Pakistan J. Zoology, 30(3):213-221, 1998.

Pakistan Journal of Zoology

NOTES ON *TYPHLOPS DIARDI* SCHLEGEL, 1839, WITH DESCRIPTION OF A NEW SUBSPECIES (Squamata, Serpentes, Scolecophidia)

Muhammad Sharif Khan
Herpetological Laboratory,
15/6 Darul Sadar North,
Rabwah 35460, Pakistan

E-mail: khan@kherps.brain.net.pk
Ph. No. 04524-212125

Pages: 22; Tables: 2; Figures: 5

Abstract: Recent discovery of Diard's blind snake from Azad Kashmir leads to present description its new subspecies. Salient taxonomic parts of the soft anatomy of the new subspecies are described. Observations on its ecology and zoogeography are recorded.

Running title: Diard's blind snake, a new subspecies.
Key words: new subspecies; *Typhlops diardi platyventris*; description; ecology; zoogeography.

INTRODUCTION

Blind snakes are specialized diminutive burrowing snakes, leading secretive, fossorial subterranean life due to which they are the most infrequently encountered snakes in nature. Most of the species are known by a single specimen or fewer specimens, while a series of specimens from a particular habitat is rare in museum collections throughout the world. The biology of the blind snakes is yet little understood. They are known to feed on soft bodied subterranean

insects and their larvae, are mostly oviparous, some are partially viviparous and even parthenogenetic (Smith, 1943; Dowling and Duellman, 1978; FitzSimons, 1962; Fitch, 1970; Deuve, 1970; McDowell, 1974). Blind snakes are most widely distributed due to their small size and easy transport by the human agency (McDowell, 1974; Nussbaum, 1980; Hahn, 1980; Shine and Webb, 1990; Ota, et al., 1991).

Their small simple uniform morphology, leaves little for taxonomists to find important enough morphological variations to base new taxa. Mainly due to these difficulties blind snakes have attracted little attention as compared to relatively larger species. Perhaps it is why only two species of typhlopids *Typhlops porrectus* and *Ramphotyphlops braminus* have so far been recorded from Pakistan and the adjoining Azad Kashmir (Smith, 1941; Minton, 1966; Mertens, 1969; Khan, 1982; Q. Khan, 1996; Q. Khan and Khan, 1996).

During past several years, present author has received several collections of snakes from Goi Madan, Kotli, Azad Kashmir, through the curtsy of an old student Master Muhammad Sadiq. The snakes contain six specimens of stout typhlopids, which are identified as *Typhlops diardi* a new record for Pakistan and Azad Kashmir (Q. Khan and Khan, 1996).

Typhlops diardi is well known Indian, Indo-Chinese and Malayan species, extending between longitude 85 to 135^{O} E, Latitude 10 to 25^{O} N. Its discovery from Kotli Azad Kashmir drags its range far east-northwards to 33^{O} 30' N and 74^{O} 00'E (Khan and Tasnim, 1990). Smith (1943) distinguished two subspecies of *Typhlops diardi* on the basis of scale rows at midbody and geographical distribution: *Typhlops diardi diardi* with 24-26, rarely 28 midbody scales, no strong contrast between brown-black dorsum and paler ventrum, ranges from north of lat. 16^{O} ,Bengal, Assam, Myanmar and French Indo-China. *Typhlops diardi mülleri* with 24-26, rarely 22 scales round the midbody, with clear demarcation between black olive-brown dorsum and yellowish ventrum. Ranges south of lat. 14^{O}, Myanmar, Siam and French Indo-China, the Malay Peninsula and Archipelago.

Recently O'Shea has collected several specimens of *Typhlops d. diardi* from tarai zone of Nepal, extending its range 700 km westward (O'Shea, in press). Present records are 900 km west of the Nepalese locality, dragging overall range to 1600 km west of its long known range in Bengal. Morphological comparison of present

series with the south-east Asian forms show significant pholidosic and measurement differences warranting further sub specific differentiation of *T. diardi*. Present paper details out external as well as internal morphology of series of six snakes from Goi, Kotli, Azad Kashmir.

Taxonomic notes

Blind snake morphology has taken time to be sufficiently known and understood to suggest their phylogenatic inter-relationships. Present series of blind snakes belongs to genus *Typhlops* as male specimens have straight pineal organ with retractor muscle inserted at its extreme tip, absence of retrocloacal sacs (Guibe, 1948; Rabb, 1966a, b). Moreover, it falls in McDowell's (1974) *diardi*-species group due to supralabial imbrication, disposition of squamous glands in parallel diagonal lines along sutures of head scales, pedunculate rectal caecum and a distinct sub-narial pit.

Both Schlegel's (1839) taxa: *T. diardi* from "Indes Orientales" and *T. mülleri* from Padang, Sumatra. have been synonomized by Brongersma (1934), giving them status of subspecies of *T. diardi,* a view supported by several workers (Smith, 1934; McDowell, 1974; Hahn, 1980; Welch, 1988), however, Taylor (1965) and David and Vogel (1996) support Schlegel's view. Apart from

Materials and Methods

The snakes for present study were received preserved in 10 % formalin. External morphological details were studied under binocular microscope using reflected lamp-light. For sex ascertation and study of some of the internal morphology, the posterior half of each animal was dissected. The dissection dish was prepared by fixing a flat piece of Balsa-wood in a large Petri dish. The animals were fixed on the Balsa-wood by small entomological pins.

Abbreviations used are: CAS, California Academy of Sciences, San Francisco; MSK, Personal collection of author, Herpetological Laboratory, Rabwah 35460, Pakistan; RMNH, Rijksmuseum van Natuurlikjke Historie, Leiden.

Typhlops diardi platyventris new subspecies

Holotype:-CAS 170526 (MSK 0902.93), (Fig. 1, A), adult male, from under stones along a torrent, near house of Master Muhammad Sadiq, Goi Madan, District Kotli, Azad Kashmir, 33^{o} 30'N and 74^{o} 00'E, elevation 1315 mm, 15 July, 1993, Master Muhammad Sadiq.

Paratypes: (five specimens) , MSK 0930.94 and MSK 0933.94, adult males, under vegetation debris, 24 July, 1994; MSK 0605.96, adult male, exposed during digging a water channel, 14 August, 1996; MSK 0901.93, adult female, under logs, 26 June, 1993; MSK 0932.94, adult female, roots of a pine tree, 4 September, 1994. Rest data as for holotype.

Diagnosis: A stout-bodied *Typhlops*, with distinctly flat ventrum; 22-25 scales round the midbody; head flat, wider than body, tail at vent wider than long; eyes large with a distinct pupil; nasal cleft incomplete; a large subnarial glandular pit, nasal cleft in contact with second supralabial; head squamous glands confined to sutures, descend in parallel diagnal rows onto the supralabials; the posterior nasal overlaps first and second supralabials, third supralabial overlapped by preocular and overlaps ocular; ocular overlaps fourth supralabial; microtubercles are scattered on the surface of all head scales; dorsum light brown, ventrum dirty white; tail with sharp ventrad bent, tip round, with a strong cuspidate spine.

Description of holotype (measurements in mm): CAS 170526, Fig. 1, A. Adult male, total length 295, tail length 7.0+spine, midbody diameter : dorso-ventral (height) 4.15, lateral (width) 6.15; diameter at the level of vent: dorso-ventral 5.75, lateral 7.15; middorsal scales 271, midventral 278, dorso-caudals 10 + spine, subcaudals 11 + spine; scale rows round the body: at neck 27, at midbody 25, at level of vent 22.

When viewed from above, snout broadly rounded, head gradually broadens, broadest at a point beyond oculars, slight taper at neck. In lateral profile, the snout extends over the mouth as much as the breadth of rostral scale. Dorsum convex with 16 scales, ventrum distinctly flat, posterior part of body and tail sharply bent ventrad, tail tip round, ending in a cuspidate solid spine.

Rostral scale keel-less, naris anterolateral, oblique crescent-like slits, lying in an oblique oval depression, the narial opening about half the size of the eye, much nearer the tip of snout than eye; eyes dorso-lateral, not visible in ventral view, located in an orbital-pit excavated in the preocular scale, eye diameter 0.54 mm, pupil distinct. Rostral width 1.7 mm, about one third the head breadth, extends to the level of eyes, tip broadly round. Nasal is the largest head scale, a weak nasal suture extends obliquely upward

and forward from nostrils towards rostral scale dividing nasal incompletely into anterior smaller (N1) and larger posterior part (N2). N2 extends on the top of head and are narrowly separated from each other by a median prefrontal. The nasal suture extends obliquely backward, joins the sub-narial pit and passes to come in contact with the second supralabial. The sub-narial pit is distinctly larger than the naris.

Ventro-posterior corner of N2 overlaps the first supralabial, while N2 overlaps first and second supralabial anterodorsally, while preocular overlaps third supralabial and ocular. The ocular is larger than preocular, overlaps fourth supralabial, it is dorsally inserted between supraocular and parietal, posteriorly it contacts with temporal and postocular. Of the four supralabials, first is transverse, much broader than high (right damaged in holotype), second is distinctly higher than broad, third extends between preocular and ocular, is higher than second, fourth is about twice larger than third. Supralabial-head scale imbrication shows T-V pattern (Wallach, 1993):

N_1 N2 PrOc Oc
SL_1-SL2- SL3- SL4
PrOc Oc

First supralabial overlaps second, which in turn overlaps third, third overlaps fourth. Scales at head-top are scarcely larger than those on body, prefrontal is as broad as long, frontal is narrower than broad. Supraocular scale is the largest on head dorsum. Microtubercles are evenly scattered on the surface of all head scales.

Body scales are almost uniform in size and arrangement, strongly imbricate, 25-26 rows round the body, 27 at neck, 22 at the level of vent. Dorsocaudal scales are slightly larger than rest of the tail scales, while subcaudals, circum-anal and circum-spine scales are heterogeneous and much smaller. The terminal caudal scale is produced at its tip into a mucronate solid spine, its diameter at base 1.2 mm, height 1.1 mm.

Disposition of squamous glands: Squamous glands on head are confined to the borders of scales, forming lines which run parallel and diagonally: the nasal-preocular line bends forward to pass onto the first supralabial, the preocular-ocular line passes on second supralabial, while ocular line is broken in three pieces, the lower of which bends forward to pass onto the third

supralabial (Fig. 1). On body, glands extend from base of the scale to its middle.

Soft anatomy: The long, pedunculate rectal caecum, lies on the left side of the rectum, running parallel to the ilium to the level of posterior end of the left kidney, opens at the ilio-rectal junction. The rectal caecum is longer than kidney, with black material inside. The kidneys are elongated fusiform structures, right longer and higher in level. the ureters run along inner side of respective kidney, straight to the base of the tail, where ureters join each other (Fig. 2, A, B).

The testis are elongated, right is much longer and is composed of four testicular units, it is more anteriorly placed than the left, which is composed of three units. Unlike separate testicular units reported for *Leptotyphlops Philip* (Warner and Brook, 1967) the testis are distended as if in advanced reproductive state, so the testicular units are almost indistinguishable from each other (ref. Plate 1, Fig. 1, Fox, 1965). Long convoluted vas deferentia extend from the anterior end of testis to the base of the tail where both converge to join each other and open in the common urinary duct, formed by the union of ureters and open in a pair of peculiar urinogenital sacs lying above the rectum. The sacs extend to the midtail (Fig. 2, A, B).

No sexual dimorphism is reported in this species. To know sex, all specimen were dissected. The thick spindle-shaped hemipenial sac extends from cloacal aperture to the base of the caudal spine. Dissection of the sac reveals pitted surface of the organ with lateral longitudinal folds running along sides converging at organ's broad distal tip. The sulcus is deep, median, runs to the top of the cylindrical organ (Fig. 3, A, B).

Ovaries are multipartite, right is at a higher level. The ova are linearly arranged and are at different stages of development. Only right oviduct is present which opens on the right side of the rectum. The reno-genital region of the body is packed with yellowish U-shaped fatbodies. A median cloacal gland is present in both sexes (Fig. 3, A, B).

Variations: Table 1 summarizes morphological data for the present collection. Most apparent variation is in the total length of the snakes which varies from 214 to 295 mm, against 430 mm reported in literature (Boulenger, 1890, 1893; Wall, 1923; Smith, 1943). Moreover, males are longer (218-295 Vs 214-215) and

wider (5.9-8.5 Vs 5.15-5.60) than females. Females have higher number of scale rows (285-307 Vs 240-271) from prefrontal to the base of tail. In holotype and MSK 0901.93, MSK 0932.94, 0930.94, dorsal head scales have orderly arrangement, the rostral scale is broadly rounded at its upper tip, N2 are separated by a wider prefrontal scale, moreover, supraorbital scale has narrow contact with N2 and is widely separated from the rostral scale, while in MSK 0933.94 and MSK 0605.96 rostral is narrowly pointed, prefrontal is much reduced, narrowly separates N2, supraorbital extends mesially forming a broad contact with N2, is narrowly separated from the rostral scale.

The nasal suture in MSK 0901.93 almost nearly divides nasal, very narrowly missing rostral scale, while in rest of the series it extends midway between naris and rostral scale. The subnarial striated pit is distinct in all specimens except in MSK 0933.94.

Ovaries in both females are in early state of vitellogenesis, left with 3-4, right 2-3 ova at different stages of development, largest 2-3 mm in diameter.

Dorsum is light-brown to olive-brown, ventrum is dirty-yellowish, except MSK 0933.94, stoutest in the series, has dark-olive dorsum, dirty-white ventrum.

Ecology

Diard's blind snake is essentially a nocturnal fossorial species, collected from lowlands, hilly slopes, in tropical wet and dry forests, plantations and wet cultivated areas. Rarely found above ground, collected from under leaf litter, vegetation debris, logs and top soil not deep down, mostly uncovered by elephant-boys collecting feed for their charges (O'Shea, per comm.). *Typhlops diardi platyventris* is uncovered during ploughing, turning logs and fodder piles, between stones on the sides of torrents in moist, humid and richly grassy habitat.

Zoogeography

Typhlops diardi is wide ranging southeast Asian tropical species, extending from Indonesia, through Cambodia, Laos, Malaysia (Malaya and East Malaysia, Singapore, Thailand, Assam, Myanmar, reaching to western Himalayas, Bangladesh (R. Khan, 1982; David and Vogel, 1996). Its recent discovery from Nepal, mid-Himalayas (O'Shea, 1996, unpublished and personal comm.) and

present collection from Azad Kashmir drags its range to temperate part of the Himalayas. Present evidence does not validate Mahendra's (1984) doubt about its occurrence in Kulu Valley region.

Long synonymy of *Typhlops diardi* (Smith, 1943; Hahn, 1980) and its wide range validate possibility of its division in several geographical races (Hahn *in* Erasmus and Branch, 1983). Taylor (1965) and David and Vogel (1996) have raised status of both subspecies to full species. However, due to close morphological proximity of present material to *T. diardi*, it is being described as its new subspecies.

Discussion

Comparative data, on RMNH 6328, from Dore, New Guinea, is available, by Brongersma (1934) and McDowell (1974), the considerable differences in measurements are attributed to shrinkage (McDowell, 1974). Reported total length of 254 mm of RMNH 6328 (Brongersma) and 240 mm (McDowell) falls within the normal range of total length of present series from Azad Kashmir (Table. 1), however, total length of 430 mm is consistently reported in literature for *Typhlops diardi* (Theobald, 1876; Wall, 1918; Smith, 1943; Mahendra, 1984; Murthy, 1986), to attribute difference between 430 mm and 214-295 to shrinkage, one needs to be cautious.

Wall (1911) in Fig. C, 2 shows disposition of eye in *Typhlops diardi* within ocular scale, while in present series half the eye is pushed in an ocular indentation in the preocular scale (Fig. 2).

The typhlopids are known to have a cylindrical body with almost uniform diameter throughout, while *T. d. platyventris* is distinctly oval in cross section with flattened ventrum and distinctly rounded dorsum. Latero-lateral (breadth) and dorso-ventral (height) diameters, at a point, differ considerably (Table 1).

Usually female is larger and heavier than male in snakes, and a museum study has shown females outnumber males in typhlopids (Fitch, 1981; Shine, 1978, Shine and Webb, 1990), however, the two females in the collection, are smaller than four males.

Leptotyphlops and *Typhlops* are unique among vertebrates in having multipartite gonads and only right oviduct (Fox, 1965; Werner and Drook, 1967). The multipartite condition of testis is temporarily lost during breeding season when testis become distended and lobes fit with each other (Fox, 1965), it appears as an elongated single cylindrical organ.

Most of the 150 species of family Typhlopidae are known oviparous (Dowling and Duellman, 1978; FitzSimons, 1962; Fitch, 1970). *Typhlops diardi* has been described as ovoviviparous (Wall, 1918). Smith (1943) reports 14 embryos in a female while Deuve (1970) records 3-8 young in this species, however females in series contain 2-4 eggs at early stage of vitellogenesis. The differences in clutch size in *T. diardi* are attributed to poorly known systematics of this wide ranging species, which may contain several species (Hahn, in Erasmus and Branch, 1983). Egg retention and true viviparity are common traits in snakes living in temperate latitudes, montane and aquatic habitats (Tinkle and Gibbons, 1977). Prolonged egg-retention in temperate species *T. bibronii* (Erasmus and Branch (1983) is understandable, however, in tropical *T. diardi* it is yet to be understood. Perhaps *T. diardi* is primarily a temperate species and its tropical migration is recent.

Acknowledgment

Author wishes to thank following friends for their help during the course of present study:
Master Mohammad Sadiq, Goi, Kotli, Azad Kashmir, for providing collection of snakes, Dr. Michael Golubev, Seattle, USA, for pieces of Balsa-wood for preparation of dissection dish and Mr. Van Wallach, Museum of Comparative Zoology, Harvard university, Cambridge, USA, for tips for study typhlopid morphology, pieces of Balsa-wood, fixing pins and pertinent literature.

Legend to figures

Fig. 1. *Typhlops diardi platyventris* new subspecies, A. CAS 170526, holotype, B. MSK 0933.94, paratype. Note distinctly flattened ventrum, Whitish material is exposed fat bodies.

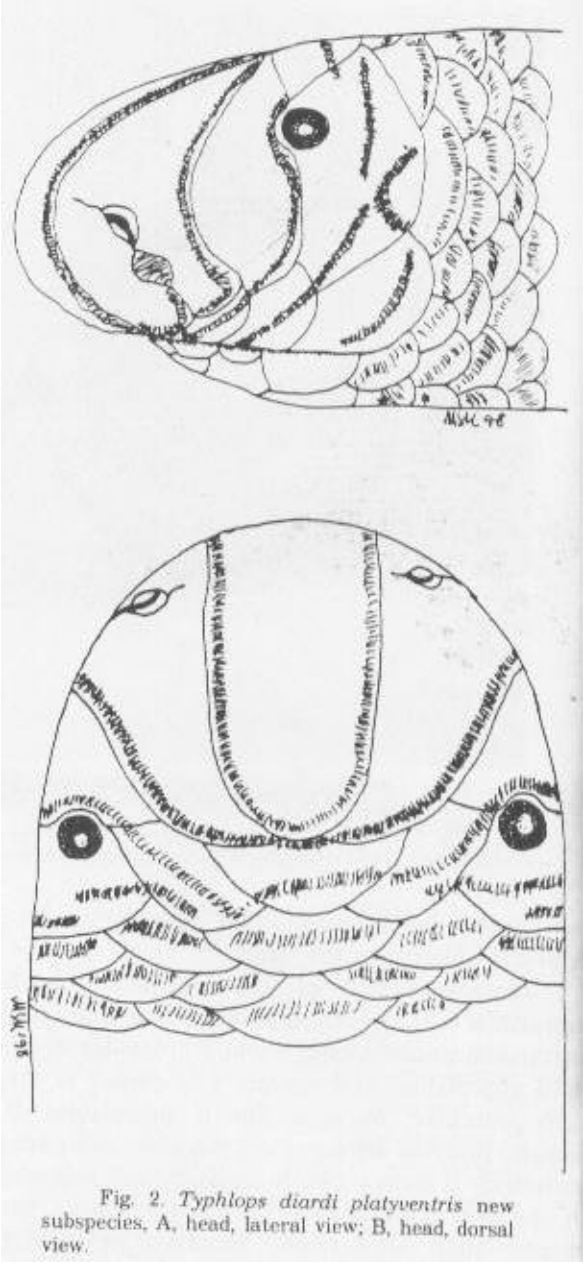

Fig. 2. *Typhlops diardi platyventris* new subspecies, A, head, lateral view; B, head, dorsal view.

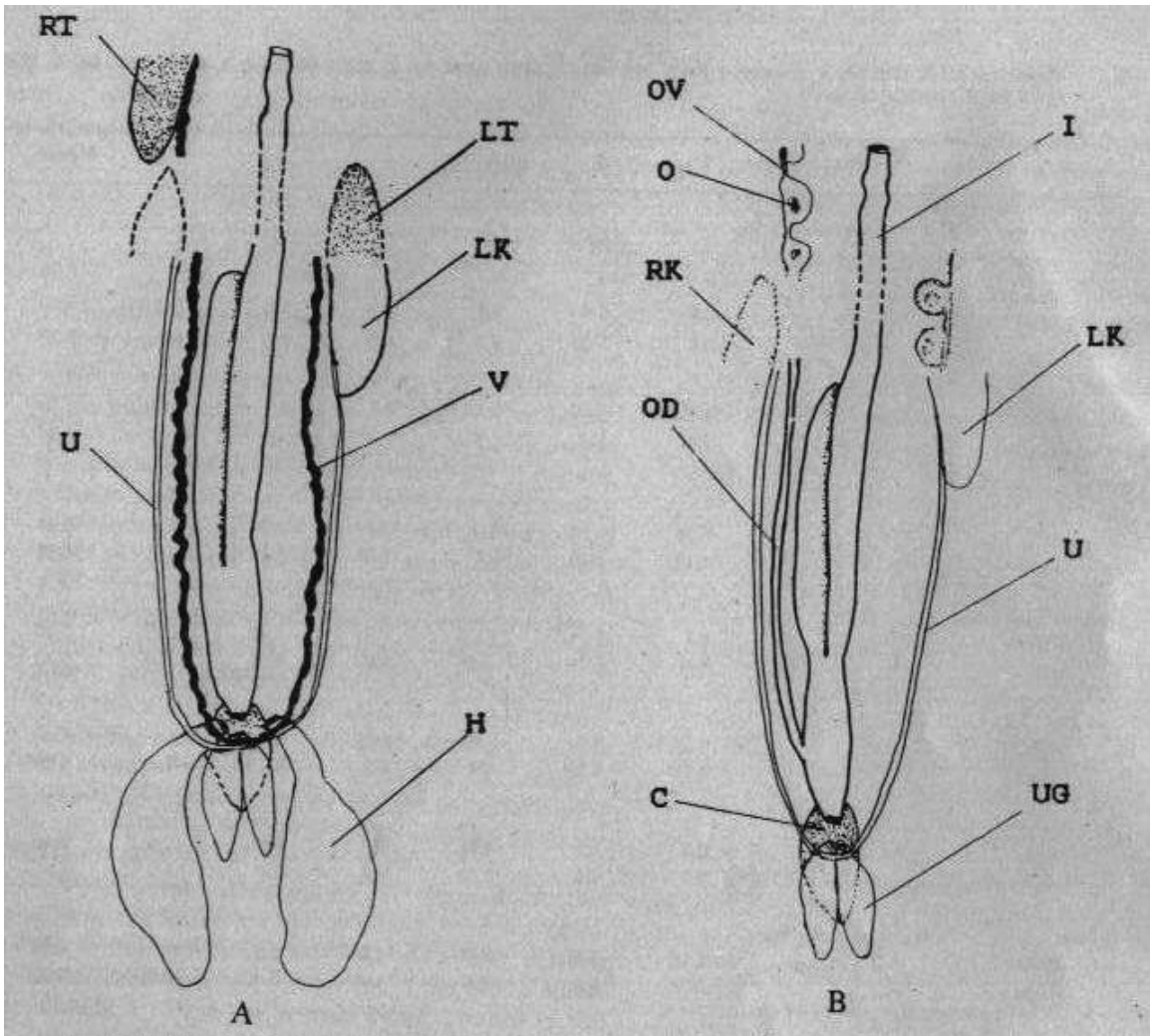

Fig. 3. *Typhlops diardi platyventris* new subpecies, soft anatomy (broken lines represent abbreviated part of diagram). A, male urinogeital organs; B, female urinogenital organs. C, cloacal gland, H, hemipineal sac; I, ilium; LK, left kidney; LT, left testis; O, ovary; OD, oviduct; OV, ovum; RC, rectal caecum; RK, right kidney; RT, right testis; U, ureter, UG, urinogenetical sacs; V, vas defrance.

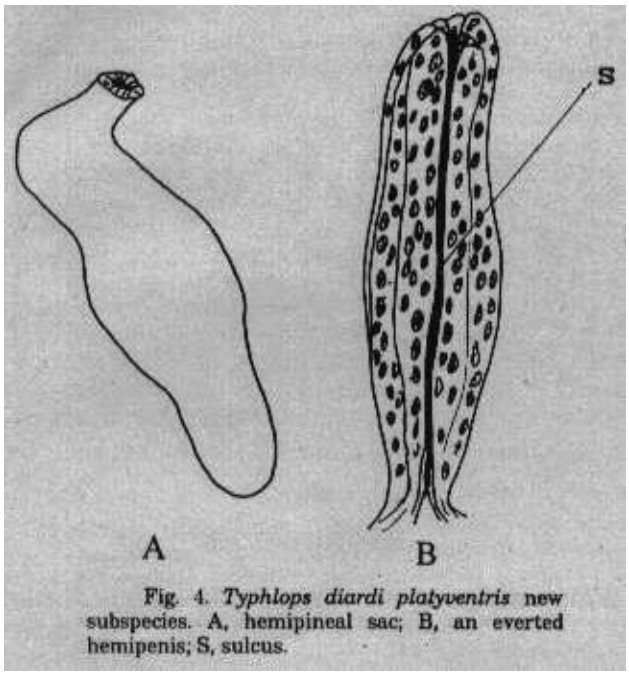

Fig. 4. *Typhlops diardi platyventris* new subspecies. A, hemipineal sac; B, an everted hemipenis; S, sulcus.

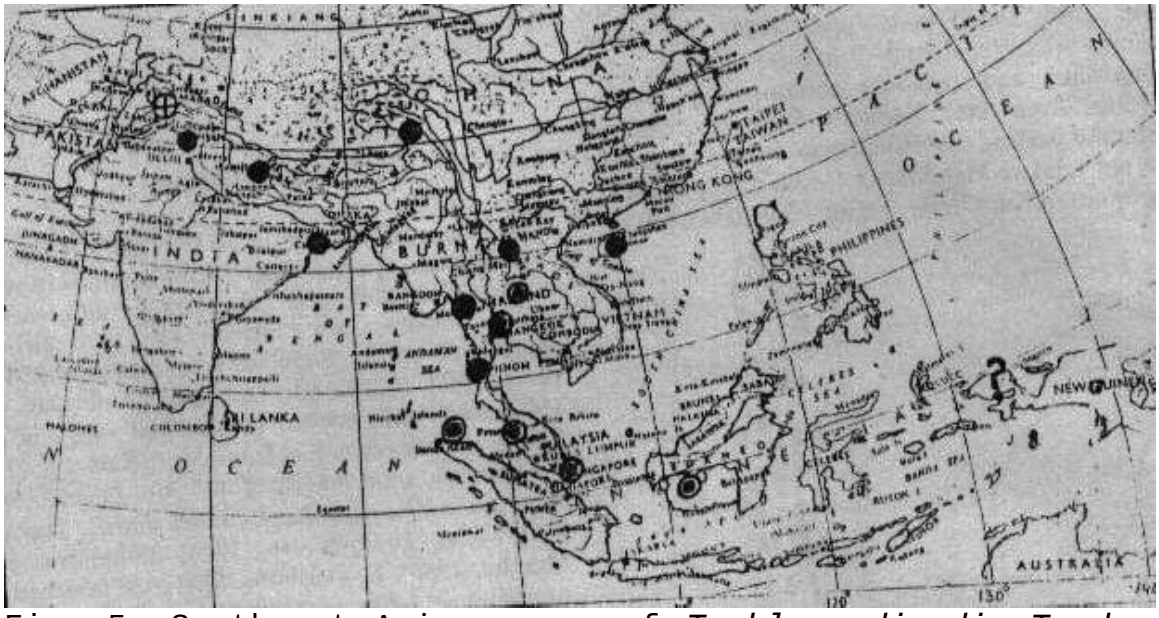

Fig. 5. Southeast Asia, races of *Typhlops diardi*: *T. d. müllari* ( ); *T. d. diardi* ( ); *T. d. platyventris* new subspecies ( ); doubtful record (?).

Table 1= Holotype CAS 170526; 2= Paratype MSK 0961.93; 3= MSK 0930.94; 4= MSK 0932.94; 5= MSK 0933.94; 6= MSK 0605.96; f=female; m=male.

	1	2	3	4	5	6	Mean
Sex	m	f	m	f	m	m	
Total length	295	215	218	214	259	261	243.66
Tail length + spine	7.0	6.8	4.4	3.0	6.5	5.9	5.9
Head width	6.5	5.25	4.8	4.6	5.8	5.2	5.35
Head height							
Diameter of eye	1.2	0.95	1.1	1.3	1.1	1.00	1.10
Width of rostral scale	1.5	1.3	1.2	1.4	1.3	1.5	1.36
Diameter at:							
head							
width	6.15	4.75	5.0	4.9	6.25	5.7	5.45
height	4.15	3.45	3.7	3.55	3.9	4.1	3.80
anterior half of body							
width	6.4	5.65	5.65	5.35	7.85	6.7	6.26
height	5.6	4.75	4.85	4.9	6.95	5.55	5.43
midbody							
width	7.25	5.6	6.05	5.15	8.5	5.9	6.40
height	5.75	5.35	4.8	4.5	6.75	5.9	5.50
posterior half of body							
width	6.6	5.7	4.75	5.5	9.05	7.2	6.46
height	5.7	4.6	5.25	4.8	7.0	4.9	5.37
at vent							
width	7.15	5.85	5.65	4.65	7.2	7.15	6.27
height	5.75	5.0	4.5	4.40	5.4	5.60	5.10
at mid tail							
width	4.6	4.0	4.2	3.75	4.4	5.45	4.4
height	3.75	3.6	3.35	3.35	4.2	3.2	3.57
Number of scales at:							
post-ceplalic	26	24	22	23	24	24	23.83
midbody	25	25	22	23	25	23	23.83
precloacal	22	24	23	23	23	22	22.83
middorsum	271	307	260	285	240	275	273
dorsocaudal	10	11	10	12	9	11	10.5
subcaudal	11	9	10	12	11	11	10.66
dorsal scales across							
midbody	16	15	16	15	15	14	15.16

Table 2. Morphological comparison of T*yphlops d. platyventris n*ew species (A) with *Typhlops diardi* B=McDowell, 1974; C=Brongersma, 1934; BL=Body length; BD=Body width; TL=Tail length; TD=Tail width.

	A	B	C
Number of specimens	6	1	1
BL/TL	31.61-71.33	90.7	68.5
BL/BW	25.15-45.65	37.3	40.00
TL/TW	0.68-1.83	0.6	0.875

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Date sent: Sun, 15 Mar 1998 09:56:11 -0700
From: Alex Golubev <mgolubev@sttl.uswest.net>
Send reply to: mgolubev@sttl.uswest.net
To: khan@kherps.brain.net.pk
Subject: Re: phrynocephalids.....

Dear Dr. Khan,

I took all those references from the Bogdanov's book. While he mentioned all data from the previous authors, you can simply reffer to his publication. According to the author, the references are:

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DEMENTYEV, KARAYEV and KARTASHEV, 1955 - unfortunately, this reference is absent from the list of references in Bogdanov's book.

Sincerely yours,

Michael Golubev

Dear friend,

Mark O' Shea

I collected several specimens in the Royal Bardia National Park, western Nepal in 1992. I presented the fact that this supposedly S.E.Asian species was in S.Asia as part of the paper in Kandy. I also recorded *Python molurus bivittatus* and *Lycodon jara* (both Indo-Chinese taxa).
This paper is due for publication in Anslem's proceedings (whenever !!?)

Since that could be some time I have included the *Typhlops diardi* note from my paper plus the discussion for your consideration.

Let me know ehat you think.
I believe the other subspecies of *T. diardi* (*T.d.muelleri* from Indo-Australia) is now recognised as a valid full species.

I welcome your comments.

Regards,

Mark

I will copy the videos to you next week if I have a chance.

Typhlops diardii Diard's blindsnake
11/3/92 Bardia Base Camp, Geruwa River, w. RBNP.
14/3/92 (x2) Bardia Base Camp, Geruwa River, w. RBNP.
Three blindsnakes were located under rotten logs around the expedition base camp. All three specimens agreed with *Typhlops diardii diardii* as described in Smith (1943 pp.51-52) with 24 longitudinal scale rows at midbody, a dark brown dorsum and slightly lighter venter but without strong demarcation.
T. diardii is not generally considered an Indian subcontinent taxa (see discussion.)

Discussion
Royal Bardia National Park lies on the contact zone between Smith's (1933) Gangetic Plains (which he considered faunistically part of India) and his Eastern Himalayan region (which he considered faunistically Indo-Chinese).
The terai is low montane forest typical of the Himalayan region whereas the phantas grassland is more indicative of neighbouring Uttar Pradesh in India. However, the denticulate delta plain formed by the Karnali River, as it exits the narrow Chisapani Gorge and spreads out over the lowlands, blurs the boundaries between Himalayan terai and Gangetic phantas. Evenso, most of the survey fieldwork was carried out in the sal forest of the terai and could, therefore, be considered just inside Smith's Eastern Himalayan region. Das (1996) did not consider the grassland plains and montane forest habitats different physiographic zones, preferring to term the entire Uttar Pradesh, Nepal, Bhutan, Sikkim and northern West Bengal zone as 'Himalayas'.
Most of the species recorded during here are well documented Indian sub-continent reptiles occurring widely from southern India (and Sri Lanka) to Nepal but three of the snake taxa are of particular zoogeographical interest since they are not species generally associated with the Indian subcontinent herpetofauna. Typhlops diardii
The range of T. diardii is recorded as northeast India (Assam), Bangladesh, Burma, China, Vietnam, Laos, Cambodia, Thailand, peninsular Malaysia and Indonesia (Sumatra and Borneo, with a doubtful record from Irian Jaya) (Smith 1943, McDowell 1974, Cox 1991). Two subspecies are recognised by some authors: T. d. diardii occurring north of latitude 16=83 in Indo-China

and T. d. muelleri occurring south of latitude 14=83. The western extention of T. diardii into western Nepal in the RBNP constitutes at least a 700km range extention for this primarily Indo-Chinese taxa.

Lycodon jara

Smith (1943) quotes the range of this taxa as "Ganjam in the northern part of the Madras Presidency; the Eastern Himalayas as far west as longitude 85=83; Bengal; Assam". Swan and Levition (1962) were not convinced by Smith's western extention to the range of L. jara, since this placed the taxa near Kathmandu and they were aware of "no specific records to substantiate this distribution". Basu (1988) reports a specimen from Katernia Ghat in Uttar Prasdesh (a gharial rehabilitation centre 320kms s.e. of Kathmandu) which constitutes a 'specific record' even further west than Smith envisaged. The two specimen collected in RBNP were found even further west, 200kms n.n.w. of Katernia Ghat, 400kms and 4=83 of longitude west of Kathmandu.

A voucher specimen is to be deposited in the BMNH.

Python molurus bivittatus

Python m. bivittatus is distinguished from the nominate subspecies, P. m. molurus, by a combination of three characteristics (fig. 2) defined in the species account earlier. The ranges of these two subspecies are generally assumed to be as follows (fig. 3):

P. molurus molurus: Sri Lanka (formerly P. m. pimbura), India (east to Bengal) and Pakistan (Sind and Punjab).

P. molurus bivattatus: Burma and Indo-China south to Isthmus of Kra, southern China, Hainan Island and western Java (but not Malaysia).

Whitaker (pers. comm.) also reports the subspecies from Bangladesh and West Bengal and suggests that it may also occur further south along the eastern coastline of India.

The presence of P. m. bivittatus in RBNP, western Nepal therefore represents a major northwestern range extention for the taxa of at least 700km (fig. 3), as for T. diardii. It seemed surprising that the presence of such a large snake taxa should have gone un-noticed and a search of the Nepalese herpetological literature failed to produce any earlier reference

to this subspecies. Swan and Leviton (1962) simply record Python molurus
from Bichiakoh in the central Nepalese terai and Kramer (1977) briefly
mentions Python molurus molurus as occurring in Nepal without specific
locality data. It would be interesting to learn the condition of the three
subspecific characters in specimens of P. molurus from central and eastern
Nepal and from neighbouring Uttar Pradesh.
In common with similar habitats in neighbouring Uttar Pradesh, northern
India, the terai region of southwestern Nepal appears to exhibit strong
herpetofaunal similarities to the Brahmaputra valley of Assam (Basu 1988)
and thence the Indo-Chinese region. It seems extremely likely that, as
Basu suggests, the terai forests of the southern Himalayas provide a
corridor or suitable habitat allowing species from the Indo-Chinese
sub-region to spread across the north of the Indian sub-region and the
tributaries of the Gangetic river system then channel them southwards into
the flood plains of Uttar Pradesh. Basu also draws attention to the
extensive clear-felling of the terai forests of Nepal. The western
populations of these Indo-Chinese taxa will become increasing more
isolated, and ultimately exterminate, unless habitat conservation measures
are instigated to protect the original lowland forests of Nepal.

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