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Photo: Philippe Geniez.

How to easily identify the flowerpot blindsnake, *Indotyphlops braminus* (Daudin, 1803), with proposal of a new genus (Serpentes: Typhlopidae)

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INTRODUCTION

There is a tiny alien stowaway spreading throughout the world, primarily with the inadvertent assistance of mankind, within the soil and root-masses of commercial plants. It is *Indotyphlops braminus* (DAUDIN, 1803), previously known under the generic names *Typhlops*, *Typhlina*, and *Ramphotyphlops*, and commonly referred to as the flowerpot snake or the Brahminy blindsnake. Nearly every place where this snake occurs, regardless of whether it is a native or introduced species, it is the smallest snake to be found, except in its ancestral home (WALLACH, 2009) of southern India and Sri Lanka that also has related species of the *I. pammeces* species group. This little snake measures only 40–65 mm at birth, with the thickness of a pencil lead (1–2 mm), and weighs only 0.1–0.2 g. Adults are usually 100–130 mm in length, 3–4 mm in diameter, and weigh less than 1 g (WALLACH, 2009).

The most similar species morphologically and genetically to *Indotyphlops braminus* are found in the South Asian *Indotyphlops pammeces* species group and the Australopapuan *Anilios polygrammicus* species group (Table 1). The *pammeces* group shares minute body size, 20 scale rows without reduction, the supranasal suture joining the narrow rostral dorsally, and in half the species the infranasal suture contacting the preocular. All species in the group except *I. pammeces* are from Sri Lanka but the most similar species to *I. braminus* is *I. pammeces* from India. The only external feature separating the two forms is the infranasal suture, contacting the preocular in *I. braminus* but the second supralabial in *I. pammeces*. However, a comparison of the visceral anatomy of *I. braminus* with the *pammeces* group (Table 2) reveals that *I. braminus* is most similar to *I. malcolmi* and

Indotyphlops braminus from Tenerife, Santa Cruz de Tenerife, Canary Isles, Spain, Botanical Garden El Palmetum, alt. 35m., March 21, 2019.

Photo: Philippe Geniez

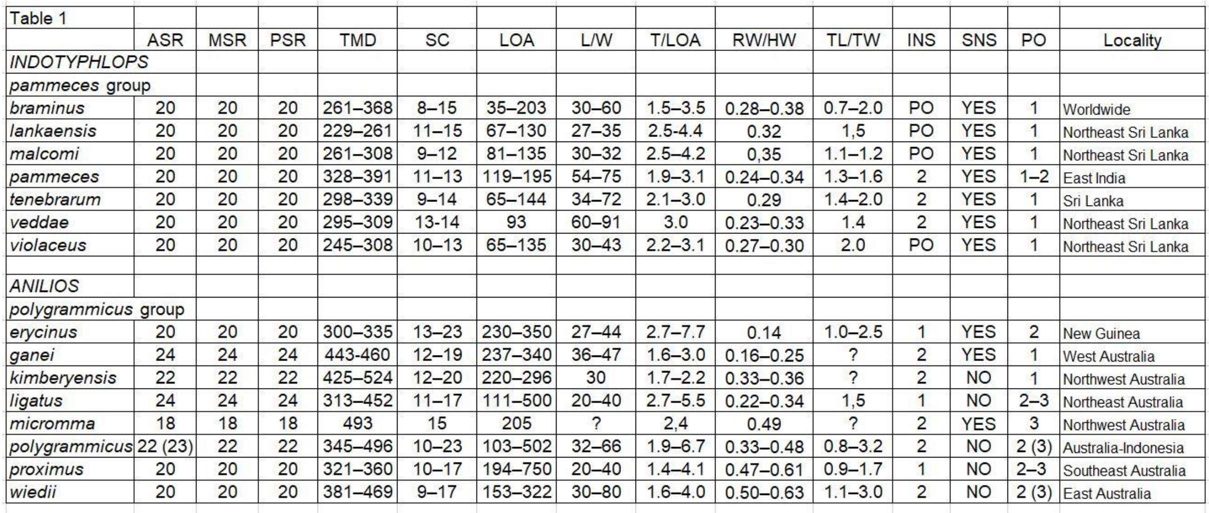

Table 1

	ASR	MSR	PSR	TMD	SC	LOA	L/W	T/LOA	RW/HW	TL/TW	INS	SNS	PO	Locality
INDOTYPHLOPS														
pammeces group														
braminus	20	20	20	261–368	8–15	35–203	30–60	1.5–3.5	0.28–0.38	0.7–2.0	PO	YES	1	Worldwide
lankaensis	20	20	20	229–261	11–15	67–130	27–35	2.5-4.4	0.32	1,5	PO	YES	1	Northeast Sri Lanka
malcomi	20	20	20	261–308	9–12	81–135	30–32	2.5–4.2	0,35	1.1–1.2	PO	YES	1	Northeast Sri Lanka
pammeces	20	20	20	328–391	11–13	119–195	54–75	1.9–3.1	0.24–0.34	1.3–1.6	2	YES	1–2	East India
tenebrarum	20	20	20	298–339	9–14	65–144	34–72	2.1–3.0	0.29	1.4–2.0	2	YES	1	Sri Lanka
veddae	20	20	20	295–309	13-14	93	60–91	3.0	0.23–0.33	1.4	2	YES	1	Northeast Sri Lanka
violaceus	20	20	20	245–308	10–13	65–135	30–43	2.2–3.1	0.27–0.30	2.0	PO	YES	1	Northeast Sri Lanka
ANILIOS														
polygrammicus group														
erycinus	20	20	20	300–335	13–23	230–350	27–44	2.7–7.7	0.14	1.0–2.5	1	YES	2	New Guinea
ganei	24	24	24	443-460	12–19	237–340	36–47	1.6–3.0	0.16–0.25	?	2	YES	1	West Australia
kimberyensis	22	22	22	425–524	12–20	220–296	30	1.7–2.2	0.33–0.36	?	2	NO	1	Northwest Australia
ligatus	24	24	24	313–452	11–17	111–500	20–40	2.7–5.5	0.22–0.34	1,5	1	NO	2–3	Northeast Australia
micromma	18	18	18	493	15	205	?	2,4	0.49	?	2	YES	3	Northwest Australia
polygrammicus	22 (23)	22	22	345–496	10–23	103–502	32–66	1.9–6.7	0.33–0.48	0.8–3.2	2	NO	2 (3)	Australia-Indonesia
proximus	20	20	20	321–360	10–17	194–750	20–40	1.4–4.1	0.47–0.61	0.9–1.7	1	NO	2–3	Southeast Australia
wiedii	20	20	20	381–469	9–17	153–322	30–80	1.6–4.0	0.50–0.63	1.1–3.0	2	NO	2 (3)	East Australia

Table 1. External characters of species similar to *I. braminus.*
ASR = anterior scale rows, MSR = midbody scale rows, PSR = posterior scale rows, TMD = total middorsals, SC = subcaudals, LOA = overall length, L/W = total length/midbody diameter, T/LOA = relative tail length (% LOA), RW/HW = relative rostral width (%),TL/TW = tail length/midtail diameter, INS = infranasal suture, contact (1 = SL1, 2 = SL2, PO = preocular), SNS = supranasal suture contact with rostral, PO = postoculars (rare condition given parenthetically).

I. tenebrarum and most distant from *I. pammeces*. These data show that although the *pammeces* group is very similar to *I. braminus* externally that they are distinctly different species based on the internal anatomy. Previous research has shown that a difference in the mean of more than 2% indicates species differentiation (WALLACH, 1991; WONG, 1994).

CLASSIFICATION

Indotyphlops braminus is a member of the Scolecophidia, a group of ancient snakes that includes dawn blindsnakes (family Anomalepididae from Latin America), wormsnakes and threadsnakes (family Leptotyphlopidae from the New World and Africa), and true blindsnakes (families Gerrhopilidae from South and Southeast Asia and East Indies, Xenotyphlopidae from Madagascar, and Typhlopidae from both the New and Old World). Taxonomically, there are 36 genera of scolecophidian with 481 total species, each family having the following representation: Anomalepididae (4 genera, 20 species), Leptotyphlopidae (12 gen., 153 sp.), Gerrhopilidae (1 gen., 21 sp.), Xenotyphlopidae (1 gen., 1 sp.), and Typhlopidae (18 gen., 286 sp.). They are small in size (Anomalepididae 70–415 mm in length, Leptotyphlopidae 55–400 mm, Gerrhopilidae 75–315 mm, Xenotyphlopidae 170–285 mm, and Typhlopidae 40–950 mm). The midbody scale rows (MSR) and total middorsal scales (TMD), which are the most important taxonomic characters, vary as follows. Anomalepididae (20–30 MSR, 245–615 TMD), Leptotyphlopidae (14–16 MSR, 155–545 TMD), Gerrhopilidae (16–26 MSR, 190–720 TMD), Xenotyphlopidae (20–22 MSR, 475–545 TMD), and Typhlopidae (16–44 MSR, 195–835 TMD). The total length divided by midbody diameter gives an important length/width ratio: Anomalepididae (20–85), Leptotyphlopidae (15–195), Gerrhopilidae (20–80), Xenotyphlopidae (60–85), and Typhlopidae (15–150) (PYRON & WALLACH, 2014).

IDENTIFICATION

Although *Indotyphlops braminus* resembles other scolecophidians, it has several unique features that can be used to positively identify it and other characters that, taken in combination, can also provide a positive identification. First off, if this exotic species is found in a region that has no other scolecophidians or typhlopids, you can be certain that it is *I. braminus*.

Secondly, the condition of the nasal sutures can separate *I. braminus* from all but five scolecophidian species. In *I. braminus* the inferior or infranasal suture (INS) from the nostril (N) curves downward and contacts the preocular (PO), rather than the first or

Table 2						
Character	*braminus* (*n*=13)	*lankaensis*	*malcolmi*	*pammeces* (*n*=2)	*tenebrarum* (*n*=2)	*violaceus*
SPT	14.0 (11.4-21.2)	15.9	13.7	11.2 (11.0-11.3)	13.3 (11.7-14.9)	17.5
HMP	31.3(28.8-36.4)	31.3	31.9	27.9 (27.4-28.3)	32.0 (30.7-33.3)	34.1
SHI	33.7 (31.4-39.4)	34.4	34.4	30.0 (29.6-30.4)	34.1 (32.3-35.9)	36.5
RL	25.0 (18.6-32.3)	17.4	22.1	21.8 (16.1-27.4)	24.9 (24.1-25.6)	20.6
RLMP	48.7 (41.6-54.7)	43.1	50.0	42.8 (40.7-44.8)	48.0 (47.7-48.2)	48.4
RLS	10.3 (7-13)	?	?	21	18.5 (17-20)	1
LGBG	9.5 (-1.4-16.2)	4.1	9.2	12.1 (9.6-14.5)	7.0 (4.39.7)	20.6
GBMP	71.6 (58.8-84.1)	56.9	70.8	66.4 (59.1-73.6)	68.1 (65.2-71.0)	79.8
RAMP	81.8 (75.4-87.7)	?	82.6	82.2 (77.8-86.6)	85.3 (83.3-87.2)	?
TK	8.2 (6.2-9.7)	18.4	8.4	8.1 (6.2-10.0)	8.7 (8.2-9.2)	6.4
RKMP	90.5 (88.0-93.8)	82.3	89.9	86.3 (83.0-89.6)	89.6 (87.8-91.3)	87.7
KVG	4.4 (2.3-65.)	5.6	5.0	8.2 6.0-10.4)	5.0 (2.6-7.4)	6.3
KVI	11.6 (8.5-14.4)	22.1	12.2	15.8 (11.9-19.6)	12.5 (10.8-14.2)	13.5
RC	4.0 (2.4-7.4)	3.6	5.0	3.9 (3.8-3.9)	3.2 (2.8-3.6)	3.2
RCVI	10.7 (7.0-14.3)	12.8	11.8	13.6 (10.7-16.5)	10.0 (9.7-10.3)	9.5
T	31.9 (25.2-38.6)	33.3	33.6	28.9 (28.6-29.1)	33.3 (31.2-35.4)	35.7
NTR	68.4 (52.8-86.8)	58.5	61.1	71.8 (68.9-74.8)	74.2 (73.1-75.2)	63.0
TLgMP	19.0 (17.0-23.5)	21.8	21.4	19.0(18.9-19.1)	20.4 (19.7-21.0)	24.2
TLgF	20.3 (17-24)	16	21	24.5 (24-25)	22.5 (22-23)	15
RLg	17.6 (8.1-28.5)	10.8	12.2	11.0 (8.7-13.2)	15.1 (11.3-18.8)	14.3
PT	51.3 (40.1-59.9)	45.1	46.6	41.0 (39.1-42.8)	49.2 (47.2-51.1)	50.8
HL CL	17.4 (11.8-25.2)	11.8	18.1	14.9 (12.4-17.4)	16.0 (14.4-17.5)	14.3
LK CL	42.6 (35.3-50.7)	42.8	41.4	45.3 (44.4-46.3)	43.2 (40.9-45.4)	41.3
TL CL	30.9 (25.3-38.4)	25.4	32.4	27.2 (24.8-29.5)	30.5 (29.5-31.5)	29.7
HRLg CL	11.1 (6.3-16.8)	8.4	8.6	7.7 (6.5-8.8)	9.6 (8.2-11.0)	9.6
HK CL	60.0 (53.4-65.1)	54.6	59.5	60.2 (56.8-63.7)	59.1 (58.4-59.8)	55.6
TBGB CL	50.8 (34.0-71.2)	36.4	48.7	46.7 (39.8-53.6)	45.8 (42.3-49.2)	56.4
HRG CL	45.7 (35.2-54.6)	39.2	48.1	50.6 (44.3-56.9)	50.8	48.0

Table 2. Visceral characters of the *I. pammeces* group (values as % SVL) .
GBMP = gall bladder midpoint, HMP =heart midpoint, KVG = kidney-vent gap, KVI = kidney-vent interval, LGBG = liver-gall bladder gap, NTR = number of tracheal rings/10% SVL, PT = posterior tip of right lung, RAMP = right adrenal midpoint, RC = rectal caecum length, RCVI = rectal caecum-vent interval, RKMP = right kidney midpoint, RL = right liver length, RLg = right lung length, RLMP = right liver midpoint, RLS = right liver segments, SHI = snout-heart interval, SPT = sternohyoideus posterior tips, T = trachea length, TK = total kidney (left + right) length, TLgMP = tracheal lung midpoint, TLgF = tracheal lung foramina, HL CL = heart-liver, LK CL = liver-kidney, TL CL = tracheal-liver, HRLg CL = heart-right lung, HK CL = heart-kidney, TBGB CL = trachea/bronchus-gall bladder, HRG CL = heart-right gonad.

second supralabial (SL1 or SL2) as in most other typhlopids, whereas the superior or supranasal suture (SNS) extends upwards and backwards onto the top of the snout and makes contact with the rostral (R) to completely divide the nasal shield (rather than not extending onto dorsum of snout and not contacting the rostral as in most other typhlopids) (Fig. 1). The supranasal suture extends onto the dorsum of the snout and contacts the rostral in only three other species (*Anilios erycinus* of New Guinea, *A. ganei* and *A. ligatus* of western Australia) and the infranasal suture contacts the preocular in only two other species (*Indotyphlops lankaensis* and *I. violaceus* of Sri Lanka).

Among these five problematic species, they differ from *Indotyphlops braminus* in having the following distinctions: *Anilios erycinus* of New Guinea has the INS contacting SL1 (vs. PO), more postoculars (2 vs. 1), a narrower rostral (0.15 vs. 0.30–0.40 head width), and is larger in size (LOA > 230 mm vs. < 200 mm); *A. ganei* of Australia has the INS in contact with SL2 (vs. PO), SNS invisible dorsally (vs. visible), more scale rows (24 vs.

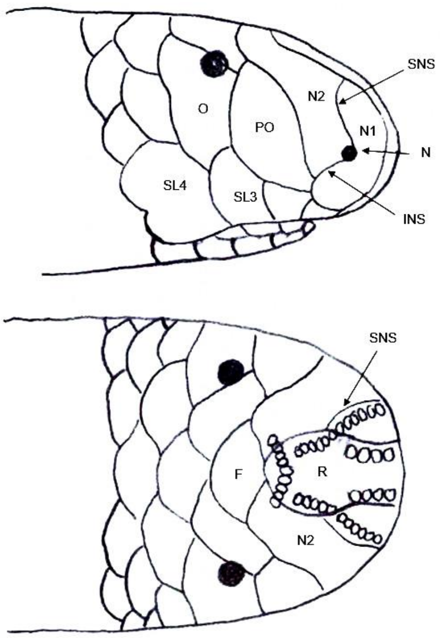

Figure 1: Lateral and dorsal view head *Indotyphlops braminus.*
F = frontal shield, INS = inferior nasal suture, N_1 = prenasal or anterior nasal shield, N_2 = postnasal or posterior nasal shield, O = ocular shield, PO = preocular shield, R = rostral shield, SL = supralabial shield, SNS = superior nasal suture.

20), more middorsals (> 440 vs. < 310), and a larger body size (> 235 mm vs. < 200 mm); *A. micromma* of Australia has the INS contacting SL 2 (vs. PO), fewer scale rows (18 vs. 20), more middorsals (493 vs. < 370), more postoculars (3 vs. 1), and a broader rostral (0.5 vs. 0.3–0.4 head width); *I. lankaensis* of Sri Lanka has the SNS invisible dorsally (vs. visible), fewer middorsals (< 261 vs. > 261), and a thicker body (L/W < 35 vs. > 30); *I. violaceus* of Sri Lanka has the SNS invisible dorsally (vs. visible). With the exceptions just noted for the above five species, the nasal suture condition of *I. braminus* will differentiate it from all of the other 475 scolecophidian species.

Thirdly, the head of *I. braminus* exhibits prominent and distinct subcutaneous sebaceous glands arranged in rows beneath each head shield (also present in the *I. pammeces* species group). These gland lines run parallel to and along the margins of the anterior head shields. A unique situation involves the gland lines of the prenasal or anterior nasal (N1) shield and the median rostral (R) shield. As the gland line on the lower or anterior rostral (ARL) ascends towards the top of the snout it is interrupted by the supranasal gland line (SNL) on the prenasal (N_1) shield, which is confluent with the gland line along the posterior rostral (PRL). A close inspection of the head will clearly reveal this condition and it is unique among all scolecophidians. This one feature will positively identify *I. braminus.* Another unusual gland line feature, also visible without the aid of a microscope, is that the posterior rostral (R) and supranasal (N_2) shields have a bow-like gland line (CGL) that is convex rather than concave and parallel to the posterior rostral border. This unique feature on the top of the head just anterior to the level of the eyes is distinct and easily visible. These two features, 1) a continuous line of whitish glands extending along the nasal suture (SNL) and posterior rostral (PRL), and 2) a convexly curved gland line (CGL) across the posterior rostral (R) and supranasal (N_2) shields, will positively identify *I. braminus* in an examination or photographs (figs. 1–2).

Indotyphlops braminus from Tenerife, Santa Cruz de Tenerife, Canary Isles, Spain, Botanical Garden El Palmetum, alt. 35m., March 21, 2019.

Photo: Philippe Geniez

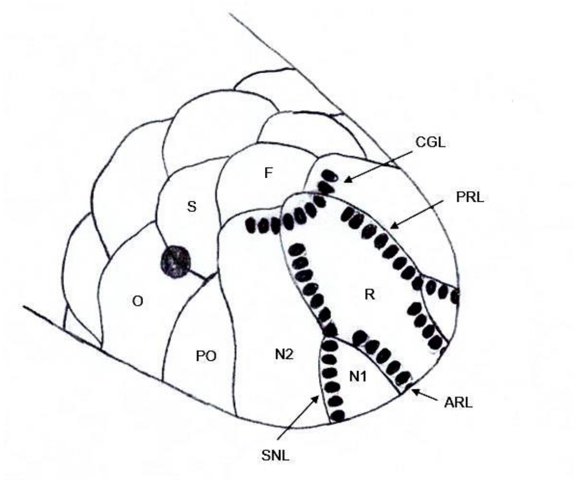

Figure 2: Fronto-dorsal view head *Indotyphlops braminus*.
ARL = anterior rostral gland line, CGL = convex gland line, F = frontal shield, N_1 = prenasal or anterior nasal shield, N_2 = postnasal or posterior nasal shield, O = ocular shield, PO = preocular shield, PRL = posterior rostral gland line, R = rostral shield, S = supraocular shield, SNL = supranasal gland line.

Fourthly, in spite of the fact that the colour in *I. braminus* ranges from jet black through all shades of brown to tan and pink, it has a lighter colored snout with a white chin, cloacal region, and tail tip.

The Gerrhopilidae (solely *Gerrhopilus*) from Southeast Asia and the East Indies differ from *I. braminus* in the SIP (T-II or T-V vs. T-III) (WALLACH, 1993), showing conspicuous cephalic glands (under center of shields vs. along sutures), subocular shield (usually present vs. absent), and INS in contact with

Indotyphlops braminus from Tenerife, Santa Cruz de Tenerife, Canary Isles, Spain, Botanical Garden El Palmetum, alt. 35m., March 21, 2019.

Photo: Philippe Geniez

SL2/3 (except *G. tindalli* with PO contact as in *braminus* but differing also with only 18 scale rows).

The Xenotyphlopidae (solely *Xenotyphlops grandidieri*) of Madagascar can be separated from *I. braminus* by middorsals (> 475 vs. < 370), rostral (> 0.75 vs. < 0.4 head width), INS contact (SL2 vs. PO), postoculars (2–3 vs. 1), SIP (T-0 vs. T-III), length/width ratio (60–85 vs. 30–60), and scale pigmentation (pink vs. brown/black).

The Leptotyphlopidae of Africa and the Americas can easily be distinguished from *I. braminus* by scale rows (14, rarely 16 vs. 20), eye (large distinct eye vs. small faint spot), ocular shield (forming border of upper lip vs. separated from upper lip by supralabials), cloacal shields (single large shield vs. multiple scales), tail length (2.1–20.0% vs. 1.5–3.5% LOA), and tail termination (rounded with minute spine vs. conical with large spine).

Indotyphlops braminus from Tenerife, Santa Cruz de Tenerife, Canary Isles, Spain, Botanical Garden El Palmetum, alt. 35m., March 21, 2019.

Photo: Philippe Geniez

The Anomalepididae mainly inhabit South America with only three species (each in a different genus) entering Central America. *Anomalepis mexicanus* from Honduras to Panama differs from *I. braminus* in having three enlarged dorsal head shields (two prefrontals and one frontal). *Helminthophis frontalis* from Costa Rica differs from *I. braminus* in midbody scale rows (22 vs. 20), middorsals (> 575 vs. < 370), and SIP (A-VI vs. T-III). *Liotyphlops albirostris* from Panama is separable from *I. braminus* by middorsals (367–520 vs. 261–368), rostral width (0.5–0.6 vs. 0.3–0.4 head width), and SIP (A-VI vs. T-III).

DISTRIBUTION

Our knowledge of the geographic distribution of *I. braminus* was limited to fewer than 40 countries in the 19th Century (1803–1900) but the 20th Century (1900–1999) saw that number double to 81 and in just the past 20 years (2000–2020) it has been found in another 40 countries for a current total of 118 countries or island entities (Wallach, 2020). It occurs on more than 540 islands worldwide and ranges in elevation from sea level to more than 3000 m.

BIOLOGY

The coloration is usually some shade of brown or black with the snout and venter being a slightly lighter shade. The chin, cloaca region, and tail tip are white. In desert regions the colour is generally lighter, from tan to pink. The tongue is white.

They are not often seen on the surface in the daytime except after rains or floods, when they come up to breathe air. They are normally found when digging in the garden, raking leaves, excavating earth, or turning stones. This snake may be mistaken for an earthworm upon superficial inspection. However, a closer examination will easily determine that it is a snake as it is covered with shiny, hard scales, lacks segmentation, has a forked tongue, a pair of dark eyespots, wiggles rapidly like a snake on smooth surfaces (like the bathroom floor where it is frequently found), and disappears into loose soil very quickly.

Indotyphlops braminus, from Hooliongapar Gibbon Sanctuary, Assam State, NE India, 130 m., 15 March 2009.

Photo: Indraneil Das

They all superficially resemble one another in comparison with other snakes and are fossorial or subterranean, active nocturnally, and feed exclusively upon ants and termites, preferably their eggs, nymphs, pupae, and larvae. Females lay an average of 3 eggs (range = 1–8) throughout the year in tropical regions (at least three times/year in the Seychelles) and only once every year or every other year in colder climates or higher elevations (NUSSBAUM, 1980; OTA et al., 1991).

DOCUMENTATION

The reason why it is important to document every observation, photograph, or collection of *I. braminus* is that it is the one and only snake species that is parthenogenetic. Out of 3600 known snake species only *I. braminus* is an obligate parthenogen, a unisexual, all-female species with a triple complement of chromosomes that can only reproduce by cloning itself (WYNN et al., 1987). Therefore, every single female *I. braminus* has the potential to found a new colony, and when someone finds a specimen it is most likely already established as a resident. Often the *I. braminus* that are discovered in and around homes are juveniles, which mean that the adult is alive and reproducing itself already. Only if you caught the first importation of the species (and it was the only individual involved) could you be certain that you prevented its establishment in your location.

I urge every person, whether a layman or professional herpetologist, to document in some form or another every known occurrence of *I. braminus* that he/she encounters. Because of its secretive, nocturnal, and fossorial nature, it is normally difficult to find, and when it does appear it is by happenstance or some fluke incident. *Indotyphlops braminus* most assuredly occurs in numerous areas (some countries, islands, and other regions) of which we yet have no knowledge.

TAXONOMY

In addition to its triploid, parthenogenetic nature, which is unique among snakes, the unusual position of *Indotyphlops braminus* is indicated by the following characters, which are rare among typhlopids:
1) presence of paired parietals (HAAS, 1930; MOOKERJEE & DAS,1932; MAHENDRA, 1936),
2) presence of a weak neural ridge on the axis (LIST, 1958),
3) lack of participation of the basioccipital in the occipital condyle, a condition also known only in *R. flaviventer* (LIST, 1966; GREER, 1997),
4) single median ventral foramen in vertebrae (MAHENDRA, 1935, 1936; LIST, 1966),
5) marrow spaces lacking within walls of vertebra except for a synapophysial marrow space (SOOD, 1948),
6) at least ventrally, point contact of the diamond-shaped ventral scales with their neighbors; the cycloid scales of other typhlopids have rounded margins that broadley overlap their neighbours (STORR, 1981),
7) fourth supralabial larger than size of other three supralabials combined and presenting a caudal notch (fig. 1), indicating presumed fusion of fourth supralabial with adjacent scale(s)—at least a postocular and costal scale (WALLACH, pers. obs.),
8) disposition of the cutaneous glands beneath the head shields, which are confined to the sutures between the shields along the

Indotyphlops braminus from Tenerife, Santa Cruz de Tenerife, Canary Isles, Spain, Botanical Garden El Palmetum, alt. 35m., March 21, 2019.

Photo: Philippe Geniez

anterior borders of each scale (figs. 1–2, Taylor, 1962; McDowell, 1974),
9) extension of supranasal suture dorsally and posteriorly onto dorsum of snout to contact rostral - as in members of the *I. pammeces* species group and *Anilios erycinus, A. gabei* and *A. micromma* (figs. 1–2, McDowell, 1974; Storr et al., 2002),
10) confluence of supranasal gland line with the caudal portion of the rostral line on top of the head, rather than with the cranial portion of the rostral line (figs. 1–2, McDowell, 1974),
11) infranasal suture in contact with preocular rather than a supralabial, and containing a small gland that is not a striated pit (fig. 1, McDowell, 1974),
12) more than 1100 cephalic sense organs with sunk-in papillae in epidermis of the head (Aota, 1940; Landmann, 1976),
13) dermal melanophores beneath epidermis but no epidermal melanophores present (Mori, 1989),
14) external nostril with a nearly circular shape with horizontal and transverse nasal passage (fig. 1), other Typhlopidae (except *Gerrhopilus ater* species group) having the nostril elongated and nasal passage oblique (McDowell, 1974; Wallach, pers. obs.),
15) small gland in the sulcus immediately behind the eye and above the temporalis anterior muscle (Fraser, 1937),
16) tongue with a pair of long, pointed lateral tongue papillae near its bifurcation (McDowell, 1974),
17) multicameral tracheal lung with avascular air cells (also present in *I. pammeces* species group) (Wallach, 1998),
18) unicameral right lung (Wallach, 1998),
19) large pedunculate rectal caecum (McDowell, 1974), and
20) karyotype = triploid chromosome set with 3n=42, NF=78, 21 macrochromosomes + 21 microchrosomes (Wynn et al., 1987; Matsubara et al., 2019).

The parthenogenetic nature alone of *I. braminus* warrants recognition of this species as a new genus that is separate from its most closely related snakes of the *Indotyphlops pammeces* species group (Wallach & Pauwels, 2004). Since it forms a terminal taxon within the *Indotyphlops* clade (Hedges et al., 2014; Figueroa et al., 2016), I propose that it be placed in a new genus as below.

Reptilia Laurenti, 1768: 19
Serpentes Linnaeus, 1758: 214
Scolecophidia Duméril & Bibron, 1844: 71
Typhlopidae Merrem, 1820: 10
Asiatyphlopinae Hedges et al., 2014: 31-32
Asiatyphlopini tribe nov.

Virgotyphlops gen. nov.

Type species: *Eryx braminus* Daudin, 1803: 279.
Content: *Virgotyphlops braminus* (Daudin, 1803) by monotypy.
Etymology: derived from the Greek *virgo*, meaning virgin birth, and *typhlops*, meaning blind.

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SUMMARY

Indotyphlops braminus, the flowerpot snake, is rapidly expanding its range around the world via introduction by way of the commercial plant trade. It can readily be recognized from other scolecophidians (blindsnakes and wormsnakes) merely from a photograph. Through various social media platforms the spread of this invasive serpent can be tracked in real time. Several key characters are discussed by which the species can be identified with certainty. As the sole obligate parthenogenetic snake in existence, and a terminal member/taxon of the *Indotyphlops albifrons-pammeces* clade, a new genus is established to recognize its condition.

SAMENVATTING

Indotyphlops braminus, de Bloempotslang, is aan een snelle uitbreiding van haar verspreidingsgebied bezig. Dat geschiedt voornamelijk door de internationale commerciële handel in opgepotte tuin- en kamerplanten. De soort is gemakkelijk van andere Scolecophidia (Worm- en Draadslangen) te onderscheiden, zelfs al vanaf een foto (denk hierbij aan sociale media). Twintig in de tekst opgesomde kenmerken geven definitief uitsluitsel. Experts kunnen dan de nieuwere verspreiding ongeveer op de voet volgen. Deze soort is de enige parthenogenetische slang die we kennen. Daarom wordt in dit artikel een nieuw eindtaxon benoemd in het *Indotyphlops albifrons-pammeces* cladon (groep): *Virgotyphlops* gen. nov.

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Peyrieras Reptile Reserve, Madagascar

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All photos by the author.

The Perinet Chameleon (*Calumma gastrotaenia*), seen at night near Andasibe.

INTRODUCTION

The island of Madagascar is considered a global biodiversity hotspot because of its high levels of endemism and the significant threats to its species and habitats (Brooks et al., 2002). Madagascar has approximately 70 species of endemic chameleons and they occupy a wide range of vegetation types and altitudes. Members of the genus *Calumma* are found in humid forest from sea level to at least 2,800 m, while the genus *Furcifer* occupies a similar altitudinal range but occurs in many types of forest vegetation in addition to heathland and urban areas. The dwarf chameleons, *Brookesia*, are associated with forest vegetation, occurring in both humid and deciduous formations from sea level to elevations of up to 1,875 m (Glaw & Vences, 2007). A number of chameleon species are only known from a single locality or occupy small areas of suitable habitat.

In June and July 2018 I made a touristic roundtrip in Madagascar, not exactly meant as a herpetological expedition, but with a constant open eye for the nature of the island. This way of traveling turned out to be not the optimal formula to see animals in the wild. Especially chameleons, with their cryptic behaviour and scattered distribution could hardly be observed. A few searches, executed at night, resulted in some observations. Daytime views were extremely rare. Fortunately a reptile reserve made it possible to see a number of different chameleons by daylight, showing their full spectrum of colours and shapes. This short communication is about that reserve and the animals, primarily the chameleons shown there.

PEYRIERAS REPTILE RESERVE

(information provided by the staff).

The Peyrieras Reptile Reserve or Madagascar Exotic (also known as the Peyrieras Butterfly Farm, Peyrieras Nature Farm and Mandraka Reptile Farm) is a small privately run reserve situated at Marozevo, on National Road N2, 75 km east of Antananarivo, between the towns of Manjakandriana and Moramanga.

It was founded and owned by the French entomologist and naturalist André Peyriéras (1927-2018) with the aim of breeding chameleons and release them in their natural habitats. Later his daughter Sylviane took over the ownership of the reserve. He discovered over 3,000 new insects. Peyriéras's dwarf chameleon (*Brookesia peyrierasi*), Peyriéras's chameleon (*Calumma peyrierasi*), and Peyriéras's woolly lemur (*Avahi peyrierasi*) are all named after him.

The collection includes many reptiles (chameleons, iguanas, geckos, crocodiles), 'batraciens' (amphibians) and 'papillons' (butterflies). The adjacent forest area supports families of relocated and habituated Verreaux's Sifaka (*Propithecus verreauxi*) and common Brown Lemur (*Eulemur fulvus*) which provide opportunities to photograph them close up at feeding times. A group of Coquerel's Sifaka (*Propithecus coquereli*) return daily to be fed and to aid photography by the tourists.

THE VISIT

National road N2 is the most important and virtually the only road leading from the capital Antananarivo to the country’s main port Toamasina (Tamatave). Literally everything, from men to goods, including oil products is being transported over this road. In addition, the relative numerous tourists traveling to the popular Andasibe-Mantadia National Park and adjacent parks have to take this road.

Although basically paved, the two lane road is often locally in a very bad condition. In addition steep climbs (over altitudes as high as 2,000 m), descents and sharp curves have to be mastered. Because of these conditions transport is difficult and time consuming. Therefore the reserve is a very welcome stopover, roughly half-way coast and capital.

The reserve is situated on a large and spacious area in a gently sloping environment. Most of the reptiles and other species are held within several large caged buildings and greenhouses, which tourists may enter when accompanied by a guide. Here they breed many of Madagascar's rare and endangered reptiles, frogs and insects.

Enclosures of various shapes and sizes.

After the simple entrance and reception building an open area is situated, consisting of a small lake in a grass environment, fenced with brick walls. A couple of Nile Crocodiles (*Crocodylus niloticus*) are housed there. The largest cage (ca. 60x20x3 m) is located in a more overgrown area. On top of low brick walls rough-mesh screens, attached to wooden poles are fastened. The housing is exposed to natural conditions of sunshine, rain and wind. Dense vegetation provide plenty of shade and shelter. In that cage some 60 chameleons are housed comprising about eight species of larger chameleons like *Furcifer oustaleti*, *F. pardalis* and *Calumma parsonii.* On first impression the housing seems to be rather overcrowded, at least according to the general vivarium practice. Nevertheless no obvious disorders could be observed during the relative short visit. Animal behaviour looked normal. No stress reaction, discoloration or other deviant reactions could be seen. On top of that the animals all looked healthy without any sign of malnutrition, deficiencies or scars or wounds. In addition both sexes of the same species were living next to each other without obvious discomfort. A large number of Panther Chameleons (*F. pardalis*) in various colour variations were active without any negative reaction towards each other nor towards the visitors, remarkable since the species is said to have a very intolerant character (McGeough, 2016). The obligate grasshopper hunting for the public was executed by several species. According to the accompanying guide most species breed without any problem under these conditions.

Similarly constructed smaller cages house other animals, including iguanas (*Oplurus* specs.), in hibernation during the visit, geckos and other lizards. Other cages house several other reptiles, frogs, fruit bats and tenrecs.

In some of those smaller enclosures even smaller cages are placed (with screen walls of adapted mesh size). In those housings the smallest chameleons are housed as well as small geckos and insects. Several of these animals could be taken out for photographic purposes without causing any apparent stress to the animals. It is really impressive to see miniature species like *F. wilsii, F. lateralis, C. gallus, C. malthe* and many others in just a one hour visit, not to speak of all the other animals that are extremely hard to find in nature. In total some 20 different species of chameleons were housed in the Reserve at the time of the visit. The small picture book included here shows just a few of the species.

Colour variants of *Furcifer pardalis.*

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Calumma parsoni, female left, male right.

Calumma gallus, male left, female right.

Furcifer lateralis.

Keeping and breeding the Two-fingered skink *Chalcides mauritanicus* (DUMÉRIL & BIBRON, 1839), and the first proof of its viviparity

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INTRODUCTION

Chalcides mauritanicus is one of the smallest and least known species within the genus *Chalcides*. It is a fossorial skink, but genetically CARRANZA et al. (2008) put *C. mauritanicus* basal in the clade of grass-swimming *Chalcides* (including for example *Chalcides chalcides*, *Chalcides minutus* and *Chalcides guentheri*; rather than with the semi-fossorial *Chalcides mionecton*). It separated from the rest of this group 9.9 million years ago and evolved into a sand swimming species, much like *C. mionecton*. This species has received little attention through the years and even now relatively little is known about its distribution, ecology, life history, population densities etc. (see BOGAERTS, 2013).

C. mauritanicus has rarely, if ever, been kept in captivity, and after raising this species for almost ten years, it is concluded not to be a suitable form for captivity. Do not read this paper as a recommendation to keep this species. However, the knowledge collected from these captive specimens adds important new data on this species.

TAXONOMY

Chalcides mauritanicus was initially described as *Heteromeles mauritanicus*. *Heteromeles* was established as a new genus for this species by DUMÉRIL & BIBRON (1839) because of the absence of several fingers and toes. However, they already wrote that its morphology resembles that of 'Seps chalcide' (now *Chalcides chalcides*). The first specimen was delivered to them by lieutenant-colonel Levaillant and came from Algeria. No exact locality is given but according to PASTEUR & BONS (1960) it should be Oran as

Greyish adult specimen of *Chalcides mauritanicus*.

stated in Boulenger (1891). The latter author included the skink in the genus *Chalcides*. Later Pasteur & Bons (1960) revived *Heteromeles* as a subgenus. Pasteur (1981) again placed it in *Chalcides*, a taxonomic choice followed by most authors to the present day, certainly after the work of Carranza et al. (2008).

DESCRIPTION

Chalcides mauritanicus is an elongated and small-sized skink with strongly reduced limbs. Caputo et al. (1995) gave measurements for ten adult specimen with mean snout-vent length ranging from 54.7-71.8 mm. Martín et al (2015) measured snout-vent lengths of 64-74 mm for males and 70-83 mm for females. Tail lengths range from 54 mm for males to 64-74 mm for females. My heaviest animal (probably the female) weighed 3.6 g but lost its tail during the weighing. I weighed the tail separately and it weighed 1.2 g so the tail made up 33% of the total body weight. My animals are heavier than cited by Martín et al. (2015) or Caputo et al. (1995). However, the lengths of my animals fall within the range of these publications. My largest animal measured 155 mm in total length (Table 1).

Newly born juvenile of *Chalcides mauritanicus*.

narrower body than *C. mionecton*, which fits to its more fossorial life.
Often there is a darker stripe visible along the mid-dorsal, especially in adults. Lateral sides are darker and the ventral side is grey. The tail is a lighter, grey-white colour with dark stripes and barely discernible ocelli. There are no ocelli on the body. In juveniles the tail is bright red until they are 7-8 months old (Doumergue, 1901). I can confirm that the tail is bright orange-red for the last two-thirds of the tail. This colouration fades within a year, starting at the dorsal side of the tail. Meanwhile the striped pattern slowly develops from the base of the tail. The tail retains a lighter colour in contrast to the darker body.

Skink	Date	Snout-vent (mm)	Tail length (mm)	Total length (mm)	Weight (g)	Remark
Adult 1	July 25, 2014	80	75	155	3.6	complete tail
Adult 2	July 25, 2014	79	72	151	3.1	complete tail
Adult 3	July 25, 2014	69	36	125	2.2	regenerated tail
Adult 4	July 25, 2014	75	54	129	2.9	regenerated tail
Adult 5	July 25, 2014	78	43	121	3.0	regenerated tail

Table 1: Measurements and weight of adult *Chalcides mauritanicus*.

Boulenger (1891) stated: "Snout conical, slightly projecting; ear opening minute, hardly distinguishable; nostril entirely in advance of the suture between the rostral and the first labial; fourth upper labial entering the orbit; supranasals distinct. Body much elongated. 18 scales round the body. Limbs very short; the anterior didactyle, the posterior tridactyle; third toe nearly twice as long as second; the hind limb equals the length of the head, and the fore limb the distance between the end of the snout and the posterior border of the eye. Yellowish or greyish above, with a lateral band formed of closely-set large black dots". In Caputo et al. (1995) was concluded that *C. mauritanicus* has an even longer and

DISTRIBUTION

At first this skink was only known from the littoral / coastal area of northwestern Algeria (Doumergue, 1901). Werner (1929) was said to have obtained a specimen from a locality called Le Kreider (now El Kheiter), Algeria, which has never been reconfirmed as it is far south from the coast. It was not known from Morocco until recently. Even in 1981 Pasteur only knew it from the coastal districts of Oran and Algiers provinces of Algeria, although Pasteur & Bons (1960) claim its presence as highly probable in the north-east in their overview of the reptiles of Morocco.

The first authors to confirm its presence in Morocco are Mellado et al. (1987) for 2 km east of Ras El Ma (southeast of Melilla). In Mateo et al. (1995) four localities are mentioned: one for Algeria, about 25 km from the Moroccan border (between Algiers and Ghazouat: Doumergue, 1901), and three for Morocco: Ras el Ma, Melilla and Beni Enzar. The skink was already considered extinct for Melilla (Mateo et al., 2009). It is known to exist in the following protected areas: mouth of the Moulouya river and Sebkha Bou Areg (Mateo et al., 2009). Bons & Geniez (1996) suspected it also lived in sandy areas west of Melilla, but so far it has not been found there. It is mainly a coastal, lowland species that is known up to at least 140 m above sea level (Mateo et al., 2009).

Recently the skink has been found on the Chafarinas islands (Martín et al., 2015). A distribution map can be found on the red list website (see Mateo et al., 2009).

ACTIVITY

The activity period of the species starts at the earliest in March when Martín et al. (2015) did their survey. My observations were done in April 2009 and April 2013. Searches in December 2012 in the same habitats yielded no skinks, which indicates that they probably hibernate during that period (other *Chalcides* species were also not found active in December). The activity probably stops somewhere in September, perhaps depending on the weather.

Doumergue (1901) described this species as extremely difficult to catch, often leaving you with only the fragile tail in your hands. This ease of tail loss is also true in captivity. When cleaning out the tank my skinks nervously move their tails when caught and it falls off very easily. Martín et al. (2015) described that 85.2 % of all adults in their study had a regenerated tail.

HABITAT

Doumergue (1901) described finding this skink under stones in the sandy (dune) areas along the coast of Oran. Mellado et al. (1987) described the habitat two km east of Ras el Ma in the coastal zone behind the dunes where exotic trees are planted like *Eucalyptus*, along with *Acacia* and *Retema*. Martín et al. (2015) mentioned that the skinks on the Chafarinas are restricted to small sandy microhabitats of Congreso Island, far from the seashore. These microhabitats were characterised by a high percentage of sandy soil without vegetation and medium sized rocks (20-60 cm), also showing a cover of leaf litter and grass. Subarboreal vegetation was also sparser at the sites occupied by skinks, with a significantly lower cover of *Salsola* bushes than its average availability. Soils occupied by skinks had a higher proportion of sand, and a lower proportion of gravel, silt and clay. Mateo et al. (1995) reported finding them by turning over dead wood, cardboard boxes, and stones very near to the sea.

I found *C. mauritanicus* only in dry sandy soils, which are a part of (the former) dunes west of the centre of Saïdia at three localities, and at one locality near Ras el Ma. They were found only by turning over rubbish like old clothes, cardboard, plastic etc. The soils were not disturbed by human digging activities. Skinks were never seen active out of their hiding place, confirming what was found by Martín et al. (2015) who in their survey never found *C. mauritanicus* above the soil surface.

The first locality was an isolated area within a building area west of Saïdia (roughly N35°05'28" W2°15'11"). It is a last remaining part of a dune area that has not yet been built up with houses, but it surely is now surrounded by newly built houses. The locality is situated about 350 meters south of the coastline. Skinks were found in the small sand dunes that were already well covered with vegetation. Five animals were seen on April 12, 2009. They were warming up under pieces of garbage (cardboard, clothes and so on) and not under plastic or stones. Other herps found there were: *Discoglossus pictus*, *Chalcides parallelus, Tarentola mauritanica, Trogonophis wiegmanni, Acanthodactylus boskianus* and *Testudo graeca.*

A second location about 900 meters west of the first was explored on April 13, 2013 (N35°05'44" W2°15'39"). This was in the dunes about 100 m from the seashore and apparently, looking at the waste, parts of it were sometimes flooded by the sea. It was along a path used for people to reach the beach. Here there was more rubbish to turn over; we saw four individuals. Other species found were *Chalcides parallelus* and *Macroprotodon abubakeri.*

Locality 1: habitat west of Saïdia.

The third locality was about 500 m inland from the seashore, also in an isolated former dune area. It was searched on April 16, 2009 (N35°05'37" W2°15'11"). It was difficult to find *Chalcides mauritanicus* because there was much less trash to turn over; only two specimens were seen. Other species observed were *Agama impalearis*, *Psammodromus algirus*, *Chalcides parallelus, Tarentola mauritanica, Acanthodactylus boskianus, Testudo graeca* and *Macroprotodon* sp.

The fourth locality where *C. mauritanicus* was found is west of the Moulouya river in the dunes of Ras el Ma. This is a nature reserve with well vegetated dunes with *Retema* bushes and *Acacia* trees. It is very difficult to find skinks here as there is little trash or wood or stones to turn over. Only one individual was found on April 8, 2013 under a piece of wood (N35°07'56" W2°23'50"). Besides that, *Chamaeleo chamaeleon*, *Psammodromus algirus*, *Chalcides parallelus, Tarentola mauritanica, Acanthodactylus boskianus, Testudo graeca,* and *Macroprotodon* sp. were also found.

As *Macroprotodon* was seen in almost all localities, it is most likely that this snake is a main predator of *C. mauritanicus*.

Diet samples were obtained by collecting faeces of live skinks.

TERRARIUM

Because very little is known about the breeding ecology or behaviour of *C. mauritanicus,* I considered it opportune and scientifically re-

Locality 2: habitat in dunes west of Saïdia.

levant to take three animals from the first locality in 2009 to study their behaviour in captivity. However, they never bred and one died during hibernation in 2011. I presume this occurred because they were all of the same sex. In April 2013 it was very difficult to find animals at locality 1, which had been further destroyed. I succeeded in collecting three new animals to add to the group of two that remained in my care. As this habitat is being destroyed, these captive skinks are serving a scientific purpose. Any animals that die will be deposited in a natural history museum.

The animals were kept together as a group in a small terrarium (50x40x20 cm, lxwxh) since April 2009. Fine sand of 4-5 cm in height was used as substrate. Some flat stones and pieces of bark served as hiding places. A small water bowl was always present. Water was refreshed every week. The soil was cleaned every few weeks with a sieve to remove dead food items and faeces. Once a year half of the soil was completely refreshed. A heating mat under the terrarium and two 12W halogen light bulbs were producing heat, light and some UV. Throughout the year the lighting and temperatures vary slightly. In winter the temperatures drop permanently to around 10°C for about two months when all heating and lights are switched off. The rest of the year temperatures within the terrarium vary from 15°C to 35°C (under the spots when the heating mat is on).

It is very hard to tell the sexes apart. Martín et al. (2015) determined the gender of adult skinks by examining the cloaca and carefully everting the hemipenis of males. I never tried this as I was too afraid that the manipulation would make the skinks lose their tails. I could not determine the sexes very easily, but suspected that I started out with three males, and more recently probably added two more males and one female.

The skinks were mainly fed with larvae of *Alphitobius laevigatus* (Tenebrionidae beetles) and juvenile crickets (*Gryllus assimilis*). All food items were dusted with Calcium and D_3 (ReptiCalcium by ZooMed with D_3 22,907 IE/g), and gut loaded with a mixture of carrot and dry dog food. Martín et al. (2015) found Formicidae (ants) and Coleoptera (beetles) the most abundant food items during spring (84.1% of all invertebrates eaten).

BEHAVIOUR

Martín et al. (2015) never observed a skink above the soil surface. After 10 years of keeping them, I must conclude that one rarely sees them above the sand. These skinks

Adult *Chalcides mauritanicus.*

Skink	Date	Snout-vent (mm)	Tail length (mm)	Total length (mm)	Weight (g)
Juvenile 1	August 10, 2013	37	32	69	0,2
Juvenile 2	August 10, 2013	39	37	76	0,3
Juvenile 3	August 10, 2013	40	39	79	0,4
Juvenile 1	November 1, 2013	44	40	84	0,5
Juvenile 2	November 1, 2013	44	41	85	0,5
Juvenile 3	November 1, 2013	44	42	86	0,5
Juvenile 1	November 21, 2014	66	61	127	not measured
Juvenile 2	November 21, 2014	65	62	127	not measured
Juvenile 3	November 21, 2014	66	41	107 (regenerated tail)	not measured

Table 2: Measurements and weights of juvenile *Chalcides mauritanicus* of the first clutch.

remain well-hidden under the sand and mostly ambush their prey from under the sand. They only come above ground to search for food when small crickets are offered and sometimes stick their heads out of the sand when they notice movement. Even warming up occurs in the sand or under the flat stones provided. It seems the skinks are not very aggressive towards each other; a character trait which appears similar to *Chalcides mionecton* (HARBIG, 2002). Several other *Chalcides* species that I have kept in the past e.g., *Chalcides bedriagai* (see BOGAERTS, 1995) or *Chalcides lanzai* (see BOGAERTS, 2006) became very tame in captivity and would beg for food, but *C. mauritanicus*, even the captive bred specimens, never became 'tame'.

BREEDING ECOLOGY

I have never observed breeding behaviour, nor have I seen animals chasing or biting each other in spring, which can be observed in other *Chalcides* species. I was therefore completely surprised to find juveniles in the terrarium on the 10th of August 2013. In total three juveniles were found in the tank. They, in sharp contrast to their parents, actively explored the terrarium. Their measurements and weights are given in table 2. They were measured and weighed again after three months and then after a year. It was, however, impossible to follow them individually. The data show that they grow rapidly and reach adult size the next year. I expected them to start breeding the second spring after being born. Their tails had not changed colour after three months, but the next year only a slight hint of orange remained. On the 19th of July 2014, again in the morning, two new juveniles were found actively exploring the tank (see table 3).

Both times the juveniles were kept separated from the adults immediately after finding them. They were raised in a miniature version of the adult terrarium and fed with very tiny crickets and grew rapidly (Table 2). Sadly,

Skink	Date	Snout-vent (mm)	Tail length (mm)	Total length (mm)	Weight (g)
Juvenile	July 19, 2014	42	36	78	not measured
Juvenile	July 19, 2014	41	34	75	not measured

Table 3: Measurements and weights of juvenile *Chalcides mauritanicus* of the second clutch.

Adult group May 2014.

there has not yet been an F2 generation. In nature juveniles are found at the end of July or the beginning of August, and measure SV+T 36+24 mm (Doumergue, 1901). This matches with my observations in the terrarium. Martín et al. (2015) suspected that the animals have small litter sizes. My case confirms their suspicion, with three and two juveniles.

It was unclear if this species is viviparous or not (Martín et al., 2015; Martínez et al., 2019). Therefore, upon discovery of the juveniles in the terrarium I cleaned it out completely to check for more juveniles and to see if there were any eggshells to be found. No remnants whatsoever were noticed and from this I conclude that this observation is the first confirmation that this species is viviparous.

CONSERVATION

This species is considered Endangered by the IUCN because its 'Extent of Occurrence' is less than 5,000 km^2, its distribution is severely fragmented, and there is continuing decline in the extent and quality of its (coastal) habitat. It is not known to exist in severely degraded habitats (Mateo et al., 2009). I can confirm that it does not seem to survive in degraded habitats as I found it difficult to find the species again after four years in the same even further degraded habitat (locality 1). Further surveys are needed to better determine the range of this species, especially in Algeria. Mateo et al. (2009) suspect the collection of driftwood for use as firewood by local people has contributed to the disappearance of the skink. I think the replacement by rubbish and trash adds up pretty well to the loss of driftwood.

The main threat to their habitat is its destruction for coastal developments (tourism and holiday villages) west of Saïdia in the direction of the Moulouya river. On Google Earth one can see photos of the area in 2004. At that time Saïdia was still a small town, and our localities 1, 2 and 3 still look pretty intact. During our visits in 2009, 2012 and 2013 we have seen the ongoing developments. On Google Earth now it is seen that most of the habitats are gone. And as these sandy habitats vanish, so will this little-known skink.

CONCLUSION

Chalcides mauritanicus is a viviparous species that has small litters of two or three young. The species is extremely fossorial and does not become 'tame' in captivity and are therefore not recommended as pet, since hand-feeding is sometimes necessary to help animals in a poorer condition. Even studying their behaviour is hard in captivity. It seems

Already in 2009 destruction of the *C. mauritanicus* habitat had started at Saïdia (locality 1).

Locality 4: pristine habitat, dunes of Ras el Ma.

the skinks are not very aggressive towards each other, a trait which appears similar to *Chalcides mionecton*.

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SUMMARY

Chalcides mauritanicus is one of the smallest and least-known species within the genus *Chalcides*. It is a fossorial skink that has rarely, if ever, been kept in captivity. The skink is only found in the coastal areas in northeastern Morocco, the northwest of Algeria and on the Chafarinas Islands. I found this species in four localities of littoral dunes in Morocco. From 2009 to the present day, I have kept this species in vivaria and have successfully bred it twice. The animals were kept together as a group in a small terrarium (50x40x20 cm), with a floor of fine sand. Temperatures in the terrarium vary from 15°C to 35°C (under the spots when the heating mat is on). A short winter resting period at 10°C is provided for two months.

The skinks were mainly fed with larvae of *Alphitobius laevigatus* and juvenile crickets *Gryllus assimilis*. All food items were dusted with a Calcium preparation and gut loaded with a mixture of carrots and dry dog food. The captive bred specimens never became tame and are only seen when they hunt for prey, and even that seems to occur mostly underground. The first birth was three juveniles on August 10, 2013 and a second batch of two juveniles was found on July 19, 2014. The juveniles were kept separately from the adults immediately upon being spotted. Mine is the first confirmation that *C. mauritanicus* is viviparous. Although the species is considered Endangered by IUCN because its Extent of Occurrence is less than 5,000 km^2, and its distribution is severely fragmented, there is a continuing decline in the extent and quality of its (coastal) habitat without any conservation measures being taken.

SAMENVATTING

Chalcides mauritanicus is een van de kleinste en minst onderzochte soorten van het genus *Chalcides*. Het is een gravende skink die zelden tot nooit in een terrarium gehouden is. De soort komt alleen voor in de kustgebieden van noordoost Marokko, in het noordwesten van Algerije en op de Chafarinas eilanden. Ik vond de vorm op vier plaatsen in de kustduinen van Marokko.

Vanaf 2009 tot en met heden verzorg ik de soort in terraria. Tot nu toe valt tweemaal voortplantingssucces te noteren. De volwassen dieren zijn als een groep ondergebracht in een klein terrarium (50x40x20 cm), met een bodembedekking van fijn zand. De temperatuur in de bak varieert van 15°C tot 35°C (dit laatste onder de spotjes met het warmtematje aan). ´s Winters krijgen ze een rustperiode van twee maanden bij 10°C. Het voer bestaat voornamelijk uit larven van het kevertje *Alphitobius laevigatus* en jonge krekeltjes van *Gryllus assimilis*. Alle voedseldieren krijgen worteltjes en droge hondenbrokken te eten, en worden voor het voederen bestoven met een kalkpreparaat. De skinken werden nooit tam in die zin dat ze komen bedelen voor voer en ze eten niet vanaf het pincet. Zelden ziet men ze prooien jagen want zelfs dat lijkt voornamelijk ondergronds te gebeuren. De eerste jongen, drie stuks, zag ik op 10 augustus 2013. Op 19 juli 2014 vond ik weer twee jongen. Deze diertjes werden gelijk in een apart terrarium geplaatst. Dit artikel vormt de eerste melding dat de soort levendbarend is.

Hoewel *C. mauritanicus* door de IUCN ondergebracht is in de categorie Endangered (bedreigd) vanwege het kleine en verbrokkelde verspreidingsgebied (<5,000 km^2), is er helaas een duidelijke en voortdurende vermindering van de beschikbare oppervlakte en een kwalitatieve habitatverslechtering te melden, terwijl er absoluut geen beschermingsmaatregelen voor het kustgebied worden ondernomen.

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