

The Distribution of the Burmese Python, *Python molurus bivittatus*

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The Burmese python was first formally identified as a distinct species of python, *Python bivittatus*, by Heinrich Kuhl in 1820. Kuhl based his description on illustrations published in Albertus Seba's *Thesaurus* in 1735. Shortly thereafter, Kuhl traveled to Java to make a collection of reptiles and amphibians for the Dutch government. Life in the Dutch Indies in the early 19th century was difficult for European naturalists—Kuhl died a few days shy of his 24th birthday. Adler (1989) described him as an “outstanding young naturalist.”

The classification of the Burmese python has evolved since its discovery. In 1842, John Edward Gray of the British Museum, recognizing the similarities between the Burmese python and its sister taxon, the Indian python, *Python molurus*, placed *bivittatus* in synonymy with *Python molurus*. However, Werner (1910) resurrected and recognized *Python bivittatus* again as a species. Mertens (1930) identified *bivittatus* as a subspecies of *Python molurus*; this has remained the accepted classification since that time. No type locality was designated for *bivittatus* in the original description; Mertens (1930) restricted the type locality to “Java.”

The Burmese python is one of the largest snake species. Even though Burmese pythons have been known to science for nearly two centuries, the taxon is not well represented in museum collections. Collection, preservation and storage are difficult for large reptile specimens and most, if not all, museums have a bias based on very practical considerations against holding large numbers of large species. One of several problems resulting from low numbers of museum specimens becomes apparent when an attempt is made to document and delimit the natural distribution of a large species, particularly a widely distributed species that is found in many countries.

Very few maps illustrating the distribution of *Python molurus bivittatus* have been published. Most appear to be intended only as a general overview of the distribution. To date, the most detailed and correct map of which we are aware is that of O'Shea (1998).

We initially intended to create a locality-dot map, with a dot representing each exact locality where Burmese pythons had been observed or collected. This quickly proved to be impractical, if not impossible. In the central area of the mainland range, including Thailand, Cambodia, Laos and Vietnam, Burmese pythons are well-known, and in some places reported to be or have been common. Even in these areas, we found few specific or exact records. Along the northern periphery of the range and in the Indonesian areas of the range, however, there are only a small number of reported specimens and most localities are identified only generally. In order to create a realistic depiction of the range, we have used river drainages, elevations, plant communities, and obvious routes of dispersal to infer the probable limits of the distribution. In addition to works cited directly in the text, the “Literature Cited” section at the end of this article includes the references on which our

map is based.

Habitat of the Burmese Python

The Burmese python, *Python molurus bivittatus*, is predominantly a creature of tropical lowlands, mangrove forest, rain-forest, wet grasslands and coastal plains of the Indo-Chinese Peninsula and southeastern China (O'Shea, 1998, 2007; Orlov et al., 2000; Mahendra, 1984; Whitaker and Captain, 2004; Ziegler et al., 2007; Stuart, 1998). These pythons are strongly associated with water, both rivers and lakes, as well as small pools in the forest (Goodyear, 1994; Reitinger, 1978; Pope, 1961; Wall, 1912).

We find few records of Burmese pythons occurring above 1000 m; the vast majority of the habitat and range of the species is below 200 m in elevation. Orlov et al. (2000) report the species occurring to 1200 m on the Tam-Dao Mountain Ridge in Vietnam; we note that several other species in this survey were found much higher, up to 1500 m. In the right circumstances, in the rhododendron and bamboo forests of some protected and temperate drainages, undoubtedly the species can be found at higher elevations. We note that Shah and Tiwari (2004) list the altitudinal range for *P. m. bivittatus* in Nepal to be 100 to 2800 m; however, in the detailed work of Schleich and Kästle (2002), the highest *bivittatus* locality in Nepal is less than 2000 m.

The Primary Distribution of the Burmese Python

The species is found in all provinces of Thailand north of the Isthmus of Kra. All reports state the distribution includes all of Cambodia, Laos and Vietnam.

The western part of the continuous mainland range includes eastern India, Bangladesh and Myanmar. In this area the species appears to follow the drainages of the Ganga and Brahmaputra in Bangladesh and eastern India. In mountainous Myanmar the distribution follows the Irrawaddy River system. Burmese pythons are found along these drainages from their deltas in the south, northward into the smaller drainages that dissect the foothills of the Himalayas and of the Shan Plateau coming down from the Tibetan highlands. Throughout these areas, suitable habitat, and climate exist to elevations of 1000 m. At the far reaches of some of the drainages, pythons may be found at elevations of 1200 m.

The Western Populations

There are three disjunct populations of Burmese pythons located to the west of the known western margin of the continuous range in eastern Bihar, India. Burmese pythons have been observed in Chitwan National Park and Royal Bardia National Park in Nepal, and in Corbett National Park in the state of Uttarakhand, India (O'Shea, 1998, 2007; Whitaker, 2004; Schleich and Kästle, 2002; Khan, 1998). These areas have elevations of 300 to 600 m (Schleich and Kästle, 2002). Evi-

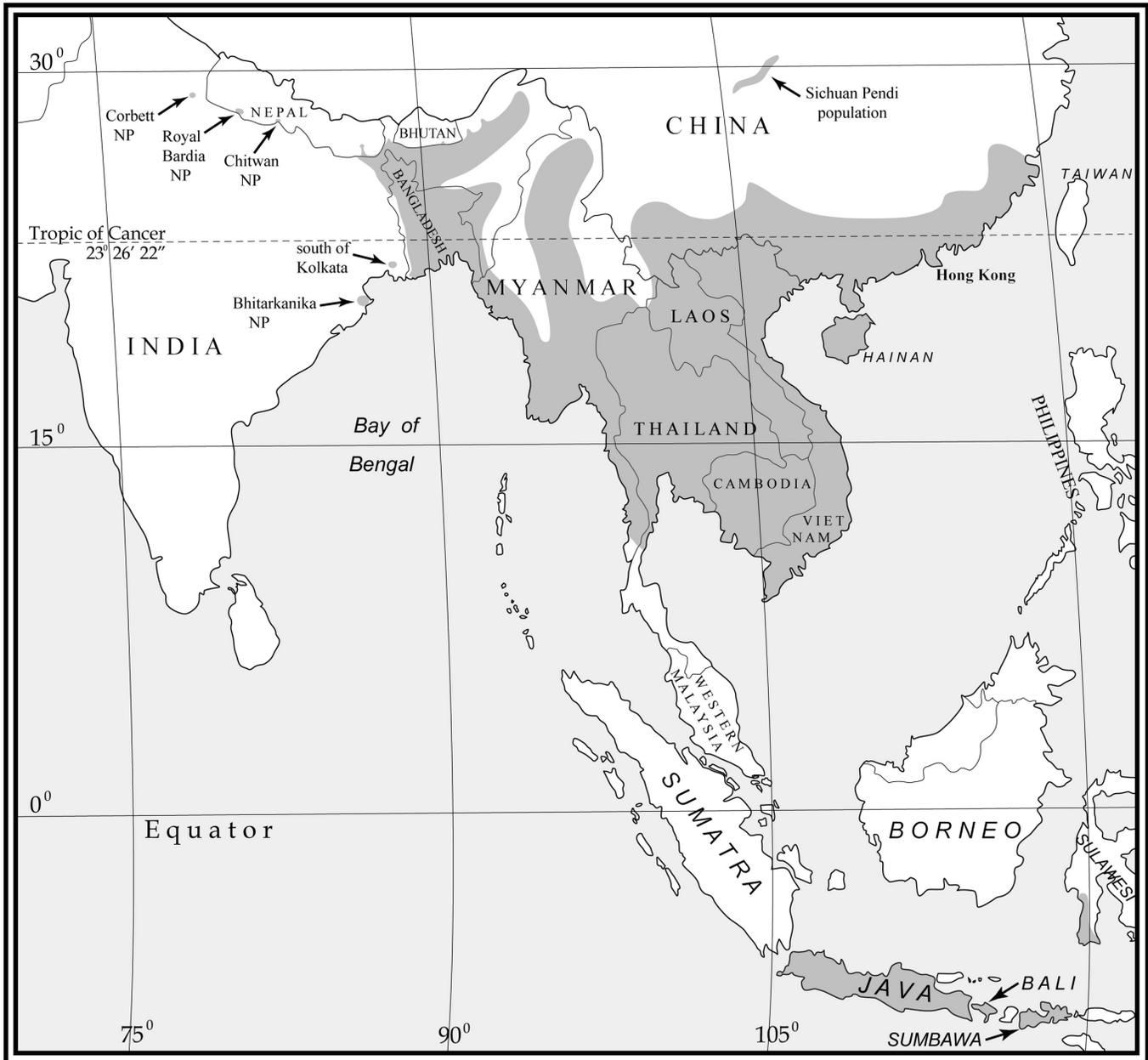


Figure 1. The distribution of the Burmese python, *Python molurus bivittatus*. The shaded region denotes the range of the Burmese python. Isolated populations are denoted with arrows.

dence that these populations are naturally occurring and not due to human transport are provided by the presence at these localities of other Indochinese species such as *Lycodon jara* and *Typhlops diardi* (Khan, 1998; O'Shea, pers. com.).

The existence of these apparently disjunct localities in the foothills of the Himalayas in northern India and along the southern Nepal border allows the interesting possibility that at some time in the past the range of Burmese pythons extended west along the Ganga, then north along the Gandak River to the vicinity of Chitwan, and northwest along the Ghaghara River and its tributaries that drain southwestern Nepal and eastern Uttarakhand. Whitaker (pers. com.) has communicated to us that there is a possibility that unreported localities for Burmese pythons are scattered all along the southern border of Nepal.

Two localities extend the distribution of Burmese pythons

west and south along the coast from the area of the mouths of the Ganges. There is a small population of Burmese pythons living on a private estate just to the south of Kolkata, West Bengal (Das, pers. com.). Mark O'Shea (pers. com.) has seen and photographed Burmese pythons in the mangrove swamps of Bhitarkanika National Park, Orissa.

It is interesting to note that in Bangladesh, Eastern India, West Bengal, Orissa, and west along the southern Nepal border to Uttarakhand, Burmese pythons are sympatric, and in some places syntopic, with Indian pythons, *P. m. molurus*. It is not understood how the two interfertile taxa remain distinct through such a broad area of sympatry; it seems likely that resource partitioning involving prey and microhabitat preferences separates the taxa (O'Shea, 2007), and that this separation allows them to maintain their identities.

Burmese Pythons in China

The species ranges east from northern Vietnam into China. Burmese pythons are found in the coastal plains of Guangxi, Guangdong, and into Fujian to the area of Nanping. The species is well-known on Hainan and Hong Kong (Pope, 1929, 1935; Zhao and Adler, 1993; Murphy and Henderson, 1997; Ji Daming, 2002).

Zhong (1993) reported the presence of Burmese pythons in southern Jianxi Province, based on a single specimen of Burmese python and also a piece of shed skin. At 24°35'N latitude, this area has a general elevation of 600 to 1700 m, but is dissected with the drainages of many streams and small rivers. No information is provided regarding the ecological associations of pythons in the area.

To the east of Myanmar, north of Laos, and northwest of Vietnam lies Yunnan Province. Burmese pythons are reported from this mountainous province, and most authors have included most or all of Yunnan on maps of the distribution of the species. However, we can find record of only one locality, that being Yuanjiang [Yuankiang] (Pope, 1929).

A cursory look at a map shows Yuanjiang in the mountains of southern Yunnan, some approaching 3000 m elevation. However, the city is located in the deep Yuan Jiang drainage, which is the Chinese portion of the Song Koi (Red River) drainage in northern Vietnam. The elevation of the river is about 500 m, and the temperate climate in the deep river valley is in contrast to the severe winter weather in the higher surrounding mountains. According to WeatherReports (<http://www.weatherreports.com>) the average winter high temperature of Yuanjiang is 78°F (26°C) and the average winter low temperature is 55°F (13°C).

Yunnan is dissected and drained by the Song Koi (Red River), Nu Jiang (Salween), and the Lancang Jiang (Mekong). These three major river systems all are populated with Burmese pythons in their lower reaches; if there are other populations of *P. m. bivittatus* in Yunnan, these rivers undoubtedly provide the routes of dispersal.

The Sichuan Population of Burmese Pythons

In recent years *P. m. bivittatus* has been reported from Sichuan Province, China. We initially were skeptical, but have conceded that the report is reliable. Several recent papers (Rodda et al., 2008; Ji Daming, 2002) have illustrated this range extension with a large northward loop that indicates that the species exists in all of eastern Sichuan, all of Guizhou, and parts of Hubei and Hunan. We do not believe this to be the case. We can find no record of the species in those three provinces—they are mountainous, there is no suitable habitat at reasonable elevations, and there are no identifiable migration routes along which the species might have dispersed.

The Sichuan specimens were collected in eastern Sichuan in an area called the Sichuan Pendi, or the Sichuan Basin. This is an isolated depression, a round valley surrounded by mountains. It is an area of temperate, foggy weather, sheltered from winter extremes. It is a refugium for temperate, tropical, and

relict species in Sichuan. The Chang Jiang (Yangtze River) passes through the basin, flowing in at the southwest side. It runs along the southern margin, with the downstream exit at the eastern side. The elevation of the river in the Pendi is about 500 m.

We believe that the Sichuan population is an isolated population. We propose that there are two possible ways that these pythons could have reached eastern Sichuan. We believe that the most parsimonious explanation is that the population was founded by survivors that dispersed or were washed down the Chang Jiang to the Pendi. However, a second possibility exists that the snakes were transported there by humans.

Upstream from the southwest corner of the Pendi, the course of the Chang Jiang turns to the southwest for about 250 km to the vicinity of Dongchuon, Yunnan. In Yunnan the Yangtze changes names again and becomes the Jinsha Jiang. At Dongchuon the course of the river turns west for about 100 km, then loops north up and around Dukou. A distance to the west of Dukou, it cuts to the north through one of the most spectacular river canyons of the world as the elevation rises from 1000 m in northern Yunnan to 5000 m on the Tibetan Highland.

The drainage of the Jinsha Jiang between Dukou and Dongchuon contacts the drainage of the Yuan Jiang. The drainages meet along a ridge between Xiaguan and Kunming. In fact, Burmese pythons are known to occur in the area of Yuanjiang, a small town south of Kunming. The Yuan Jiang and its larger tributaries lie in deep river valleys with temperate conditions. It's possible that pythons in this region could cross into the Jinsha Jiang drainage and from there disperse downstream to the Pendi. Other than the small population in the Pendi, Burmese pythons are unknown from the Jinsha Jiang/Chang Jiang drainage.

The Insular Populations in Indonesia

It is interesting to note that while *P. m. bivittatus* exists in sympatry with the reticulated python, *Python reticulatus*, throughout much of its distribution, Burmese pythons are not known to exist anywhere within the ranges of the three species in the *curtus* complex. The blood python, *Python brongersmai*, is found in southern Thailand south of the Isthmus of Kra, Peninsular Malaysia, eastern Sumatra and islands in the Straits of Malacca; the Sumatran python, *Python curtus*, is found in western and southern Sumatra; and the Borneo python, *Python breitensteini*, occurs throughout Borneo. Based solely on observed distribution, these three species appear to exclude *P. m. bivittatus* from within their ranges.

The Burmese python occurs on Java, where it is uncommon and smaller than mainland forms (Whitten et al., 1996; Tepedelen, pers. com.). It is found in Bali (McKay, 2006). The species is reported from Sumbawa in the western Lesser Sundas archipelago (Haas, 1950; Manthey and Grossman, 1997). A population is reported to exist in southern Sulawesi (Boulenger, 1897; Deraniyagala, 1955; McDiarmid et al., 1999). Lang and Vogel (2005) state that *P. m. bivittatus* on Sulawesi are small, with a maximum size of 2.5 m. In general,

little is known or published regarding this taxon in Indonesia.

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individuals with experience and knowledge regarding the exact limits of the distribution of Burmese pythons will contribute to correct errors and omissions we may have committed. We welcome all comments and information that serve to improve the map.

Literature Cited

- Adler, K. 1989. Herpetologists of the past. Pp. 5-141. *In*: K. Adler, editor, Contributions to the history of herpetology. Oxford, Ohio: Society for the Study of Amphibians and Reptiles, Contributions to Herpetology, Number 5.
- Ahmed, S., and Mrs. G. Dasgupta. 1992. Reptilia. Pp. 1-65. *In*: A. K. Ghosh, editor, State fauna series 3: Fauna of West Bengal, Part 2. (Reptilia, Amphibia, Fishes, Hemichordata, and Archaeozoology). Calcutta: Zoological Survey of India.
- Bauer, A. M., and R. Günther. 1992. A preliminary report on the reptile fauna of the Kingdom of Bhutan with the description of a new species of scincid lizard (Reptilia: Scincidae). *Asiatic Herpetological Research* 4:23-36.
- Boulenger, G. A. 1897. A catalogue of the reptiles and batrachians of Celebes, with special reference to the collections made by Drs. P. and F. Sarasin in 1893-1896. *Proceedings of the Zoological Society of London* 13:193-237.
- Bourret, R. 1936. Les serpents de l'Indochine: Tome I, Études sur la Fauna. Toulouse, France: Imprimerie Henri Basuyau & Cie.
- Campden-Main, S. M. 1970. A field guide to the snakes of South Vietnam. Washington, D.C.: Smithsonian Institution.
- Chan-ard, T., W. Grossmann, A. Gumprecht and K.-D. Schulz. 1999. Amphibians and reptiles of peninsular Malaysia and Thailand: An illustrated checklist. Würselen, Germany: Bushmaster Publications.
- Cox, M. J. 1991. The snakes of Thailand and their husbandry. Malabar, Florida: Krieger Publishing Company.
- Das, I. 1996. Biogeography of the reptiles of South Asia. Malabar, Florida: Krieger Publishing Company.
- Deraniyagala, P. E. P. 1955. A colored atlas of some vertebrates from Ceylon, Volume three: Serpentine Reptilia. Colombo: Government Press, Ceylon.
- de Silva, P. H. D. H. 1980. Snake fauna of Sri Lanka with special reference to skull, dentition and venom in snakes. Colombo: National Museum of Sri Lanka.
- Deuve, J. 1970. Serpents du Laos. *Mémoires O.R.S.T.O.M.* no. 39:1-251.
- Dowling, H. G., and J. V. Jenner. 1988. Snakes of Burma: Checklist of reported species and bibliography. Washington D.C.: Smithsonian Herpetological Information Service, no. 76.
- Goodyear, N. C. 1994. *Python molurus bivittatus* (Burmese Python). *Movements*. *Herpetological Review* 25(2):71-72.
- Gray, J. E. 1842. Synopsis of the species of prehensile-tailed snakes, or family Boidae. *Zoological Miscellany*, London 2:41-46.
- Groombridge, B., and R. Luxmoore. 1991. Pythons in South-East Asia: A Review of distribution, status, and trade in three selected species. Lausanne, Switzerland: Secretariat of CITES.
- Haas, C. P. J. de. 1950. Checklist of the snakes of the Indo-Australian archipelago (Reptiles, Ophidia). *Treubia* 20(3):511-625.
- Ji, Daming. 2002. Atlas of reptiles of China. Hefei, China: Henan Science and Technology Publishing House.
- Karsen, S. J., M. W. Lau and A. Bogadek. 1986. Hong Kong Amphibians and Reptiles. Urban Council, Hong Kong.
- Khan, M. S. 1998. Notes on *Typhlops diardi* Schegel, 1839, with description of a new subspecies (Squamata, Serpentes, Scolecophidia). *Pakistan Journal of Zoology* 30(3): 213-221.
- Kuhl, H. 1820. Beiträge zur Zoologie und vergleichenden Anatomie. Frankfurt am Main: Hermannsche Buchhandlung.
- Lang, R. de, and G. Vogel. 2005. The snakes of Sulawesi: A field guide to the land snakes of Sulawesi with identification keys. Frankfurt Contributions to Natural History Volume 25. Frankfurt am Main: Edition Chimaira.
- Lang, R. de, and G. Vogel. 2006. The snakes of Sulawesi. Pp. 35-38. *In*: M. Vences, J. Köhler, T. Ziegler and W. Böhme, editors, *Herpetologia Bonnensis II*. Proceedings of the 13th Congress of the Societas Europaea Herpetologica.
- Mahendra, B. C. 1984. Handbook of the snakes of India, Ceylon, Burma, Bangladesh, and Pakistan. Agra, India: The Academy of Zoology. *The Annals of Zoology*, Volume XXII (1984 B).

- Manthey, U., and W. Grossmann. 1997. *Amphibien and Reptilien Südasiens*. Berlin: Natur und Tier-Verlag.
- McDiarmid, R. W., J. A. Campbell and T. A. Touré. 1999. *Snake species of the world: A taxonomic and geographic reference*, Vol. 1. Washington, D.C.: The Herpetologists' League,
- McKay, J. L. 2006. *A field guide to the amphibians and reptiles of Bali*. Malabar, Florida: Krieger Publishing Company.
- Mertens, R. 1930. Die Amphibien und Reptilien der Inseln Bali, Lombok, Sumbawa und Flores (Beiträge zur Fauna der Kleinen Sunda-Inseln, I). *Frankfurt am Main: Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft* 42(3):115-344.
- Monk, K. A., Y. De Fretes and G. Reksodiharjo-Lilley. 1997. *The ecology of Nusa Tenggara and Maluku*. Singapore: Periplus Editions.
- Murphy, J. C., and R. W. Henderson. 1997. *Tales of giant snakes: A historical natural history of anacondas and pythons*. Malabar, Florida: Krieger Publishing Company.
- Murthy, T. S. N. 1985. Classification and distribution of the reptiles of India. *The SNAKE* 17:48-71.
- Orlov, N. L., R. W. Murphy and T. J. Pappenfuss. 2000. List of snakes of Tam-Dao Mountain Ridge (Tonkin, Vietnam). *Russian Journal of Herpetology* 7(3):69-80.
- O'Shea, M. 1998. Herpetological results of two short field excursions to the Royal Bardia region of western Nepal, including range extensions for Assamese/Indo-Chinese snake taxa. Pp. 306-317. *In: A. de Silva, editor, Biology and conservation of the amphibians, reptiles, and their habitats in South Asia. Proceedings of the International Conference on Biology and Conservation of Amphibians and Reptiles in South Asia, Sri Lanka, August 1-5, 1996*. Peradeniya, Sri Lanka: Amphibia and Reptile Research Organization of Sri Lanka (ARROS).
- . 2007. *Boas and pythons of the world*. Princeton and Oxford: Princeton University Press.
- Pauwels, O. S. G., P. David, C. Chimsunchart and K. Thirakupt. 2003. Reptiles of Phetchaburi Province, western Thailand: A list of species, with natural history notes, and a discussion of the biogeography at the Isthmus of Kra. *The Natural History Journal of Chulalongkorn University* 3(1):23-53.
- Pope, C. H. 1929. Notes on reptiles from Fukien and other Chinese provinces. *Bulletin of the American Museum of Natural History* 58(8):335-487.
- . 1934. List of Chinese turtles, crocodylians, and snakes, with keys. *American Museum Novitates* (733):1-29.
- . 1935. The reptiles of China: Turtles, crocodylians, snakes, lizards. *Natural History of Central Asia, Volume X*. New York: American Museum of Natural History.
- . 1961. *The giant snakes*. New York: Alfred A. Knopf.
- Reitinger, F. 1978. *Common snakes of South East Asia and Hong Kong*. Hong Kong: Heinemann Educational Books.
- Rodda, G., C. S. Jarnevich and R. N. Reed. 2008. What parts of the US mainland are climatically suitable for the invasive alien pythons spreading from Everglades National Park? *Biological Invasions* [in press].
- Rooij, N. de. 1917. *The reptiles of the Indo-Australian Archipelago. II. Ophidia*. Leiden: E. J. Brill.
- Saint Girons, H. 1972. Les serpents du Cambodge. *Mémoires du Muséum national d'Histoire naturelle, Série A, Zoologie* 74:1-170.
- Schleich, H. H., and W. Kästle, editors. 2002. *Amphibians and reptiles of Nepal*. Ruggell, Liechtenstein: A.R.G. Gantner Verlag Kommanditgesellschaft.
- Sclater, W. L. 1891. List of the snakes in the Indian Museum. Trustees of the Indian Museum, Calcutta.
- Seba, A. 1735. *Locupletissimi rerum naturalium thesauri accurata descriptio, et iconibus artificiosissimis expressio, per universam physices historiam*. Amsterdam: J. Westenium, G. Smith, & Janssonio-Waesbergios. Vol. II (1735).
- Shah, K. B., and S. Tiwari. 2004. *Herpetofauna of Nepal: A conservation companion*. IUCN, Nepal.
- Shaw, G. E., E. O. Shebbeare and P. E. Barker. 2000 [reprint]. *The snakes of Sikkim and Bengal*. Delhi: Asiatic Publishing House.
- Smith, M. A. 1943. *The fauna of British India, Ceylon and Burma. Reptilia and Amphibia, Vol. III—Serpentes*. London: Taylor and Francis.
- Stuart, B. 1998. A survey of amphibians and reptiles in Phou Louey Biodiversity Conservation Area, Houaphanh Province, Lao PDR. *Wildlife Conservation Society Lao Program*: http://www.directoryofngos.org/project_publications/PHOU%20LOEUY.pdf
- Swan, L. W., and A. E. Leviton. 1962. *The herpetology of Nepal: A history, check list, and zoogeographical analysis of the*

- herpetofauna. Proceedings of the California Academy of Science, Fourth Series 32(6):103-147.
- Taylor, E. H. 1965. The serpents of Thailand and adjacent waters. University of Kansas Science Bulletin 45(9):609-1096.
- Wall, F. 1912. A popular treatise on the common Indian snakes. Part XVII. Journal of the Bombay Natural History Society 21: 447-476.
- . 1921. Ophidia Taprobanica, or the snakes of Ceylon. Colombo: H. R. Cottle, Government Printer, Ceylon.
- Welch, K. R. G. 1988. Snakes of the Orient: A checklist. Malabar, Florida: Krieger Publishing Company.
- . 1994. Snakes of the world: A checklist. 2: Boas, pythons, shield-tails and worm snakes. Somerset, England: R and R Research and Information.
- Werner, F. 1910. Neue oder seltenere Reptilien des Musée Royal d'Histoire naturelle de Belgique in Brüssel. Zoologischer Jahrbücher. Abteilung für Systematik, Ökologie und Geographie der Tiere, Jena 28:262-288.
- Whitaker, R., and A. Captain. 2004. Snakes of India, The field guide. Chennai, India: Draco Books.
- Whitten, T., R. E. Soeriaatmadja and S. A. Afiff. 1996. The ecology of Java and Bali. The Ecology of Indonesia Series, Volume II. Jakarta: Periplus Editions.
- Zhao, Er-Mi and K. Adler. 1993. Herpetology of China. Salt Lake City, Utah: Society for the Study of Amphibians and Reptiles.
- Zhong, Changfu. 1993. First records for *Ophisaurus harti* and *Python molurus bivittatus* from Jiangxi Province, China. Asiatic Herpetological Research 5:103-104.
- Ziegler, T., R. Hendrix, V. N. Thanh, M. Vogt, B. Forster and D. N. Kien. 2007. The diversity of a snake community in a karst forest ecosystem in the central Truong Son, Vietnam, with an identification key. Zootaxa 1493:1-40.