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First Record of the Krait *Bungarus slowinskii* Kuch, Kizirian, Nguyen, Lawson, Donelly and Mebs, 2005 (Squamata: Elapidae) from Thailand

TON SMITS[1] AND SJON HAUSER[2*]

[1]105 M. 4 Kaeng Krachan, Phetchaburi 76170, THAILAND
[2]71 Wiang Phing Rd, Mueang, 50100 Chiang Mai, THAILAND
[*]Corresponding author. Sjon Hauser (sjonhauser@gmail.com)
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ABSTRACT.– The Red River krait *Bungarus slowinskii* has hitherto been known only from six localities in northern and central Vietnam and central Laos. In this paper, the first country record of this species is reported for Thailand. One adult specimen was observed and photographed in the evergreen forest in the mountainous Doi Phu Kha National Park, Nan Province, eastern North Thailand. Its morphological characteristics closely matched those in the previous records of *B. slowinskii*. The new record extends the range of the species about 200 km to the west.

KEY WORDS: *Bungarus slowinskii*, elapids, habitat, northern Thailand, zoogeography

INTRODUCTION

The elapid genus *Bungarus* Daudin, 1803 presently includes some 16 medium-sized or large snakes, and is distributed from Iran through much of South, East and Southeast Asia as far to the east as Kalimantan in Indonesia (Kharin et al. 2011; Wallach et al., 2014; Uetz P. and Hošek J., 2018). The preferred habitats of these species show extreme differences, varying from desert with shrubs in Iran for *B. persicus* (Abtin et al., 2014) to tropical rain forest for *B. flaviceps* (Cox et al., 2012). A number of species are of considerable medical importance (Alirol et al., 2010). *Bungarus slowinskii* Kuch, Kizirian, Nguyen, Lawson, Donelly and Mebs, 2005, is the latest described species for the genus in Southeast Asia and has hitherto been known only from six localities in Vietnam and Laos. We herein report the first record of *B. slowinskii* from Thailand.

MATERIALS AND METHODS

During the rainy season of 2017-18 (May–October) the authors spent many days in various mountainous parts of the provinces of northern Thailand. At daytime as well as at night roads and forest trails and adjacent vegetation were screened for DORs (Dead On Road snakes) and living snakes. Living snakes were photographed, and relatively intact DORs were collected and preserved. During one of these surveys a specimen of *Bungarus slowinskii* was observed and photographed.

RESULTS

On 15 September 2018 at 22.40 h, the first author spotted an adult black and white-banded krait foraging in the partly overgrown concrete drain alongside Highway 1256 which crosses the mountains of Doi Phu Kha National Park, Nan Province, northern Thailand. The black-

edged scales in the white bands on the body, the short, blunt-tipped tail, the markings on the head and other characteristics (Fig. 1) identified it as *B. slowinskii*. The snake was photographically documented from different angles in both its habitat and in a portable studio setup. Subsequently, the krait was released at the site where it had been captured. Voucher photographs of the snake have been deposited at the Queen Saovabha Memorial Institute in Bangkok and are cataloged as QSMI 1601.

Morphological characteristics

The total length of the snake was estimated to be about 125 cm, the tail length about 15 cm. The snout is rounded, the head fairly distinct from the neck. The body is somewhat laterally compressed with a distinct vertebral ridge. The short tail ends abruptly into a blunt tip.

The dorsal scales are smooth and shiny. In the vertebral (middorsal) row the scales are enlarged and hexagonal. In a number of pictures of the flanks, both at anterior and posterior positions and at midbody, all scale rows between the row of enlarged vertebrals and the ventral shields could be counted. There are invariably 7 rows, which implies that the DSF (dorsal scale formula) is 15:15:15 (15 rows of dorsal scales throughout).

The upperside of the head is black with a white, dotted chevron-shaped marking, its apex just before the anterior tip of the frontal shield, and its legs extending backwards over the parietal shields and radiating to the corner of the mouth where

FIGURE 1. QSMI 1601, *Bungarus slowinskii* from Nan Province, Thailand.

FIGURE 2. Lateral view of the head and neck of QSMI 1601, *Bungarus slowinskii* from Nan Province, Thailand.

FIGURE 3. Details of white cross-bands with the black-edged scales of QSMI 1601, *Bungarus slowinskii* from Nan Province, Thailand.

they fuse with the white-colored throat. A white line extends just in front of the apex over the width of the pair of prefrontals and extends and radiates over the second supralabial just in front of the rather small black eye (Fig. 2). The tongue is pinkish with white tips.

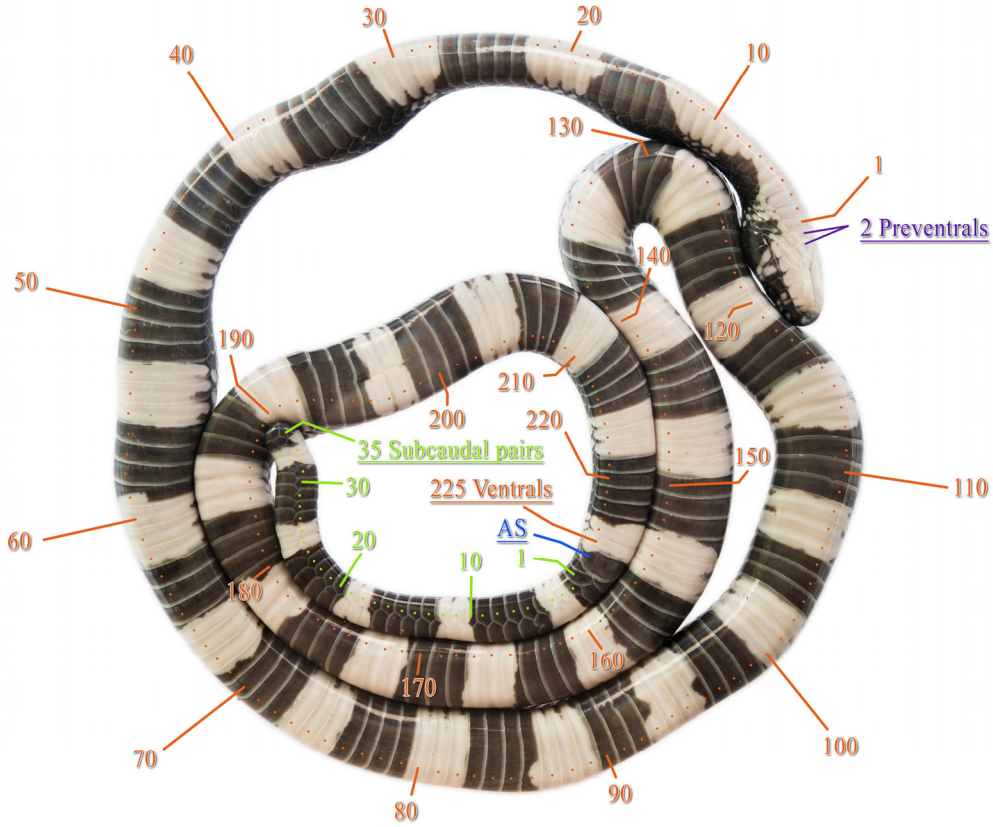

FIGURE 4. Underside with the count of the ventral shields and the subcaudal pairs of QSMI 1601, *Bungarus slowinskii* from Nan Province, Thailand.

The body and tail are black and white-banded, the first two white bands behind the head being V-shaped, all other bands more or less ring-shaped. Both white and black bands extend laterally over the underside of the snake. There are 32 white and 32 black bands on the body and 5 white and 6 black bands on the tail, including the black tail tip. On the underside the width of black and white bands is almost equal, whereas on the upperside, the white bands are only half the width of the black bands.

A distinct characteristic of the white bands is that all white scales in these bands have black edges in the posterior half of the scale that fuse in a black posterior scale tip (see Fig. 3).

The ventral shields were counted according to Dowling (1951), excluding the entire (undivided) anal shield. There are 2 preventral and 225 ventral shields. All subcaudal shields are divided and there are 35 pairs of them, excluding the terminal scute (see Fig. 4). The sex of the specimen could not be determined.

The head scalation is depicted in Fig. 5. The scalation on the left side is essentially the same as that on the right side. The shape

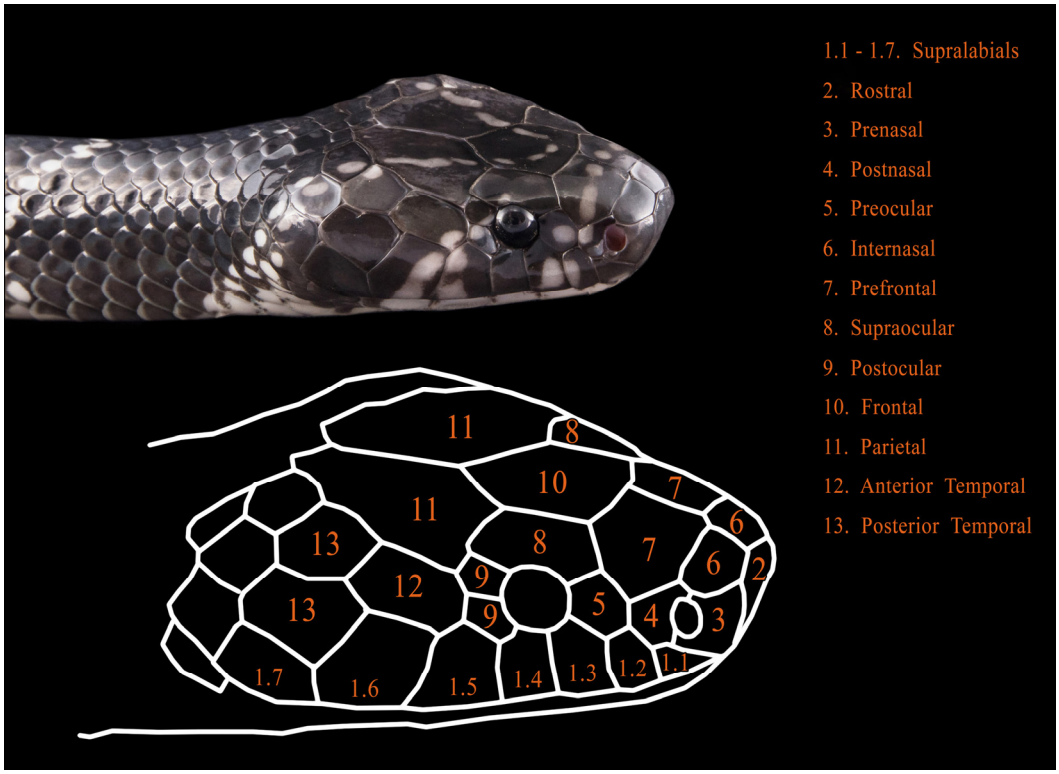

FIGURE 5. Head scalation of QSMI 1601, *Bungarus slowinskii* from Nan Province, Thailand.

of the mental is more or less triangular. The posterior chin shields are slightly longer than the anterior ones. The mental groove is pronounced. There are seven infralabials, the fourth distinctly the largest and in broad contact with posterior chin shield. The infralabials lack cuneate scutes.

The data summarized above unmistakably identify the specimen as *Bungarus slowinskii*. They closely match the data of six specimens from Vietnam and Laos supplied in a table in Kharin et al. (2011). Ventral scales in the latter publication were not counted according to Dowling (1951), so the 2 PV in our specimen should be added to the V-count of 225 to make the data comparable; 227 V is in the range of 225 – 230 V for the six specimens from Vietnam and Laos. The total amount of 37 white crossbars on body and tail in the Thai specimen is within the range of 31 – 38 of the six specimens listed in Kharin et al. (2011).

Behavior

Apart from an occasional hiss during the initial capture, the snake was calm, and did not show any defensive behavior. It did not make any attempt to strike or bite during the handling. However, in spite of its rather sluggish movements, it was difficult to get it motionless for longer than a few seconds.

Locality and Habitat

The specimen was spotted amidst leaf litter, low vegetation and debris of eroded

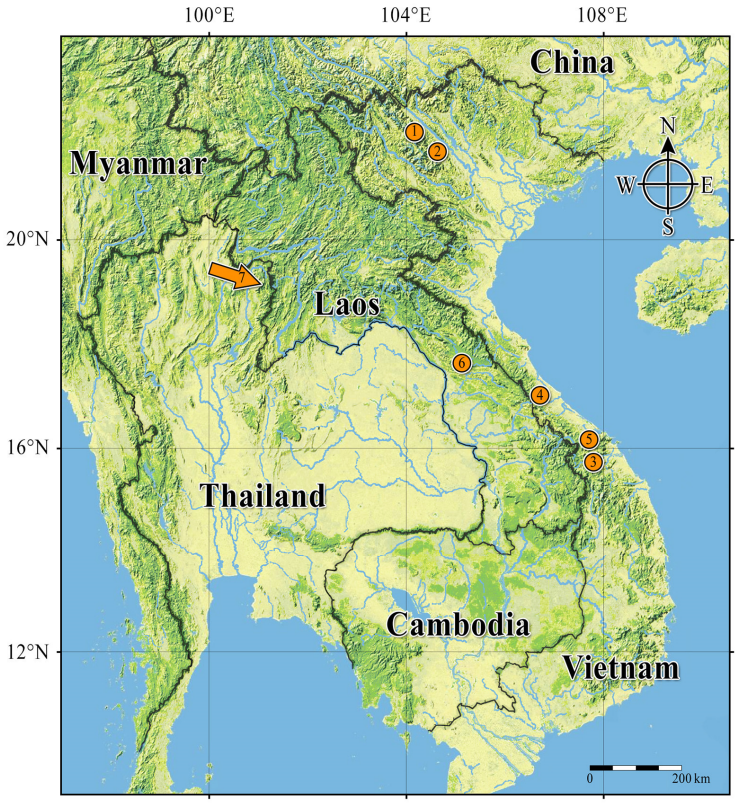

FIGURE 6. Map showing the localities of *Bungarus slowinskii* in Vietnam, Laos and Thailand (adapted from Kharin et al.). In Vietnam: 1. Van Ban District, Lao Cai Province. 2. Van Dien District, Yen Bai Province. 3.Tay Giang District Quang Nam Province. 4. Huong Hoa District, Quang Tri Province. 5. Bach Ma National park, Thua-Thien-Hue Province. In Laos: 6. Thakhek District, Khammouane Province. In Thailand: the arrow (7) refers to Doi Phu Kha National Park, Pua District, Nan Province, Thailand.

stones spilled in a concrete drain from the steep, densely forested mountain slope on the northern side of Highway 1256 at about KM 30 (30 road kms east of Pua Town), at an elevation of 1461 m at 19° 10.959' N and 101° 05.635' E, Doi Phu Kha National Park, Pua District, Nan Province, Thailand. This record of *B. slowinskii* extends the range of the species more than 200 km to the west, but the locality is not an outlier when compared to the currently known range (see Fig. 6).

At the locality, the slope on the northern side of the road is covered with dense evergreen/submontane forest in which the tree *Bretschneidera sinensis* is common, a relict species otherwise only known from a few localities in southern China and northern Vietnam (Santisuk, 1989). This forest type differs somewhat from the 'ancient forest' at higher elevations (1500-1685 m) situated to the east, in which the endemic palm *Caryota gigas* is a common feature (Gardner et al., 2000). Because of the steepness of the mountain slopes, these

forests are difficult to explore. At many places, including one near the site where the krait was spotted, small streams cascade downhill and empty into the drains alongside the road.

B. slowinskii is known to feed on snakes. In the stomach of a specimen from a comparable habitat in Vietnam two recently swallowed viperid snakes were found (Kharin et al., 2011). The site of the Thai record is known to have a rich and diverse ophiofauna (authors, unpublished data).

DISCUSSION

Bungarus slowinskii is known from six localities in the mountains of Vietnam and Laos of which the elevation varies from 140 m to 1300 m (Kharin et al., 2011). The new record from Thailand originated from evergreen forest at an elevation of 1460 m. The habitat and elevation of the Thai specimen seem to resemble those of the record from Bach Ma National Park near Hue in Central Vietnam closest (mountain forest at 1300 m). Kharin et al. (2011) argue that the large altitude range of the records indicates a wide temperature tolerance of the species.

With seven official records in 17 years, the species appears to be rare. Orlov et al. (2003) commented on the tropical snake fauna that an extremely rare repetition of records is characteristic in a number of species. The reasons given for this are the low numbers and density, nocturnal activity, a mosaic distribution in tropical habitats and the difficulty of permanent observations during the different seasons in many species. The distribution of *B. slowinskii* in Indochina and Thailand is possibly mosaic with many large gaps.

Over the past years, at least three rare snake species have been recorded in Doi Phu Kha National Park, that had previously been known mainly from locations at high elevations at much higher latitudes in the Indo-Chinese and Indo-Himalayan regions (see Hauser, 2018). The high-elevated slopes adjacent to mountain peaks in Doi Phu Kha National Park could have served as humid refuges for such species (perhaps including *B. slowinskii*) during the last glaciations when habitats at lower elevations became drier, as has been discussed in Ziegler et al. (2008).

Over the past 15 years, the number of snake species known from Laos has almost doubled (Teynié et al. 2017), many of the new additions originating from the North (adjacent to Thailand's Nan Province). Similar discoveries may be expected sooner or later, when Thailand's northern region, in particular Nan Province with its ophiofaunal affinities to northern Laos, is surveyed more intensively.

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