightly greater than the distance between eye and lip; tail short, tapering progressively to a point.

Measurements: SVL: 147 mm; TaL: 17 mm; TL: 164 mm; ratio TaL/TL: 0.104; HL: 8.75 mm; SnL: 2.95 mm.

Body scalation: DSR: 15 - 15 - 15, all smooth without apical pits; scales of the outer dorsal scale row distinctly enlarged; 159 VEN (+ 2 preventrals), angulate; 29 SC, all paired; cloacal plate entire; terminal caudal scale pointed.

Head scalation complement complete, including 2 internasals, 2 prefrontals, 2 supraoculars, 1 frontal, and 2 parietals. Rostral large, wider than high, well visible from above and inserted deeply between internasals on about one half of their length; 1/1 large, elongate,

nasal divided into 2 scales by a suture distinctly visible below the nostril, altogether about 1.8 times longer than high, prenasal distinctly larger than postnasal; internasals subrectangular, narrow and much wider than long, separated by a short suture and obliquely directed backward; prefrontals large, pentagonal, much wider than long, longer than internasals but suture between prefrontals more or less equal to the suture between internasals; frontal large, hexagonal, wide and rather squat, posterior edges pointing backwards, about 1.2 times longer than wide; parietals large, longer than wide, slightly longer than frontal, abruptly truncated posteriorly with a straight posterior margin, followed by a series of transversely elongate nuchal scales; on each side, one large supraocular, about twice longer than wide, a little bit more than half as wide as the frontal; no enlarged nuchal scale behind parietals; 1/1 loreal scale, relatively large, subrectangular, as high as long; 8/7 supralabials, 1st and 2nd SL in contact with nasals on both sides, 2nd and 3rd at left, only 2nd SL at right in contact with loreal, 4th and 5th SL at left, 3 and 4th SL at right entering orbit, 6th and 7th SL at left, 6th SL at right largest; 1/2 preoculars, scale alone or altogether about 75% as high as eye diameter, in contact or the upper one in contact with prefrontal but not reaching the frontal; no presubocular; 2/2 small, subrectangular postoculars, similar in size; 1 + 2 + 3 temporals on each side, anterior one much elongate, posterior ones rather small, about half as long as anterior temporal; 7/7 IL, first in contact with each other, 1st–4th at left and 1st–3rd at right in contact with anterior chin shields; mental small; anterior chin shields much longer than posterior ones.

Dentition. Maxillary teeth: left maxilla with 11 teeth, 8 subequal teeth plus 3 strongly enlarged, blade-like teeth, without diastema.

Colouration. In preservative, the body is pale ochre-brown (it was bright reddish-brown in life; unfortunately no picture was taken), slightly paler on the lower flanks; most dorsal scales are distinctly speckled with minute blackish-brown dots and flecks; a series of 29 dorsal crossbands on the body, straight or slightly oblique, pale ochre-yellow (white or cream in life), edged on each side with a narrow blackish-brown line; each crossband is 1 scale long and stops on each side on the 3rd or 4th dorsal scale row; first crossband located at the level of the 6th ventral plate or at 9 nuchal and vertebral scales behind the limit between

parietals; crossbands separated by 5 or 6 vertebral scales along the body; some crossbands are oblique. The tail is coloured the same as the body with 6 similar crossbands that stop on the 2nd row of lateral scales; the tip of the tail is pale ochre-brown.

The head is dark greyish-brown above, much darker than the body; a narrow blackish-brown crossline extends from the anterior edge of one eye to the other one crossing the frontal at the level of its first anterior quarter; in front of this line the upper part of the snout is paler brown and uniform; behind it, the crown is heavily speckled with blackish-brown; on the frontal, the black crossline is immediately followed by a large, dark reddish-brown pear-shaped blotch, its apex pointing backward; another large blotch of the same colour covers the anterior part of the parietals, nearly in contact with the frontal blotch; a third, much larger blotch, constricted in its middle, covers much of the central posterior part of parietals, just before their straight limit; furthermore, each parietal bears a large, oval-shaped blotch of the same colour near its outer edge; supralabials and sides of rostral pale yellow; 1st and 2nd supralabials heavily powdered with blackish-brown; an oblique, blackish-brown subocular streak covers the upper rear corner of 4th SL, the whole of 5th SL and the anterior half of 6th SL at left, the 3rd to 5th SL at right with the same scheme; on each side of the head, a strong, oblique, cream, black-edged streak extends downward and backward from the outer edge of the central part of each parietal down to the 1st dorsal scale row on the side of the neck. The chin and throat are uniform cream-yellow in preservative; some dark brown spots are visible on the infralabials.

The venter is uniform cream-yellow in preservative (pink in life) with only a few blackish-brown, irregular flecks on the tips of ventral plates on the anterior part of the venter. The ventral surface of the tail is similar, uniform without any pattern except some flecks on the outer edges of subcaudals.

Variation. The paratype, an adult male, is in poor condition (Figs. 3A–B). When the second author found this individual dead on the road, parts, especially the front of the head and the venter, had been eaten by ants. The posterior part of the body and the tail were present and measured. Subsequently, the tail with hemipenis, already rotten, was discarded along with the extreme posterior part of the body. The

remaining part of the specimen was skinned and the skin later laminated. Unfortunately, this incomplete skin does not allow us to record all external morphological characters.

Main available characters of the paratype (measured and counted on the freshly collected snake) are as follows:

Morphometry: SVL: 255 mm, TaL 45 mm, TL 300 mm; ratio TaL/TL 0.150; head length: 8.75 mm (from the tip of the snout to the angle of the jaws).

Hemipenis: according to what could be seen on the organ of the paratype, the hemipenis is unforked and thick, and devoid of large spines.

Body scalation: Dorsal scale rows: 15–15–15; ventral plates: 150 (perhaps 152); subcaudal scales not counted but all paired.

Head scalation: complement complete as in the holotype.

Colouration. Freshly dead, the dorsum was pale brick-red, paler and more yellowish-red on the 1st–4th DSR; 30 pale ochre-yellow or yellowish-brown crossbands on the body (plus perhaps one or two on the missing part of the skin), the first four ones reduced to cream vertebral dots edged with dark brown, the following ones less distinct than in the holotype, irregularly-shaped, 1 dorsal scale wide and covering the 7–11 upper dorsal scale rows.

The head is coloured the same as the body and its upper surface is seemingly patterned as in the holotype, with an indistinct mark on the frontal shield. The venter is cream-pink.

We consider that the slight differences of pattern between the holotype and the paratype result either from individual variation or from an ontogenetic variation. We have not observed any sexual dimorphism in the colouration in all examined species of the genus *Oligodon* so we do not retain this possibility.

Distribution. (Fig. 4). LAOS. Champasak Province. *Oligodon teyniei* sp. nov. is currently known only from two localities in a small area of the southern part of this province, namely (1) the vicinity of Ban Kiatngong (or Ban Khiet Ngong), at the northern limit of Xepian NPA, and (2) Không Island, a large island in the Mekong River. These two localities are separated by about 70 km.

The range of *O. teyniei* sp. nov. may be wider than currently known. As the southwestern end of Không Island is separated from Cambodia only by the Mekong and its southeastern end is only 8 km from the border between Laos and Cambodia, *O. teyniei* sp. nov.

may also be expected to occur in the north-east of Cambodia.



Figure 4. Distribution of *Oligodon teyniei* sp. nov. in Laos (square, holotype) and (dot, paratype)

Natural history. This species is known only from lowland areas in the valley of the Mekong River, between about 100 and 300 m. a.s.l. The holotype was collected on the ground during daytime at the edge of a lowland evergreen forest. The paratype was lying on a part of the peripheral road around the island crossing a habitat of mixed agricultural lands and shrubs. It was found dead on the road in December, during the dry, cooler season. Nothing else is known about the biology of this species.

The extreme south of Laos, where the holotype and paratype of *O. teyniei* sp. nov. were collected, is rather dry. The natural vegetation consists of lowland semi-evergreen and deciduous mixed forest, and dipterocarp monsoon forest mixed with grassland (Vidal 1960; Stuart 1998; Wikramanayake *et al.* 2002).

The holotype was collected along the northern fringe of Xepian National Park, or Xepian NPA. The park is located in the southern part of Laos. The natural vegetation of this region can be identified as lowland monsoon evergreen forest and lowland monsoon semi-evergreen forests (Collins *et al.* 1991; Anonymous 2022a-b), although some parts of the region are covered with open dry monsoon forests or have been converted to agriculture. Much of the vegetation of the park is composed of moist lowland monsoon evergreen or semi-evergreen forests, with tracts of dry lowland monsoon mixed deciduous forests.

The locality of the paratype, Don Khong, is a large, major island of the Mekong River, 19 km long on its north-south axis and 8 km wide

on a more or less east-west axis, centred at about 14°08'45"N-105°49'30"E. It is located immediately north of the border with Cambodia. Its central part is made of low hills with some “peaks” at about 189, 209 and 240 m a.s.l., respectively. The long history of habitation/agriculture and recent history of logging suggests that deforestation has been extensive and probably recurrent on this island. Combined with the dry climate, this human activity has resulted in degraded dry semi-evergreen or dry deciduous forest.

Discussion

The lowlands of southern Laos, where the holotype and paratype of *O. teyniei* sp. nov. were collected, are subject to a marked monsoonal climate. Xepian NPA is slightly more humid, with extensive lowland monsoon evergreen and semi-evergreen forest, than Không Island located further south. In Laos, xerophyllous snake species requiring a long, dry season such as *Ahaetulla* cf. *nasuta* (Lacépède, 1789) and *Psammophis indochinensis* Smith, are only known from the extreme southern part of the country, especially west of the Mekong River.

The snake fauna of Xepian NPA is rich, with at least 30 snake species (Teynié *et al.* 2004; Teynié & David 2010) including three other species of the genus *Oligodon*, namely *O. barroni* (Smith, 1916), *O. inornatus* (Boulenger, 1914) and *O. ocellatus* (Morice, 1875). The snake fauna of Không Island is less rich. Nevertheless, other snake species recorded on the island by the second author during a brief stay in December 2004 included one specimen of *Xenopeltis unicolor* H. Boie in F. Boie, 1827, two of *Dendrelaphis pictus* (Gmelin, 1789), two *Fowlea flavipunctatus* (Hallowell, 1861), three *O. taeniatus* (Günther, 1861) and one *Calliophis maculiceps* (Günther, 1858), all found dead on the road. It is likely that *O. teyniei* sp. nov. is a species of regions subject to a marked monsoonal climate.

Smith (1943) defined several informal groups in the genus *Oligodon* based on the hemipenial morphology. Green *et al.* (2010) confirmed genetically the distinctiveness of these groups; see David *et al.* (2012) for a discussion. With its presumably unforked and thick hemipenis, *O. teyniei* sp. nov. agrees with hemipenial morphology known from the groups of *O. cinereus*, *O. octolineatus* (Schneider, 1801), *O. modestus* Günther, 1864 and *O.*

purpurascens. As members of the groups of *O. purpurascens*, *O. octolineatus* and *O. modestus* include species inhabiting the Malay Peninsula, Indo-Malayan Archipelago and the Philippine Islands, affinities are rather with the group of *O. cinereus* for both zoogeographical and morphological reasons. Furthermore, the pattern of dorsal pale, black-edged crossbands also occurs in the taxon currently known as *O. cinereus pallidocinctus*, also confirmed from southern Laos (our unpublished data) based on voucher specimens listed in Appendix I.

Lastly, there are minor differences between the dorsal pattern of the two specimens of *O. teyniei* sp. nov., especially in the size and shape of the dorsal crossbars. Obviously, additional specimens are necessary to specify the variation and accurate hemipenial morphology of this species.

The number of taxa of *Oligodon* present in Laos increased from ten in Teynié & David (2010) to 14 in the present work. In Laos, the genus currently comprises the following taxa: *O. barroni*; *O. catenatus* (Blyth, 1854); *O. cinereus pallidocinctus* [first mention from Laos, our material listed in Appendix I, and David *et al.* in prep.]; *O. cinereus plurimaculatus* (Bourret, 1942) [first mention from Laos, our material and David *et al.* in prep.]; *O. cinereus tamdaoensis* (Bourret, 1935) [first record from Laos, our material and David *et al.* in prep.]; *O. deuvei* David, Vogel & van Rooijen, 2008; *O. fasciolatus* (Günther, 1864); *O. inornatus*; *O. joysoni* (Smith, 1917); *O. lacroixi* [first record from Laos, David *et al.* in prep.]; *O. nagao* David, Nguyen, Nguyen *et al.* 2012; *O. ocellatus*; *O. taeniatus* (Günther, 1861); and *O. teyniei* sp. nov.

However, there are certainly more cryptic species awaiting to be discovered, especially in the *O. fasciolatus* species complex and, of course, in that of *O. cinereus*. The status of the various synonyms and subspecies of this latter species complex is currently under revision (Vogel *et al.* in prep.). A summary of morphological differences in Laotian species of the genus *Oligodon* is given in Table 2. These taxa can be identified by the following key:

- 1. (a) 13 MSR *O. catenatus*
 (b) 15 MSR 2
 (c) 17 MSR 5
 (d) 19 MSR 11
 (e) 21 (rarely 23) MSR *O. fasciolatus*
- 2. (a) dorsal scale rows 15-15-15 3
 (b) dorsal scale rows 17-15-15 *O. nagao*

(Note: the value of 15 dorsal scale rows at midbody seems to be anomalous in this species)

- 3. (a) Internasals and loreals absent; only 5 supralabials; dorsal pattern with 4 longitudinal stripes and small orange vertebral blotches *O. lacroixi*
 (b) Internasals and loreals present; 7–8 supralabials; dorsal colouration not as above (see below) 4
- 4. (a) 165–174 ventrals; dorsal body uniform or with black reticulations forming irregular dark crossbars; sometimes, a pair of slightly darker, faint paravertebral stripes and a narrow dorsolateral stripe *O. inornatus*
 (b) 150–159 ventrals; 29 or 30 white/cream (pale ochre yellow/yellowish brown in preservative) cross bands on dorsum covering 7–11 upper dorsal scale rows *O. teyniei* sp. nov.
- 5. (a) Dorsal pattern with blotches and/or cross bands / crossbars 6
 (b) Dorsal pattern with a broad, conspicuous vertebral stripe, bright rusty red, orange or yellow; sometimes a faint and discontinuous, dark dorsolateral stripe on each side with aligned dark grey/brown spots *O. deuvei*
- 6. (a) Dorsal pattern mainly with blotches 7
 (b) Dorsal pattern with transverse cross bands / crossbars 9
- 7. (a) Small-sized (total length up to ~400 mm); hemipenes deeply forked, not spinous, fitted with two large papillae; presubocular absent; 10–14 dark brown or black blotches on the dorsal body and 2–3 on the tail *O. barroni*
 (b) Large / medium sized (total length up to ~800 mm); hemipenes not forked but divided into two lobes near the tip, thick and bulbous, smooth, each lobe with a papilla; at least 27 dark blotches on the dorsal body and 5 on the tail 8
- 8. (a) Large-sized (total length up to ~800 mm); single minute presubocular; 8 (exceptionally 7) supralabials; 184–193 ventrals in males (females unknown); 27–37 dark, pale centred, butterfly-shaped blotches on the dorsal body and 5–8 on the tail *O. nagao*
 (Note: the value of 17 dorsal scale rows at midbody seems to be anomalous in this species)
 (b) Medium-sized (total length up to ~600 mm); no presubocular in the sole known specimen; 7 supralabials; 164 ventrals in the male holotype; 38 conspicuous, dark purplish-brown, black-edged, transversally elongate blotches on the dorsal body and 5 on the tail *O. cinereus plurimaculatus*
- 9. (a) Dorsal cross bands much darker than the background colour 10

- (b) Dorsal crossbands white / cream, much paler than the background colour *O. cinereus pallidocinctus*
10. (a) 186–200 ventrals; presubocular always present; dorsal background dark reddish brown/purplish brown/dark greyish brown; dorsal pattern with black/blackish brown reticulations forming ~40–50 irregular, zigzag dark crossbars *O. joysoni*
 (b) 169–184 ventrals; presubocular often absent; dorsal background dark yellowish brown / tan / dark greyish brown; dorsal pattern with 16–25 dark brown / blackish brown, solid, straight dorsal crossbars *O. cinereus tamdaoensis*
11. (a) Presubocular always present; 2 anterior temporals; long and deeply forked hemipenes, thin, smooth and not spinous throughout; dorsal pattern typically blotched in most specimens, with 11–13 large blotches on the body and 2–3 on the tail, or sometimes merely a reticulated pattern with very faint blotches *O. ocellatus*
 (b) Presubocular rarely present; 1 anterior temporal (exceptionally 2); deeply forked hemipenes, not spinous but fitted with two large papillae; dorsal pattern with two dark longitudinal paravertebral stripes edging a pale (yellow in life) vertebral stripe, and two narrow dark dorsolateral stripes *O. taeniatus*

Table 2. A summary of main diagnostic characters of Laotian species of the genus *Oligodon*; ASR, number of dorsal scales around the neck; MSR, number of dorsal scales at midbody; CLO, cloacal plate; E, entire; D, divided; InN, internasals; A, absent; P, present; values or characters of rare occurrence are placed in brackets.

Species/subspecies	ASR	MSR	CLO	InN	Dorsal colouration
<i>O. barroni</i>	17	17	E	P	10–14 blotches
<i>O. catenatus</i>	13	13	D	A	longitudinally striped and blotched
<i>O. c. pallidocinctus</i>	17	17	E	P	22–37 pale cross bands / crossbars
<i>O. c. plurimaculatus</i>	17	17	E	P	38 blotches
<i>O. c. tamdaoensis</i>	17	17	E	P	16–25 dark cross bands / crossbars
<i>O. deuvei</i>	17	17	E	P	longitudinally striped
<i>O. fasciolatus</i>	21, 23	21 (23)	E	P	9–18 blotched or reticulated
<i>O. inornatus</i>	15, 17	15	E	P	uniform or reticulated
<i>O. joysoni</i>	17	17	E	P	40–50 dark cross bands / crossbars or reticulated
<i>O. lacroixi</i>	15	15	D	A	11–17 longitudinal stripes and blotched
<i>O. nagao</i>	17	17 (15)	E	P	27–37 blotches
<i>O. ocellatus</i>	19	19	E	P	11–13 blotches
<i>O. taeniatus</i>	19	19	E	P	longitudinally striped
<i>O. teynieii</i> sp. nov.	15	15	E	P	29–30 pale cross bands / crossbars

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Appendix I. Examined specimens

- Oligodon cinereus pallidocinctus* ($n=14$). LAOS. Attapu Province. MNHN-RA-1897.0425, “Attapeu”, perhaps the city of Attapu. Xékong Province. ZMA 19170, Ban Dakchung. – VIETNAM. Dong Nai Province. MNHN-RA-1937.0022, USNM 90009–90011, Bien Hoa. Ho Chi Minh City Municipality. NHMUK 1938.8.7.33–34, “Saigon”, now Ho Chi Minh City; USNM 73850, “Gia Dinh”, now included in Ho Chi Minh City. Quang Binh Province. IEBR 94, S 0154 (T. Ziegler’s personal collection), Phong Nha-Ke Bang National Park. No specified locality. MHL 42000348 (1575), “Cochinchine, Tay Ninh”, now Tay Ninh Province; MNHN-RA-1899.0278, “Annam (Indochine)”, central Vietnam; MNHN-RA-1938.0135 (holotype of *Oligodon violaceus pallidocinctus* Bourret, 1934), “Cochinchine”, i.e., extreme southern Vietnam.
- O. c. tamdaoensis* ($n=22$). LAOS. Phongsali Province. USNM 68130, 50.5 km ENE of Phongsali. Xiangkhoang Province. MNHN-RA-1928.0070, MNHN-RA-1999.8150–51, “Xieng-Khouang (Indochine)”, namely in the former city of Xiengkhouang, now Khoue, Khoue District – PEOPLE’S REPUBLIC OF CHINA. Guizhou Province. CIB 72378, Guiyang. – VIETNAM. Bac Kan Province. KBS 2, Ba Bé National Park, Ba Bé District; MNHN-RA-1897.0407–408, “Bao Kan, (Tonkin)”, now Bac Kan, Bac Kan District; MNHN-RA-1958.0466, “Nghan Son, Tonkin”, now Ngán Son, Ngán Son District. Da Nang Municipality. MNHN-RA-1997.4359–60, “Bana Nature Reserve, Na Hang, Tatke sector”, now Bà Nà-Núi Chúa Nature Reserve, Hoa Vang District. Ha Noi Municipality. MNHN-RA-1959.0465, “Bavi Tonkin”, now Ba Vi Mt., Ba Vi District. Lào Cai Province. MNHN-RA-1901.0373, “Bao-Ha (Tonkin)”, now Bảo Hà, Bảo Yên District; MNHN-RA-1901.0507, “Minh Luong (Tonkin)”, now Minh Luong, Van Ban District; MNHN-RA-1908.0203, “Région de Laokay (Haut Tonkin)”, now in the vicinity of Lào Cai; MNHN-RA-1948.0087, “Coc-Xan, Région de Lao Kay”, now Coc Xan. Vinh Phúc Province. MNHN-RA-1938.0136 (holotype of *Holarchus violaceus tamdaoensis*), “Tam Dao, Tonkin”, MNHN-RA-1996.7436, MNHN-RA-2011.0242–43, MNHN-RA-2011.0257, VNUH 2009.0626, Tam Dao Hill Station, Tam Dao District.

- O. inornatus** ($n=11$). LAOS. Attapeu Province. FMNH 259202, Sanamsai District. Champasak Province. MNHN-RA-2003.3331, Ban Kiatngong, Xepian NPA. – THAILAND. Chiang Mai Province. NHMUK 1969.1858, “Chiengmai”, now Chiang Mai. Chon Buri Province. NHMUK 1914.5.11.5, “Nong Kai Ploy; Siam”, now Ban Nong Kai Ploi; NHMUK 1921.4.1.22, “Hup Bon, SE Siam”, now Ban Hup Bon; NHMUK 1969.1860, Sriracha; USNM 84823, USNM 94653, “Sriracha, Huey Yang”, now Ban Huai Yang, Sriracha. Trat Province. NHMUK 1915.8.14.22, Ko Kat Island. No specified locality. NHMUK 1969.1842, “Chai Tenk”, unidentified locality; NHMUK 1969.1862, “SE Siam”.
- O. joynsoni** ($n=6$). LAOS. No locality. MNHN-RA-1896.0633, “Laos”. – THAILAND. Lampang Province. NHMUK 1946.1.4.23 (Holotype), NHMUK 1969.1809, Muang Ngao or Muang Ngau, 18°45'27N, 99°58'42E. Chiang Mai Province. NHMUK 1938.8.7.40, NHMUK 1969.1808, “Me Wang, N. Siam”, now Mae Wang. – PEOPLE’S REPUBLIC OF CHINA. Yunnan Province. KIZ 09128, Xishuangbanna region, Xishuangbanna Dai Autonomous Prefecture.
- O. lacroixi** ($n=7$). VIETNAM. Lào Cai Province. MNHN-RA-1933.0001 (Syntype), MNHN-RA-1994.1365 (ex MNHN 1933.0001A; syntype), “Chapa, 20 km SW de Lao-Kay”, now Sa Pa, Sa Pa District; MNHN-RA-1935.0004, MNHN-RA-1938.0137–38, MNHN-RA-1958.0464, “Chapa”, now Sa Pa, Sa Pa District. PEOPLE’S REPUBLIC OF CHINA. Yunnan Province. DL 2019092510 (Ding Li’s private collection), Quilong Mt., Kunming.
- O. nagao** ($n=5$). LAOS. Khammouan Province. ZFMK 93281 (Paratype), Ban Nathan, 17°58.854'N-104°49.517'E, Hin Boun District, elevation 172 m a.s.l. – PEOPLE’S REPUBLIC OF CHINA. Guangxi Zhuang Province. KIZ 014591, Nonggang National Nature Reserve, Longzhou County. – VIETNAM. Cao Bang Province. IEBR A.2012.6, Duc Quang Commune, Ha Lang District. Lang Son Province. MNHN-RA-2012.0216, VNMN A.2012.1 (Holotype), Huu Lien forest, Huu Lung District.

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