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Contributions to the taxonomic status and molecular phylogeny of Asian Bronzeback Snakes (Colubridae, Ahaetuliinae, *Dendrelaphis* Boulenger, 1890), from Mizoram State, Northeast India

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Couverture / *Cover* :
Adult *Dendrelaphis cyanochloris* (Wall, 1921) from Mizoram, Northeast India.

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ABSTRACT
We evaluate the presence of three sympatric species of Asian Bronzeback Snakes (genus *Dendrelaphis* Boulenger, 1890) from Mizoram State, India. These are taxonomically complicated species that were recently, either resurrected (*D. proarchos* Wall, 1909, *D. biloreatus* Wall, 1908) or redefined (*D. cyanochloris* (Wall, 1921)). In the light of morphological and molecular data, we confirm the validity of *D. proarchos* from Mizoram, Northeast India, and subsequently confer the specimen of

D. pictus (Gmelin, 1789) (CHS791) from Hainan (China) to *D. proarchos*. We also provide the first molecular phylogenetic data for the lesser-known species *D. biloreatus* as well as the first molecular samples of *D. cyanochloris* from Mizoram, Northeast India which seems to be the closest sample from Darjeeling, India (type locality). Apart from this, we also affirm the southwestern population in the distribution range of the latter species as *D. cyanochloris sensu stricto*, while conferring the southern population from Pinag Island, Malaysia to *D. vogeli* Jiang, Ren, Guo, Wang, Ding & Li, 2020, and the northeastern populations comprising Kachin (Myanmar), Tibet, Yunnan and Hainan (China) to *D. ngansonensis* (Bourret, 1935). Our present mitochondrial gene trees using the genes 16S rRNA, COI, and Cytb suggest the presence of cryptic diversity within several *Dendrelaphis* species, which will require rigorous genetic sampling and integrative taxonomic analysis to examine whether these lineages represent distinct species. This study also presents natural history and additional data on the distributional localities of *Dendrelaphis* species from Mizoram State, Northeast India.

KEY WORDS
Bronzeback Snakes,
integrated taxonomy,
phylogeny,
distribution,
Natural History.

RÉSUMÉ
Contribution à la systématique des Dendrelaphis *Boulenger, 1890, ou « serpents asiatiques à dos couleur bronze » (Colubridae, Ahaetuliinae, Dendrelaphis), du Nord-Est de l'Inde.*
Nous évaluons l'existence de trois espèces sympatriques du genre *Dendrelaphis* Boulenger, 1890 (« serpents asiatiques à dos couleur bronze ») dans l'État de Mizoram (Inde). Ces espèces sont compliquées du point de vue taxonomique et ont été récemment rétablies (*D. proarchos* Wall, 1909, *D. biloreatus* Wall, 1908) ou redéfinies (*D. cyanochloris* (Wall, 1921)). En nous fondant sur des données morphologiques et moléculaires, nous confirmons la présence de *D. proarchos* dans le Nord-Est de l'Inde et en déduisons l'appartenance du spécimen de *D. pictus* (Gmelin, 1789) (CHS791) de Hainan (Chine) à *D. proarchos*. Nous présentons également les premières données de phylogénie moléculaire pour *D. biloreatus*, espèce la moins connue, ainsi que les premiers échantillonnages moléculaires pour des spécimens de *D. cyanochloris* de Mizoram au Nord-Est de l'Inde, qui semblent être les plus proches de Darjeeling, Inde (localité type). En outre, nous confirmons également la population du sud-ouest dans l'aire de distribution de cette dernière espèce comme *D. cyanochloris sensu stricto*, et identifions la population du sud de l'île Pinag, Malaisie, à *D. vogeli* Jiang, Ren, Guo, Wang, Ding & Li, 2020, et les populations du nord-est localisées au Kachin (Myanmar), Tibet, Yunnan et Hainan (Chine) à *D. ngansonensis* (Bourret, 1935). Les arbres que nous avons contruits sur les gènes mitochondriaux 16S rRNA, COI et Cytb, suggèrent l'existence d'une diversité cryptique au sein de plusieurs espèces de *Dendrelaphis*. Un échantillonnage génétique poussé et des analyses taxonomiques intégratives seront nécessaires pour déterminer si ces lignées représentent des espèces distinctes. Notre étude présente également l'histoire naturelle et de nouvelles données sur la répartition des espèces de *Dendrelaphis* dans l'État du Mizoram au Nord-Est de l'Inde.

MOTS CLÉS
Dendrelaphis,
taxonomie intégrative,
phylogénie,
répartition,
histoire naturelle.

INTRODUCTION

The colubrid snake genus *Dendrelaphis* Boulenger, 1890 currently comprises 47 species (Uetz *et al.* 2021; Jiang *et al.* 2020). Historically, the taxonomic status of this genus has been ambiguous and incomplete, and only a few authors have attempted systematic revisions of different species (Vogel & van Rooijen 2008, 2011a; van Rooijen & Vogel 2008a). Nevertheless, several new *Dendrelaphis* species have been discovered in the past decade from South and Southeast Asia. Many species exhibit high amounts of phenotypic plasticity, which can make identification in the field challenging (Boulenger 1894; Wall 1921; Meise & Henning 1932; Mertens 1934; Smith 1943; Vogel & van Rooijen 2007, 2008, 2011a; van Rooijen & Vogel 2008a, b, 2012; Vogel *et al.* 2012; Wickramasinghe 2016; Jiang *et al.* 2020). As of now, 11 species of *Dendrelaphis* have been reported from India (Aengals *et al.* 2018) namely: *Dendrelaphis andamanensis* (Anderson, 1871), *Dendrelaphis ashoki* Vogel & van Rooijen, 2011a, *Dendrelaphis biloreatus* Wall, 1908, *Dendrelaphis chairecacos* (Boie, 1827), *Dendrelaphis cyanochloris* (Wall, 1921), *Dendrelaphis girii* Vogel & van Rooijen, 2011, *Dendrelaphis grandoculis* (Boulenger, 1890), *Dendrelaphis humayuni* Tiwari & Biswas, 1973, *Dendrelaphis pictus* (Gmelin, 1789) *sensu lato*, *Dendrelaphis subocularis* (Boulenger, 1888), and *Dendrelaphis tristis* (Daudin, 1803). *Dendrelaphis cyanochloris*, *D. biloreatus* (also as *D. gorei*), *D. pictus sensu lato* and *D. subocularis* were previously reported to inhabit Northeast India (Wall 1908;1921; Smith 1943; Wallach *et al.* 2014; Aengals *et al.* 2018), but their distributional patterns are still poorly understood in this region. From Mizoram State, earlier workers have reported *D.* cf. *pictus* (Pawar & Birand 2001), *D. pictus sensu lato* (Matthew 2007; Laltanpuia *et al.* 2008), and *D. cyanochloris* (Lalremsanga *et al.* 2011).

The systematics of the *Dendrelaphis* species complex has been updated several times in the past few decades, with recent studies resurrecting many names previously considered synonyms of *D. pictus sensu lato* such as *D. andamanensis*,

D. ngansonensis (Bourret, 1935) and *D. proarchos* Wall, 1909, as well as the description of a new species, *D. haasi* van Rooijen & Vogel, 2008a. In the latest review of this complex, the morphological features of *D. pictus* populations from Northeast India and adjacent Myanmar were evaluated and found to be significantly different from the populations of the *D. pictus* occurring further east (Vogel & van Rooijen 2011a). As such, these authors resurrected the name *D. proarchos* from synonymy for the former populations in the Indo-Burmese zoogeographic region. Prior to this study, the molecular information of *D. proarchos* was restricted to Myanmar, a place far away from its type locality (Figueroa *et al.* 2016; Jiang *et al.* 2020). Nonetheless, *D. proarchos* is currently recognized as a synonym of *D. pictus* by Uetz *et al.* (2021). Given the insufficient systematic information, the present study aims to confirm the taxonomic status of these three taxonomically debatable *Dendrelaphis* species from Northeast India. We employed a combination of morphology and mitochondrial DNA to confirm the species diversity and we also provide additional data on the natural history of nominate *Dendrelaphis* species, thus filling in the gap of knowledge.

MATERIAL AND METHODS

Abbreviations

Institutions

BMHN	British Museum of Natural History, London;
CAS	California Academy of Sciences, San Francisco;
LSUHC	La Sierra University Herpetological Collection, California;
MNHN	Muséum national d'Histoire naturelle, Paris;
MZMU	Departmental Museum of Zoology, Mizoram University, Mizoram;
MZU	Mizoram University, Mizoram.

Measurements

All head and body measurements were taken with a slide-caliper (Mitutoyo, 505-671) to the nearest 0.1 mm except for snout-vent length and tail length, which were measured with a ruler to the nearest 1 mm. We followed the ventral scale count method of Dowling (1951). Values for paired head scale characters are provided in left/right order. Dorsal scale rows are given at one head length behind the head, at mid-body, and one head length before the vent. The terminal scute is excluded from the number of subcaudals. Sex was determined by using a metal sexing probe in live specimens, whereas in preserved specimens, it was determined by making an incision at the base of the tail to detect the presence or absence of hemipenes.

As	anal shield;
ATe	anterior temporals;
DSR	dorsal scale row;
ED	eye diameter;
END	eye-nostril distance;
HL	head length;
HW	head width;
IF	infralabials;
IND	inter-narial distance;
IOD	inter-orbital distance;
Ls	loreal scale;
PoO	postoculars;
PrO	preoculars;
PTe	posterior temporals;
RTaL	relative tail length;
Sc	subcaudals.
SL	snout length;
SL	supralabials;
SLE	supralabials touching eye;
SVL	snout-vent length;
SW	snout width;
TaL	tail length;
Ve	ventrals.

Sampling

Herpetological field surveys and sampling were conducted after obtaining permission (No.A.33011/2/99-CWLW/225) from the Chief Wildlife Warden of Environment, Forests and Climate Change Department, Government of Mizoram. Both live and road-killed specimens of *Dendrelaphis* were collected from Mizoram State, Northeast India. Liver tissue sample was dissected out from each representative specimen and deposited at –20°C for further molecular-based investigation. Voucher specimens were fixed in 10% formalin, subsequently transferred to 70% ethanol, and deposited in the departmental Museum of Zoology, Mizoram University, India. Latitude and longitude of each sampling site was documented by using a portable GPS unit (Garmin Montana 650-GPS navigator), and all records were organized and plotted on a distributional map of *Dendrelaphis* species in the state (Appendix 1). Additional natural history information on *Dendrelaphis* specimens were also obtained from the field.

Molecular analyses

Genomic DNA was extracted from nine new specimens of the three *Dendrelaphis* species (*D. proarchos*, *D. cyanochloris* and *D. biloreatus*) by using DNeasy (Qiagen™) blood and tissue kits with manufacturer standard protocols. Fragments of mitochondrial cytochrome c oxydase I (COI) gene was amplified using LCO1490 and HCO2198 primers (Folmer *et al.* 1994), cytochrome b (Cytb) using mcb 398 and mcb 869 primers (Verma & Singh 2002), and 16S ribosomal RNA (16S rRNA) using primers L02510 (Palumbi 1996) and H3056 (Rassmann 1997). PCR amplifications were performed in a 25 µl volume following standard polymerase chain reactions (PCR) for each primer pairs. Amplified PCR products were subsequently purified and sequenced in both directions at Barcode BioSciences, Bangalore, India. After screening the chromatograms through nucleotide BLAST (https://blast.ncbi.nlm.nih.gov/) and ORF finder (https://www.ncbi.nlm.nih.gov/orffinder/), consensus sequences were submitted to GenBank and were deposited under the accession numbers listed in Appendix 3.

We acquired several sequences (15 16S rRNA, 7 COI, and 62 Cytb) of same or related species of *Dendrelaphis* from GenBank to form a combined dataset for the estimation of genetic divergence and phylogenetic analyses (Appendix 3). A total of three datasets (16S rRNA, COI, and Cytb) were constructed using our samples and publically available sequences from GenBank. Each of these datasets was aligned using ClustalW (Thompson *et al.* 1994). Kimura 2 parameter (K2P) genetic distances were estimated by using

MEGAX (Kumar *et al.* 2018). For Bayesian inference (BI) phylogeny, the best fitting nucleotide substitution models (GTR+G+I for 16S rRNA; GTR+G for COI; HKY+G+I for Cytb) were selected under the Akaike Information Criterion through Mr.Modeltest 2.4 (Nylander 2004). The BI phylogenetic trees were reconstructed in MrBayes 3.2.5 (Ronquist *et al.* 2012), the MCMC (one cold and three hot chains) were run for 20 million generations sampling one tree each 1000 generations, discarding the first 25% of the trees as burn-in, and further illustrated the trees in iTOL v5 software (Letunic & Bork 2021). For Maximum Likelihood (ML) phylogeny, the best fit models (TIM2+F+I+G4 for 16S rRNA; TIM2+F+I for COI; TPM2u+F+I+G4 for Cytb) were also selected through ModelFinder (Kalyaanamoorthy *et al.* 2017) under Bayesian Information Criterion. The ML phylogenetic reconstructions were subsequently performed in IQ-TREE (Nguyen *et al.* 2015) with 10 000 Ultrafast Bootstrap (UFB) (Minh *et al.* 2013). The database sequence of *Chrysopelea ornata* (GenBank: KX660217 for 16S rRNA; GenBank: MN788512 for COI; GenBank: LC105633 for Cytb) of family Colubridae Oppel, 1811 was used as an outgroup in all phylogenetic analyses.

SYSTEMATICS

Family COLUBRIDAE Oppel, 1811
Genus *Dendrelaphis* Boulenger, 1890

Dendrelaphis proarchos Wall, 1909
(Figs 1A, B; 6A, B; 7B)

Dendrophis proarchos Wall, 1909: 347; 1910: 827.

Dendrophis proarchus – Wall 1921: 157.

Dendrelaphis proarchos – Vogel & van Rooijen 2011a. — Das 2012. — Hakim *et al.* 2020. — Jiang *et al.* 2020.

TYPE MATERIAL. — Not located. According to Vogel & van Rooijen (2011a), the specimen examined by Wall was from the collection of St. Joseph's College, Darjeeling, India.

TYPE LOCALITY. —"Darjeeling," State of West Bengal, India, by inference; unknown collector.

MATERIAL EXAMINED. — **India** • 1 ♀; Assam, Dibrugarh; BMNH1908.6.23.27 • 1 ♀; Mizoram, Aizawl District, Durtlang; 23°14'0"N, 92°43'31"E; 1215 m a.s.l.; 6.VI.2017; Lal Biakzuala leg.; GenBank: MT635656; MZMU951 • 1 ♂; MZMU1066; Mizoram, Siaha District, Phura; 22°13'57"N, 92°54'45"E; 226 m a.s.l.; 7.VIII.2016; M. Vabeiryureilai leg. • 1 ♀; Mizoram, Mamit District, Reiek-kai; 23°42'43"N, 92°39'49"E; 150 m a.s.l.; 16.III.2013; H. T. Lalremsanga leg.; MZMU1077 • 1 ♂; Mizoram; Aizawl District, Sailam; 23°21'10"N, 92°47'53"E; 1312 m a.s.l.; 15.V.2014; H. T. Lalremsanga leg.; MZMU1078 • 1 ♂; Mizoram, Serchhip District, Buangpui; 23°42'15"N, 92°45'0"E; 710 m a.s.l.; 4.VIII.2017; Vanlal Hrima leg.; MZMU1079 • 1 ♂; Mizoram, Aizawl District, Sateek; 23°32'49"N, 92°42'12"E; 909 m a.s.l.; 18.VIII.2018; Lal Muansanga leg.; MZMU1080 • 1 ♀; Mizoram, Mamit District, Reiek Community Reserved Forest; 23°41'48"N, 92°36'19"E; 1166 m a.s.l.; 21.V.2017; G. Z. Hmar leg.; MZMU1101 • 1 ♂; Mizoram, Aizawl District, Tlangnuam; 23°42'23"N, 92°42'54"E; 1040 m a.s.l.; 12.V.2018; Lal Biakzuala leg.; GenBank: MT647129; MZMU1218 • 1 ♂; Mizoram, Lunglei District, Thenhlum; 23°11'51"N, 92°34'59"E; 687 m a.s.l.; 17.VIII.2014; H. T. Lalremsanga leg.; MZMU1327; GenBank: MT311195 • 1 ♂; Mizoram, Aizawl District, MZU campus; 23°44'15"N, 92°39'45"E; 789 m a.s.l.; 21.V.2019; Lalrinsanga leg.; GenBank: MT647128, MT711166; MZMU1370 • 1 ♀; Mizoram, Aizawl District, Maubuang; 23°29'15"N, 92°42'43"E; 1012 m a.s.l.; Denzil Lalneihsanga leg.; GenBank: MT635657; MZMU1432 • 1 ♂; Mizoram, Khawzawl District, Khawzawl; 23°32'34"N, 93°10'51"E; 1225 m a.s.l.; 7.VII.2018; H. T. Lalremsanga leg.; MZMU1475 • 1 ♂; Mizoram, Aizawl District, Kepran; 23°56'40"N, 92°55'50"E; 1360 m a.s.l.; 9.III.2018; H. T. Lalremsanga leg.; MZMU1507 • 1 ♀; Mizoram, Saitual District, Tamdil National Wetland; 23°44'24"N, 92°57'5"E; 774 m a.s.l.; H. T. Lalremsanga leg.; GenBank: MT634738; MZMU1509 • 1 ♀, 1 ♂; Mizoram, Serchhip District, Leng; 23°9'20"N, 93°7'14"E; 1230 m a.s.l.; H. T. Lalremsanga leg.; MZMU1510, MZMU1529 • 1 ♂; Mizoram, Serchhip District, Khawlailung; 23°13'12"N, 92°59'33"E; 1035 m a.s.l.; H. T. Lalremsanga leg.; MZMU1516 • 1 ♂; Mizoram, Aizawl District, Sesawng; 23°45'34"N, 92°51'14"E; 853 m a.s.l.; 15.VIII.2015; Lalrinsanga leg.; MZMU1566 • 1 ♂; Mizoram, Aizawl District, Daifim resort; 23°47'59"N, 92°37'29"E; 70 m a.s.l.; 11.VI.2019; H. Laltlanchhuaha leg.; MZMU1598 • 1 ♂; Mizoram, Aizawl District, Tanhril; 23°44'12"N, 92°40'33"E; 958 m a.s.l.; 16.IX.2019; Lalrinsanga leg.; MZMU1602 • 1 ♂; Mizoram, Mamit District, Dampa Tiger Reserve; 23°43'28"N, 92°23'40"E; 255 m a.s.l.; 10.VI.2016; Ht. Decemson leg.; MZMU1603 • 1 ♀; Mizoram, Aizawl District, Sialsuk; 23°23'50"N, 92°44'46"E; 1255 m a.s.l.; 7.X.2019; Angshuman Das leg.; GenBank: MT274567; MZMU1629.
Myanmar • 1 ♂; Sagaing Division; CAS210338; GenBank: KX660183, KX660456 (Figueroa *et al.* 2016) • 1 ♀; Ayeyarwady Division; GenBank: KX660182, KX660455; CAS222690 (Figueroa *et al.* 2016).
Laos • 2 ♀; no locality information; MNHN1896.650; MNHN1896.651 • 1 ♀; Phongsaly Province, Buon Tai; MNHN2004.0253 • 1 ♀; Phongsaly Province, Long Nai; MNHN2004.0254; • 2 ♂; Phongsaly Province; MNHN2004.0263; MNHN2004.0251.
Vietnam • 1 ♀; Tonkin; MNHN1948.82.

DIAGNOSIS (BASED ON NEW MATERIAL). — From a total of 34 *Dendrelaphis* specimens collected from the Mizoram State, 22 of them were morphologically diagnosed as *D. proarchos* based on the combination of: 1) bronze-coloured body with bluish interstitial skin and a black lateral stripe separating cream dorsolateral stripe from whitish underside; 2) enlarged vertebral scales; 3) Ve 180-190 in males, 186-195 in females; 4) paired Sc 142-163 in males, 138-146 in females; 5) undivided As in 36.4% of the specimens; 6) Ls single; 7) PrO 1; 8) PoO 2-3; 9) Te 2+2 or 2+3, rarely 3+2 or 1+2; 10) 4th–6th SLE; 11) IF 9-10, rarely 11; 12) SL 8-9; 13) DSR 15:15:9 in males, 15:15:11 in females, rarely nine rows in females; and 14) average relative RTaL 0.35 (0.31-0.37) in males, 0.33 (0.33-0.34) in females. The hemipenis is not bilobate, and extends up to seven caudal plates; a prominent sulcus spermaticus runs up to the tip; a sinuous fold is present at about the middle of the organ, and the distal area is covered by somewhat evenly distributed small spines. The new materials divulged a new upper limit of Sc range i.e, 138-163 (sex pooled) vs 138-156 (Vogel & van Rooijen 2011a). However, other morphological characters of the new materials are consistent with the specimens from Assam (Northeast India), Myanmar, Laos and Vietnam (also see Vogel & van Rooijen 2011a).

GEOGRAPHICAL DISTRIBUTION. — Northeast India, Bangladesh, Myanmar, northern Laos, and northern Vietnam (Vogel & van Rooijen 2011a). In this study, we documented *D. proarchos* from 22 different localities at the elevation range between 60-1360 m a.s.l. from Mizoram, Northeast India (Fig. 5; Appendix 1).

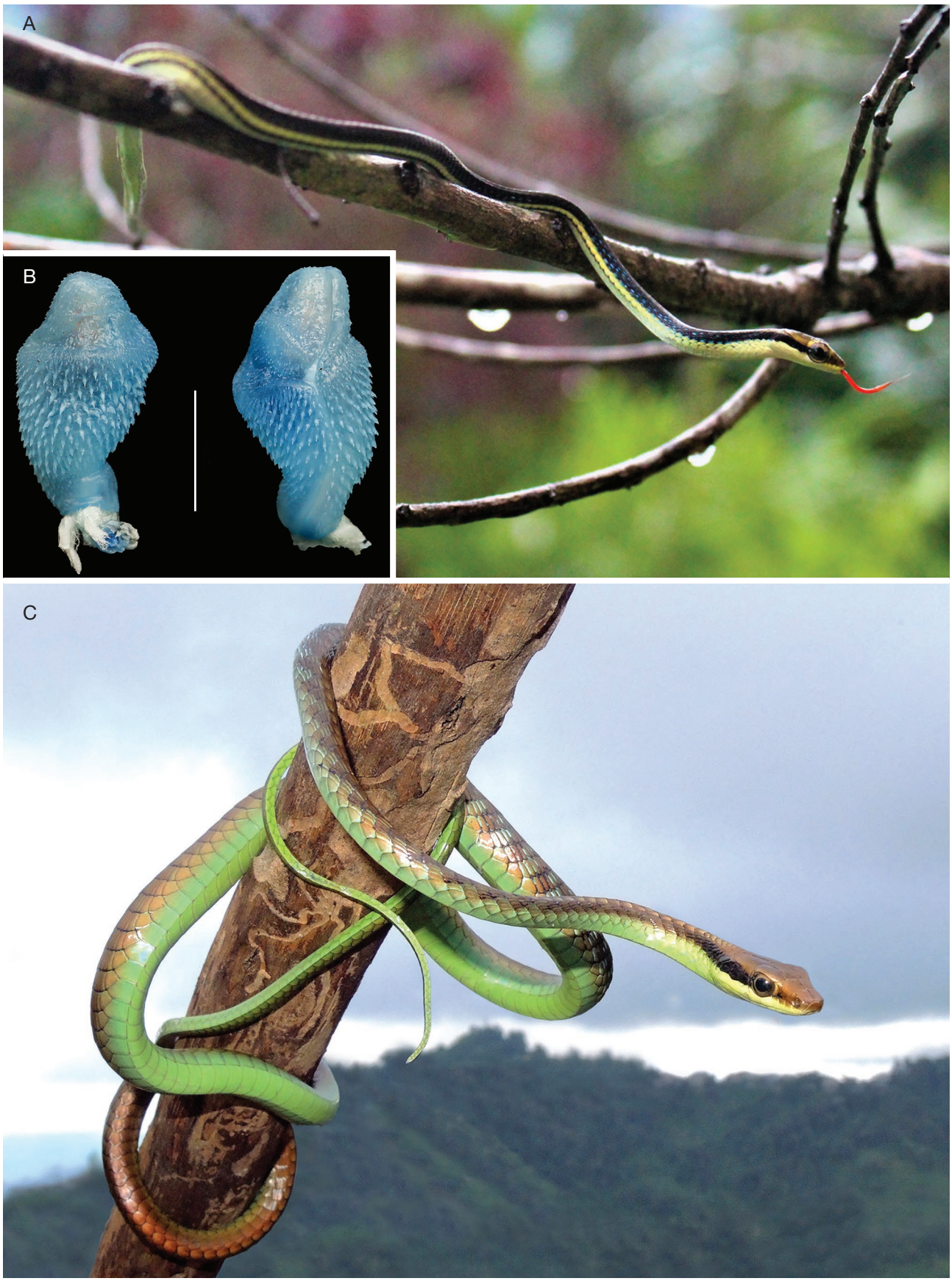

FIG. 1. — **A**, sub-adult *Dendrelaphis proarchos* Wall, 1909 from Mizoram, NE India; **B**, everted hemipenial sulcal side (right) and asulcal side (left) of *Dendrelaphis proarchos* from Mizoram, NE India; **C**, Adult *Dendrelaphis cyanochloris* (Wall, 1921) from Mizoram, NE India. Scale bar: B, 5 mm.

Dendrelaphis cyanochloris (Wall, 1921)
(Figs 1C; 7A)

Dendrophis pictus var. *cyanochloris* Wall, 1921: 155.

Dendrophis boiga cyanochloris – Meise & Hennig 1932.

Ahaetulla cyanochloris – Smith 1940: 482; 1943: 244.

Dendrelaphis cyanochloris – Manthey & Grossmann 1997: 337. — Cox *et al.* 1998: 70. — Wallach *et al.* 2014: 216.

TYPE MATERIAL EXAMINED. — **Lectotype** (as designated by Vogel & van Rooijen 2007). **India** • 1 ♂; BMNH1940.3.4.27.

TYPE LOCALITY.—Based on the designation of a lectotype by Vogel & van Rooijen (2007): "Darjeeling", West Bengal State, India. The original description of *D. cyanochloris* was partly based on specimens from India (Eastern Himalaya and Assam) and "Burma", now Myanmar, as well as specimens of *D. humayuni* Tiwari & Biswas, 1973.

MATERIAL EXAMINED. — **India** • 1 ♀; Mizoram, Saitual District, Keifang; 23°39'31"N, 92°57'38"E; 1035 m a.s.l.; 3.VII.2009; H. T. Lalremsanga leg. MZMU153 • 1 ♂; Mizoram, Aizawl District, Durtlang; 23°47'35"N, 92°44'1"E; 1104 m a.s.l.; 1.X.2019; Lal Biakzuala leg.; GenBank: MT711165; MZMU985; • 1 ♂; Mizoram, Siaha District, Palak National Wetland; 22°12'11"N, 92°53'6"E; 290 m a.s.l.; 3.V.2017; M. Vabeiryureilai leg.; MZMU1102 • 1 ♂; Mizoram, Mamit District, Dampa Tiger Reserve; 23°41'16"N, 92°26'43"E; 454 m a.s.l.; 9.V.2019; Ht. Decemson leg.; MZMU1472 • 1 ♂; Mizoram, Mamit District, Lengpui; 23°50'11"N, 92°38'5"E; 210 m a.s.l.; 5.IV.2016; Vanlal Hrima leg.; MZMU1473 • 1 ♀; Mizoram, Mamit District, Reiek Community Reserved Forest; 23°41'22"N, 92°36'16"E; 1300 m a.s.l.; 23.VI.2018; Lal Muansanga leg.; MZMU1476 • 1 ♀; Mizoram, Aizawl District, MZU campus; 23°44'17"N, 92°40'6"E; 873 m a.s.l.; 11.VIII.2019; Angshuman Das leg.; MZMU1560 • 1 ♂; Mizoram, Aizawl District, Sawleng; 23°58'52"N, 92°56'0"E; 1107 m a.s.l.; 4.VII.2009; Tbc. Lalbiaknunmawia leg.; MZMU1593.
Myanmar • 1 ♂; Kachin State, Putao District; CAS221428; GenBank: KX660454 (Figueroa *et al.* 2016).

DIAGNOSIS (BASED ON NEW MATERIAL). — The specimens of *D. cyanochloris* (N=8) are diagnosed by the combination of: 1) bronze-coloured body with conspicuous bluish interstitial skin, large black postocular streak from eye to nape, absence of lateral stripes along the body, and greenish underside; 2) Ve 184-207 in males, 183-210 in females; 3) paired Sc 138-153 in males, 138-144 in females; 4) divided As; 5) Ls single; 6) PrO 1; 7) PoO 2; 8) Te 2+2 or 3+2, rarely 1+2; 9) 4th-6th SLE; 10) IF 9-10; 11) SL 9; 12) DSR 15:15:11, rarely nine rows; and 13) average RTaL 0.32(0.30-0.36) in males, 0.29 (0.25-0.33) in females. The new materials from Mizoram, Northeast India enlarged the following morphological attributes (values for the lectotype are given in parentheses): Ve 184-207 in males and 183-210 in females (201); DSR at one head length before the vent 11, and rarely nine (11); SLE 4th-6th (5th-6th).

GEOGRAPHICAL DISTRIBUTION. — India (Darjeeling and Mizoram), the range of distribution is also discussed. In this study, specimens of *D. cyanochloris* were documented from 10 different localities at elevations between 100-1300 m a.s.l. from Mizoram, Northeast India (Fig. 5; Appendix 1).

Dendrelaphis biloreatus Wall, 1908
(Fig. 2A, B)

Dendrelaphis biloreatus Wall, 1908: 273, figs 1-5. — Vogel & van Rooijen 2011b. — Wallach *et al.* 2014: 215.

Dendrophis gorei Wall, 1910: 829.

Ahaetulla gorei – Smith 1943: 246.

Dendrelaphis gorei – Tian & Jiang 1986. — Dowling & Jenner 1988. — Das & Chaturvedi 1998. — Das 1996: 55.

TYPE MATERIAL. — **Holotype**. **India** • BMNH (no voucher number), a 690-700 mm specimen (native, June, 1907) (*fide* Wallach *et al.* 2014).

TYPE LOCALITY.— India, Sadiya on the Bramaputra 70 odd miles north-east of Dibrugarh (Wall 1908), now Sadiya, Assam State, NE India, 27°50'N, 95°40'E, elevation 125 m a.s.l. (Wallach *et al.* 2014).

MATERIAL EXAMINED. — **India** • 1 ♀; Mizoram, Kolasib District, Khuangpuilam; 24°12'13"N, 92°41'10"E; 665 m a.s.l.; 7.X.2019; Jacob Lalhriatrenga leg.; GenBank: MT711167, MT814708, MT731341, MT731342; MZMU1659 • 1 ♂; Mizoram, Aizawl District, MZU campus; 23°44'14"N, 92°39'47"E; 800 m a.s.l.; 6.VIII.2020; Michael Vanlalchhuana leg.; MZMU1812 • 1 ♂; Mizoram, Champhai District, Champhai Jail veng; 23°28'4"N, 93°19'0"E; 1420 m a.s.l.; 20.I.2021; Tbc. Lalpekthara leg.; MZMU2051.

DIAGNOSIS (BASED ON NEW MATERIAL). — Specimens of *D. biloreatus* (N = 4) are diagnosed by the combination of: 1) brownish dorsum with a black stripe on each side of head extending up to the neck; 2) upper and lower lips and chin yellowish; 3) Ve 203 in females, 190-198 in male; 4) paired Sc 137-151 in males, 102 in damaged tail female; 5) divided As; 6) Ls 1-2; 7) PrO 1; 8) PoO 2; 9) Te 1+2, 2+2, 2+3; 10) 4th–5th SLE; 11) IF 10; 12) SL 8; 13) DSR 13:13:11; and 14) average RTaL 0.32 (0.26-0.36) in males, and 0.28 in the damaged tail female. The new materials from this study updated the known morphological characters as follows: upper limit of Ve 190-203 vs 192 (Wall 1908) and 187-199 as *D. gorei* (Smith 1943); lower limit of Sc 137-151 vs 147 (Wall 1908) and 139-154 as *D. gorei* (Smith 1943); Te 1+2, 2+2, 2+3 vs 1+1 (Wall 1908; Smith 1943). In addition, we provide brief comparative morphological data between *D. cyanochloris*, *D. proarchos*, and *D. biloreatus* from other zoological collections, along with the new *Dendrelaphis* specimens collected from Mizoram State (Table 1). See Appendix 1 for the detailed collection records, and Appendix 2 for the morphometry and scalation data of *Dendrelaphis* species collected from Mizoram State, India.

GEOGRAPHICAL DISTRIBUTION. —This species inhabits the Assam Valley with the adjoining Himalayan foothills, and northern parts of Myanmar near the border with Assam (Vogel & van Rooijen 2011b). In this work, *D. biloreatus* is documented from four localities in Mizoram state at the elevation range of 443-1,420 m a.s.l. (Fig. 5; Appendix 1)

MOLECULAR SYSTEMATICS

A total of two16S rRNA sequences (GenBank: MT731341, MT731342) and two Cytb sequences (GenBank: MT711167, MT814708) of *D. biloreatus*; one Cytb sequence (GenBank: MT711165) of *D. cyanochloris*; two 16S rRNA sequences (GenBank: MT274567, MT634738), five COI sequences (GenBank: MT311195, MT635656, MT635657, MT647128, MT647129) and one Cytb sequence (GenBank: MT711166) of *D. proarchos* were generated in the present study.

The mitochondrial 16S rRNA dataset (449 bp) showed 16.49% variable sites within the eight *Dendrelaphis* species. The overall mean genetic distance was 5.2% in this dataset. The mean intra-species genetic distance was ranging from 1.3% (0.0%-2.2%) in *D. proarchos* to 3.8% in *D. cyanochloris*. Regardless of the *D. cyanochloris+ngansonensis* species

FIG. 2. — **A**, *Dendrelaphis biloreatus* Wall, 1908 in life, showing anterior body and head from Kolasib, Mizoram, NE India. Inset: Dorso-lateral view of the head showing two loreal scales; **B**, juvenile *Dendrelaphis biloreatus* (MZMU1812) in life from MZU Campus, Mizoram, NE India, photographed by Tbc. Lalhruaitluangi. Inset: Antero-lateral view of the head showing single loreal scale, photographed by Romalsawma.

TABLE 1. — Morphometric (in mm) and scalation data of *Dendrelaphis* Boulenger, 1890 species examined for this study. Paired values are given as left/right order. Symbol: * indicates damaged or incomplete characters, and hyphens indicate unavailable data).

Species	*D. cyanochloris sensu stricto*			*D.* cf. *vogeli*	*D.* cf. *ngansonensis*	*D. proarchos* (also see Vogel & van Rooijen 2011a)					*D. biloreatus*		
Vouchers	BMNH 1940.3.4.27 (Lectotype)	MZMU		LSUHC 6768	CAS 221428	CAS 210338	CAS 222690	BMNH 1908.6.23.27	MZMU		BMNH no voucher (Holotype)	MZMU	
Origin	Darjeeling, NE India	Mizoram, NE India		Pulau Pinang, Malaysia	Kachin, Myanmar	Sagaing, Myanmar	Ayeyarwady, Myanmar	Assam, NE India	Mizoram, NE India		Dibrugarh, India (*fide* Wall 1908)	Mizoram, NE India	
Sex	♂ (n = 1)	♂ (n = 5)	♀ (n = 3)	Unsexed (n = 1)	♂ (n = 1)	♂ (n = 1)	♀ (n = 1)	♀ (n = 1)	♂ (n = 15)	♀ (n = 7)	–	♂ (n = 3)	♀ (n = 1)
ED	4.4	3.8 (3.45-4.22)	3.4 (2.25-4/64)	5.1	4.4	5.0	4.9	5.1	3.8 (2.45-4.58)	4.5 (3.23-5.07)	–	3.5 (2.78-4.71)	3.3
HL	19.0	17.0 (14.20-20.04)	15.6 (10.19-21.93)	21.0	18.5	23.0	23.8	*	16.8 (11.69-26.68)	21.5 (14.83-24.88)	–	15.9 (12.48-22.12)	14.7
ED/HL	0.232	0.226 (0.183-0.261)	0.182 (0.161-0.205)	0.243	0.238	0.217	0.206	*	0.233 (0.160-0.281)	0.209 (0.186-0.239)	–	0.222 (0.211-0.243)	0.221
SVL	590	386-663	249-805	695	530	750	810	815	281-720	446-840	700 (Total length)	409-898	594
TaL	260	214-300	120-330	320	250	420	390	395	142-388	226-421		220-321	231
RtaL	0.31	0.32 (0.30-0.36)	0.29 (0.25-0.33)	0.32	0.32	0.36	0.33	0.33	0.35 (0.31-0.37)	0.33 (0.33-0.34)	0.34	0.32 (0.26-0.36)	0.28*
Ve	201	184-207	183-210	190	188	181	191	191	180-190	186-195	192	190-198	203
Sc	137	138-153	138-144	137	146	150	131*	137	142-163	138-146	147	137-151	102*
DSR	15-15-11	15-15-11(9)	15-15-11	15-15-11	17-15-11	15-15-9	15-15-11	15-15-11	15-15-9	15-15-11(9)	13-13-9	13-13-11	13-13-11
SL	9/9	9/9	9/9	9/9	9/8	9/9	9/9	9/9	9(rarely 8)/9	9/9	9	8/8	8/8
SLE	5th-6th	4th-6th	4th-6th	4th-6th	4th-6th	4th-6th	4th-6th	4th-6th	4th-6th	4th-6th	3 scales	4th-5th	4th -5th
IF	9/10	9(10)/9(10)	9(10)/9	10/9	10/10	10/10	10/10	10/9	10(9,11)/10(9)	10/10(9)	–	10/10	10/10
Ls	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	2	1/1, 2/2	1/1
ATe	2/2	2(1,3)/2(1,3)	3(2)/2	1/1	2/2	2/2	2/2	2/2	2(3)/2(1,3)	2/2	1	1/1	2/2
PTe	2/2	2/2	2/3(2)	2/2	1/1	2/2	1/1	1/2	2(3)/2(1,3)	2(1,3)/2(3)	1	2/2	2/3
PoO	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2/2	2or3/2(3)	3(2)/2(3)	2	2/2	2/2
PrO	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1/1	1	1/1	1/1
As	2	2	2	2	2	2	2	1	1 or 2	1 or 2	2	2	2

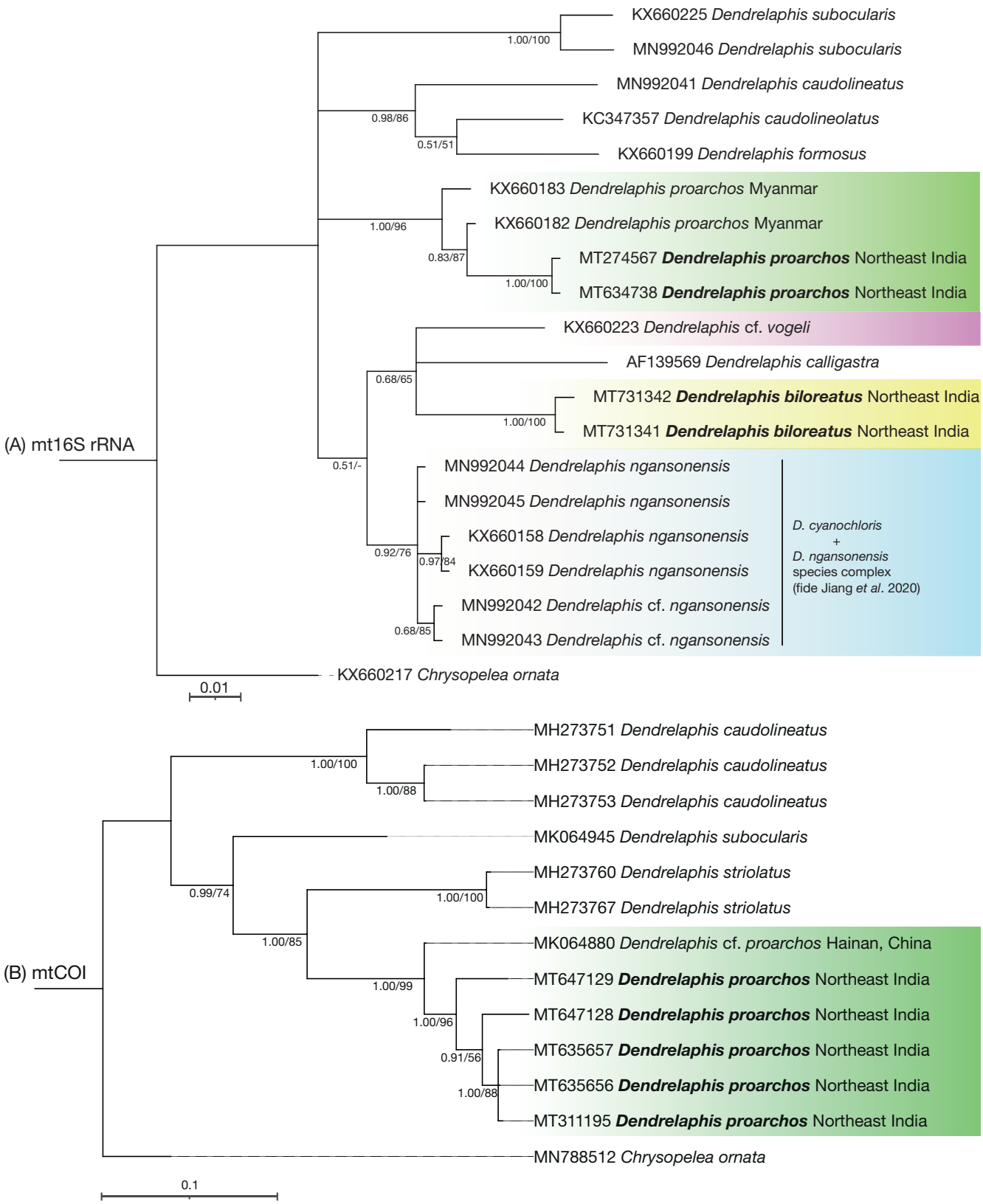

Fig. 3. — **A**, BI phylogenetic tree estimated by mitochondrial 16S rRNA and; **B**, partial COI sequences depicting the phylogenetic relationships of *Dendrelaphis* Boulenger, 1890 species with BPP/UFB support at the branch nodes. Sequences generated in this study are shown in bold.

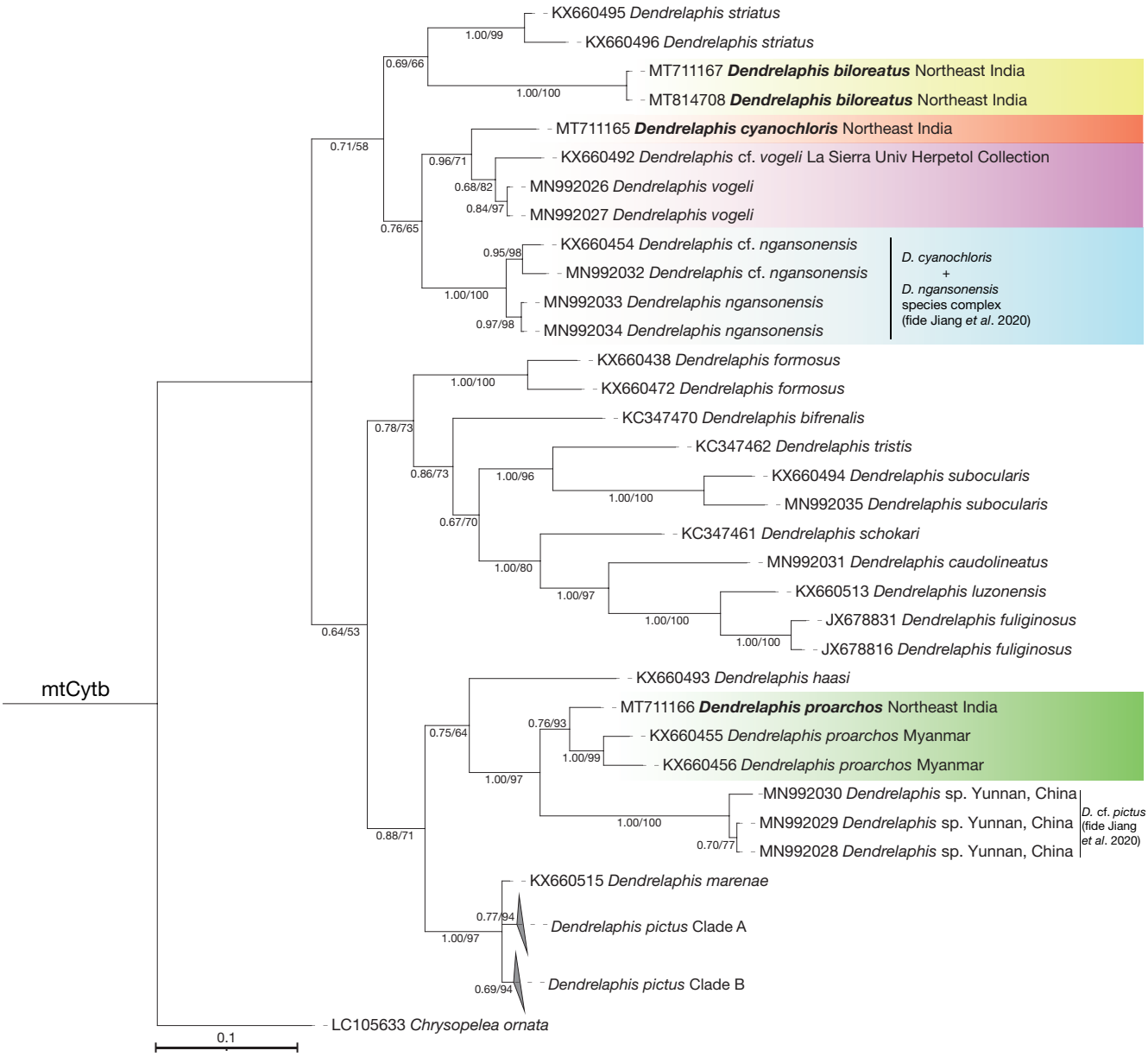

Fig. 4. — BI phylogenetic tree estimated by mitochondrial Cytb sequences depicting phylogenetic relationships of *Dendrelaphis* Boulenger, 1890 species with BPP/UFB support at the branch nodes. Sequences generated in this study are shown in bold.

complex, the mean inter-species genetic distance ranged from 4.7% (*D. cyanochloris* vs *D. biloreatus*) to 9.1% (*D. calligastra* vs *D. subocularis*). The studied species, *D. proarchos* and *D. biloreatus* revealed a 7.8% genetic distance between them. In the 16S rRNA based BI and ML phylogenies, the studied *Dendrelaphis* species (*D. biloreatus* and *D. proarchos*) also showed distinct lineages with sufficient Bayesian posterior probabilities (BPP) and UFB values (Fig. 3A).

The mitochondrial COI dataset (621 bp) showed 29.63% variable sites within the five *Dendrelaphis* species. The overall mean genetic distance was 15.4% in the study's dataset. The mean intra-species genetic distance ranged from 0.2% (*D. striolatus*) to 7.2% (*D. caudolineatus*). In *D. proarchos*, the mean intra-species genetic divergence is 3.0% (0.0%–6.0%). The mean inter-species genetic distance ranged from 3.8% (*D. pictus* [*fide* Li *et al.* (2020)] vs *D. proarchos*) to 22.3% (*D. caudolineatus* vs *D. proarchos*). The COI based BI and ML phylogenies distinctly separate all *Dendrelaphis* species with sufficient BPP (0.91-1.00) and UFB (56%–100%) values (Fig. 3B). Notably, the specimen of *D. pictus* (CHS791; GenBank: MK064880) (*fide* Li *et al.* 2020), collected from Hainan, China is forming the sister species to the Northeast Indian *D. proarchos* and showed a close relationship with a 3.3% genetic distance.

The mitochondrial Cytb dataset (410 bp) showed 43.41% variable sites within the studied *Dendrelaphis* species. The overall mean genetic distance was 17.9% in the study dataset, and the mean inter-species genetic distance was ranging

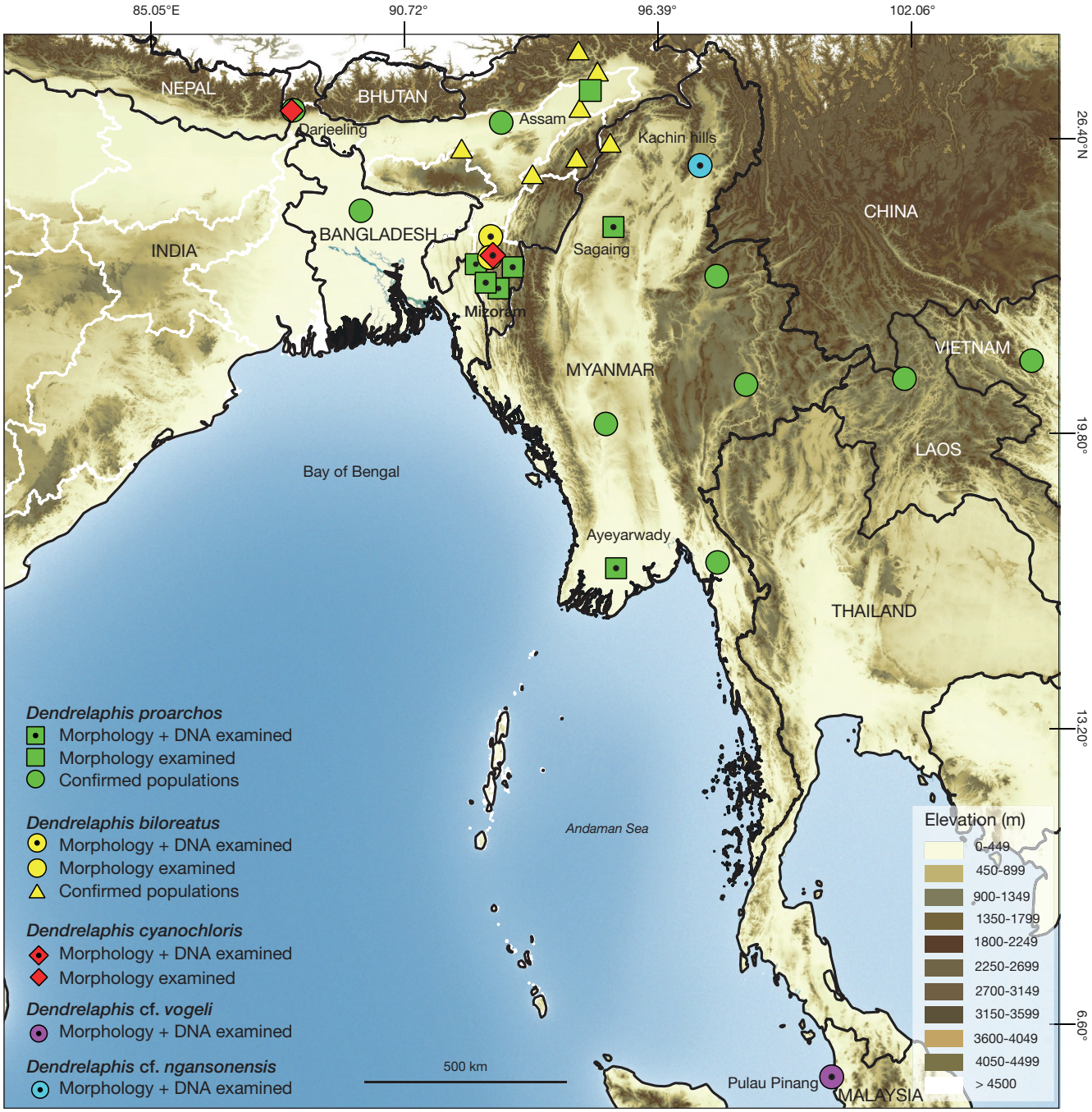

FIG. 5. — Elevation map showing the specimens location of *Dendrelaphis proarchos* Wall, 1909 (**green shapes**), *Dendrelaphis biloreatus* Wall, 1908 (**yellow shapes**), *Dendrelaphis cyanochloris* (Wall, 1921) (**red shapes**), *Dendrelaphis* cf. *vogeli* LSUHC 6768 (**purple circle with dot**), and *Dendelaphis* cf. *ngansonensis* CAS221428 (**blue circle with dot**) examined in this study. Confirmed populations of *Dendrelaphis proarchos* (**green circles**) and *Dendrelaphis biloreatus* (**yellow triangles**) are based on Vogel & van Rooijen (2011a, b).

from 1.6% (*D. pictus* Clade A + B vs *D. marenae*) to 27.1% (*D. subocularis* vs *D. fuliginosus*). Excluding the species-complex, the mean intra-species genetic distance ranged from 0% (*D. biloreatus*) to 7.4% (*D. subocularis*). Regardless of the genetic distance from *D. pictus* + *D. marenae* species group, and by considering the low inter-species genetic distance (5.4%) between *D. cyanochloris* and *D. vogeli*, high intra-species genetic distance was observed in three species, *D. formosus* (6.7%), *D. proarchos* (5.1%), and *D. subocularis* (7.4%). The study species showed sufficient genetic distances from other *Dendrelaphis* species: *D. biloreatus* (ranging from 15.7% with *D. cyanochloris* to 23.9% with *D. luzonensis*), *D. cyanochloris* (ranging from 5.4% with *D. vogeli* to 26.4% with *Dendrelaphis* sp.), and *D. proarchos* (ranging from 11.0% with *D. marenae* to 22.9% with *D. subocularis*). The Northeast Indian *D. cyanochloris* showed a 7.4% genetic distance with *D.* cf. *vogeli* (KX660492) vouchered as LSUHC 6768 from Pinang Island, West Malaysia (also see Jiang *et al.* 2020), while

Fig. 6. — Two specimens of *Dendrelaphis proarchos* Wall, 1909 found sheltered inside a green bamboo: **A**, from Kepran, photographed by Tbc. Mapuia; **B**, from Tlangnuam, photographed by C. Mawitea.

Fig. 7. — **A**, *Dendrelaphis cyanochloris* (Wall, 1921) preying on adult *Calotes emma* Gray, 1845, photographed by R. Lalnunmawia; **B**, *Dendrelaphis proarchos* Wall, 1909 preying on adult *Duttaphrynus melanostictus* (Schneider, 1799), photographed by Hawla Hmar Zote.

the mean genetic distance between *D. vogeli* and *D.* cf. *vogeli* is only 2.6%. So, obviously, the southern form belongs to *D.* cf. *vogeli*, as pointed out previously in Jiang *et al.* (2020). Further, the specimens of *D. proarchos* collected from Northeast India showed 5.0% to 6.3% genetic distance with the conspecifics (KX660455 and KX660456) collected from Myanmar Ayeyarwady Region and Sagaing Region, and vouchered as CAS222690 and CAS210338, respectively. Both specimens were determined as *D. proarchos* by Vogel & van Rooijen (2011a). This is quite surprising, as the distance between Mizoram and Sagaing is only around 250 km. The Cytb based BI and ML phylogenies distinctly separate all *Dendrelaphis* species with sufficient BPP (0.64-1.0) and UFB (53%-100%) supports (Fig. 4). The present phylogeny also depicted a clustering of *D. cyanochloris+ngansonensis* species complex (*fide* Jiang *et al.* 2020) with 2.5% intra-clade genetic distance.

Natural history

Upon examining preserved specimens, a female *D. proarchos* (MZMU 951) collected from the Durtlang locality on 6 June 2017 was found gravid with seven eggs measuring 36.76-43.32 mm (length) and 11.21-13.36 mm (width). Notably, two specimens of *D. proarchos* collected from the Kepran and Tlangnuam localities were found sheltered inside pieces of bamboo that contained holes into which the snakes must have entered (Fig. 6A, B).

Moreover, on 8 September 2019 at *c.* 1100 h, we documented a *D. cyanochloris* preying on an adult *Calotes emma* Gray, 1845 in Durtlang, Aizawl District, Mizoram (23°47'35"N, 92°44'1"E; 1,104 m a.s.l.) (Fig. 7A). We also documented a *D. proarchos* swallowing an adult *Duttaphrynus melanostictus* (Schneider, 1799) at *c.* 0930 h, on 1 June 2017, near a forest pathway in Khawlailung, Champhai District, Mizoram (23°13'12"N, 92°59'33"E; 1,035 m a.s.l.) (Fig. 7B).

DISCUSSION

The present study points out the diversity of *Dendrelaphis* species in Northeast India. We identified three species, *D. bilorea-tus*, *D. cyanochloris*, and *D. proarchos* by using the combined approach of morphology and mitochondrial DNA sequence data. Historically, *D. pictus* has been reported from Northeast India (Das *et al.* 2009; Purkayastha *et al.* 2011; Sengupta *et al.* 2019). Wall (1909) collected 24 specimens of *Dendrelaphis* from Assam, India (Sadiya, North Lakhimpur, Doom Dooma and Dibrugarh) which were morphologically similar to *D. pictus* but differed from it by an undivided anal shield and dentition. Subsequently, based on the undivided anal shield, Wall (1909, 1910) described a distinct taxon, *D. proarchos*, from Northeast India and Myanmar. Later on, Smith (1943) synonymized *D. proarchos* with *D. pictus* due to the unstable morphology of the anal shield. Recently, based on multivariate statistics of morphometric data from 48 North-

east Indian and Burmese specimens, Vogel & van Rooijen (2011a) resurrected the taxon *D. proarchos* from *D. pictus*. Moreover, we also agree that the single loreal scale in three of the studied specimens of *D. biloreatus* confirms the opinions of Vogel & Rooijen (2011b) stating that the presence of a double loreal in the type specimen is likely to be based either on an anomalous specimen or a misjudgment.

Our extensive field surveys from the past decade have yielded quite a few specimens of *D. proarchos*, *D. cyanochloris* and *D. biloreatus*, but most of them were road-killed specimens, or were found dead in the field except for *D. biloreatus*. Among the examined specimens of *D. proarchos*, 36.4% showed an undivided cloacal shield, a value which is almost similar to the previous record (40%) by Vogel & van Rooijen (2008) who considered this to be a unique feature within the genus. It is noted that *D. proarchos* differs from *D. pictus* in numbers of Ve (173-198, avg. 185 vs 166-178, avg. 172 in *D. pictus*) and Sc (131-156, avg. 144 vs 113-147, avg. 131 in *D. pictus*). The Ve and Sc ranges of the studied specimens (Ve 180-195, avg. 186.9; Sc 138-163, avg. 146.8) congruent with the Ve and Sc ranges of *D. proarchos* as listed in Vogel & van Rooijen (2011a). The mitochondrial Cytb sequences also revealed shallow divergences (5.0% to 6.3%) between the Mizoram and Burmese population of *D. proarchos*. Further, the molecular data also readily separated specimens of *D. proarchos* from those of *D. pictus* (Clade A + B) with the inter-species genetic divergences of 11.0%–11.6%; also from *D.* cf. *pictus* (*fide* Jiang *et al.* 2020) collected from Yunnan, China with deep genetic divergence (14.1%) in Cytb gene. Based on both genetic and morphological data, the present study confirms the validity of *D. proarchos* previously resurrected by Vogel & van Rooijen (2011a). Moreover, considering the previously recognized population that could either be *D. pictus* or *D. proarchos* from Hainan Island, China, by Vogel & van Rooijen (2011a), and the shallow inter-species genetic divergence (3.9%) observed between *D. pictus* (CHS791) (*fide* Li *et al.* 2020) and *D. proarchos* from Mizoram (India) in the study COI gene, we suggest the specimen of *D. pictus* (*fide* Li *et al.* 2020) from the aforementioned locality can be conferred to *D. proarchos*.

The lack of sequence data available for *Dendrelaphis* has limited our understanding of the group, thus creating a gap in our understanding of their true diversity. Some authors still treat *D. proarchos* as a synonym of *D. pictus* due to lack of unequivocally substantial morphometric evidence to differentiate the two species (see Uetz *et al.* 2021), while others treat the two as distinct species (Vogel & van Rooijen 2011a; Wallach *et al.* 2014). Hence, this work not only provides a genetic confirmation of the morphology-based hypothesis on *Dendrelaphis* species diversity in Northeast India (e.g. Vogel & van Rooijen 2011a) but also enriches global databases with new samples that future studies can utilize to help identify lineages. Wall (1908, 1909, 1910, 1921) erected many species series nomina of the genus *Dendrelaphis* from Northeast India. But yet, many of the existing sequences associated with these nominate taxa, only come from Myanmar. Therefore, these novel sequences from Mizoram originating further closer to the type locality are important for our understanding of *Dendrelaphis* taxonomy by and large. Furthermore, the present molecular analysis distinguished all the *Dendrelaphis* species included in this study for each mitochondrial gene (16S rRNA, COI, and Cytb), BI + ML topologies and genetic distances. Both BI and ML trees were also congruent with the previous evolutionary hypothesis on the *D. cyanochloris+ngansonensis* species complex (Pyron *et al.* 2013; Figueroa *et al.* 2016; Jiang *et al.* 2020). The Cytb based BI phylogeny also showed the two distinct clades of *D. cyanochloris+vogeli* and *D. cyanochloris+ngansonensis* with well supported nodes. However, the studied *D. cyanochloris* genetic data sampled from the Mizoram State (Northeast India) seems to be the closest sample from the taxon type locality (Darjeeling, India) (see Vogel & van Rooijen 2007). Considering the low inter-species genetic divergences between *D. marenae* and *D. pictus* in the Cytb gene, and the high intra-species genetic distances within the COI and Cytb genes in the sampled species, we hypothesise the presence of possible cryptic diversity in seven *Dendrelaphis* species (*D. proarchos*, *D. pictus*, *D. marenae*, *D. caudolineatus*, *D. cyanochloris*, *D. formosus* and *D. subocularis*). Moreover, owing to the shallow K2P divergence (3.8%), we also hypothesise that the specimen of *D.* cf. *cyanochloris* (*fide* Jiang *et al.* 2020) vouchered in the La Sierra University Herpetological Collection from Pinang Island, Malaysia is most likely conspecific with species recently described, *D. vogeli* from southern Yunnan, China. So, it is possible that the *D.* cf. *cyanochloris* (*fide* Jiang *et al.* 2020) population living in the south of the distribution range must be conferred the name *D. vogeli*, whereas only the northwestern population must keep the name *D. cyanochloris sensu stricto*, since Darjeeling is its type locality.

Adding to this, we present updated distributional records for *D. proarchos* with its sympatric congeners *D. cyanochloris* and *D. biloreatus,* and suggest that the former two species are quite common in the region while the latter one is rarely encountered. Both *D. cyanochloris* and *D. proarchos* are often encountered near human habitations as well as plantation sites that could be a significant threat to their population, as the killing of these species was frequently encountered by the local people. The documentation of *D. biloreatus* represents the first report from Mizoram state in Northeast India. The documentation on the preying of *D. proarchos* on *Duttaphrynus melanostictus* and *D. cyanochloris* on *Calotes emma* come in as additional biological information on their diet.

CONCLUSION

In this study, we highlight the importance of generating more DNA sequence data (mitochondrial and nuclear genes) from different localities to assess the true diversity and taxonomy of *Dendrelaphis* in Southeast Asia. We also advocate sequencing tissue samples of these nominate taxa from the type localities (Sadiya and Darjeeling), situated to the north of the Brahmaputra River, a known biogeographic barrier. Even so, we are convinced of the validity of *D. ngansonensis* at species level, therefore, we confer the northeastern populations of *D. cyanochloris* from Tibet, Yunnan and Hainan (China) as

well as the Burmese specimen (CAS221428) that clustered with *D. ngansonensis* in the present phylogenetic analyses to *D. ngansonensis*; while the southwestern populations of *D. cyanochloris* comprising Darjeeling (type locality) up to Mizoram, Northeast India to remain as *D. cyanochloris sensu stricto*, and the southern population of *D.* cf. *cyanochloris* (LSUHC 6768) (*fide* Jiang *et al.* 2020) from Pinang Island, Malaysia to *D. vogeli*. In this study, we also ratify the validity of the nomen *D. proarchos* from Mizoram, Northeast India. Given, the shallow genetic divergence (3.9%) between *D. pictus* (CHS791) (*fide* Li *et al.* 2020) and *D. proarchos* from Mizoram (India) in the COI gene, we confer the specimen of *D. pictus* (CHS791) from Hainan Island, China to *D. proarchos*. Furthermore, considering the deep genetic divergence (14.1%) between *D. proarchos* from Mizoram (India) and *D.* cf. *pictus* (*fide* Jiang *et al.* 2020) from Yunnan (China) in the Cytb gene, we regard the Chinese *D.* cf. *pictus* population as undescribed species of *Dendrelaphis.*

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APPENDICES

APPENDIX 1. — Distributional data of *Dendrelaphis* species documented in Mizoram State with date, locality, coordinates, and elevation (in meters a.s.l.). Bold voucher numbers denote the specimens used for the molecular analysis. Symbol: *, specimen not vouchered.

Species	Voucher no.	Date	Locality	Grid references	Elevation
D. cyanochloris	MZMU153	3 Jul. 2009	Keifang	23°39'31"N, 92°57'38"E	1035
D. cyanochloris	MZMU1593	4 Jul. 2009	Sawleng	23°58'52"N, 92°56'0"E	1107
D. proarchos	MZMU1077	16 Mar. 2013	Reiek-kai	23°42'43"N, 92°39'49"E	150
D. proarchos	MZMU1078	15 May 2014	Sailam	23°21'10"N, 92°47'53"E	1312
D. proarchos	**MZMU1327**	17 Aug. 2014	Thenhlum	23°11'51"N, 92°34'59"E	687
D. cyanochloris	MZMU1473	5 Apr. 2015	Dapchhuah	23°46'18"N, 92°31'7"E	100
D. cyanochloris	MZMU1560	3 Jul. 2015	Lungdai	23°53'0"N, 92°44'31"E	1140
D. proarchos	MZMU1566	15 Aug. 2015	Sesawng	23°45'34"N, 92°51'14"E	853
D. cyanochloris	MZMU1473	5 Apr. 2016	Lengpui	23°50'11"N, 92°38'5"E	410
D. proarchos	MZMU1603	10 June. 2016	Dampa (DTR)	23°43'28"N, 92°23'40"E	255
D. proarchos	MZMU1066	7 Aug. 2016	Phura	22°13'57"N, 92°54'45"E	226
D. cyanochloris	MZMU1102	3 May 2017	Palak	22°12'11"N, 92°53'6"E	290
D. proarchos	MZMU1101	21 May 2017	Reiek	23°41'48"N, 92°36'19"E	1166
D. proarchos	MZMU1516	1 Jun. 2017	Khawlailung	23°13'12"N, 92°59'33"E	1035
D. proarchos	**MZMU951**	6 Jun. 2017	Durtlang	23°14'0"N, 92°43'31"E	1215
D. proarchos	MZMU1079	4 Aug. 2017	Buangpui	23°42'15"N, 92°45'0"E	710
D. proarchos	**MZMU1218**	12 May 2018	Tlangnuam	23°47'0"N, 92°42'54"E	1040
D. proarchos	MZMU1507	9 Mar. 2018	Kepran	23°56'40"N, 92°55'50"E	1360
D. proarchos	**MZMU1432**	16 Jun. 2018	Maubuang	23°29'15"N, 92°42'43"E	1012
D. cyanochloris	MZMU1476	23 Jun. 2018	Reiek	23°41'22"N, 92°36'16"E	1300
D. proarchos	MZMU1475	7 Jul. 2018	Khawzawl	23°32'34"N, 93°10'51"E	1225
D. proarchos	**MZMU1509**	15 Jul. 2018	Tamdil	23°44'24"N, 92°57'5"E	774
D. proarchos	MZMU1510	29 Jul. 2018	Leng	23°9'20"N, 93°7'14"E	1230
D. proarchos	MZMU1080	18 Aug. 2018	Sateek	23°32'49"N, 92°42'12"E	909
D. proarchos	MZMU1598	11 Jun. 2019	Daifim Resorts	23°47'59"N, 92°37'29"E	70
D. cyanochloris	MZMU1472	9 May. 2019	Dampa (DTR)	23°41'16"N, 92°26'43"E	454
D. proarchos	**MZMU1370**	21 May. 2019	MZU Campus	23°44'15"N, 92°39'45"E	789
D. cyanochloris	MZMU1560	11 Aug. 2019	MZU Campus	23°44'17"N, 92°40'6"E	873
D. proarchos	MZMU1602	16 Sep. 2019	Tanhril	23°44'12"N, 92°40'33"E	958
D. cyanochloris	**MZMU985**	1 Oct. 2019	Durtlang	23°47'35"N, 92°44'1"E	1104
D. proarchos	**MZMU1629**	7 Oct. 2019	Sialsuk	23°23'50"N, 92°44'46"E	1255
D. biloreatus	*	11 Sep. 2011	Vaipuanpho	23°42'35"N, 92°38'25"E	443
D. biloreatus	*	27 Oct. 2017	Kolasib	24°13'19"N, 92°41'0"E	580
D. biloreatus	**MZMU1659**	25 May 2020	Khuangpuilam	24°12'13"N, 92°41'10"E	665
D. biloreatus	MZMU 1812	6 Aug. 2020	MZU Campus	23°44'14"N, 92°39'47"E	800
D. biloreatus	MZMU 2051	20 Jan. 2021	Champhai Jail veng	23°28'4"N, 93°19'0"E	1420

Appendix 2. — Morphometric (in mm) and scalation data of *Dendrelaphis proarchos* Wall, 1909 (**Dp**), *Dendrelaphis cyanochloris* (Wall, 1921) (**Dc**) and *Dendrelaphis biloreatus* Wall, 1908 (**Db**) from Mizoram State, Northeast India. Paired values are given as left/right order. Symbols: *****, damaged scales and/or broken body parts; **#**, specimen not vouchered.

Voucher number	Sp.	Sex	ED	END	IOD	IND	SVL	TaL	SW	SL	HL	HW	RtaL	Ve	Sc	DSR	SL	SLE	IF	Ls	ATe	PTe	PoO	PrO	As
MZMU 951	Dp	♀	5,06	4,71	8,51	5,57	825	421	5,74	6,51	24,15	13,47	0,337	186	146	15-15-11	9L/9R	4th-6th	10L/10R	1L/1R	2L/2R	1L/2R	2L/2R	1L/1R	2
MZMU 1077	Dp	♀	3,62	3,54	5,79	4,07	648	315	3,95	5,38	19,51	9,91	0,327	193	141	15-15-11	9L/9R	4th-6th	10L/10R	1L/1R	2L/2R	3L/2R	3L/2R	1L/1R	1
MZMU 1101	Dp	♀	4,76	4,14	7,04	3,82	620	*	5,35	6,37	19,89	9,9	*	194	*	15-15-11	9L/9R	4th-6th	10L/9R	1L/1R	2L/2R	3L/3R	3L/3R	1L/1R	2
MZMU 1432	Dp	♀	4,7	4,13	7	4,56	769	390	4,91	6,76	22,33	12,25	0,336	187	144	15-15-11	9L/9R	4th-6th	10L/10R	1L/1R	2L/2R	2L/2R	3L/3R	1L/1R	2
MZMU 1509	Dp	♀	4,88	4,14	9,2	4,4	840	282	5,04	6,98	24,65	14,5	*	194	*	15-15-11	9L/9R	4th-6th	10L/10R	1L/1R	2L/2R	2L/2R	3L/2R	1L/1R	1
MZMU 1510	Dp	♀	5,07	4,77	8,68	4,76	810	375	5,53	6,9	24,88	13,15	*	189	*	15-15-9	9L/9R	4th-6th	10L/10R	1L/1R	2L/2R	2L/2R	3L/2R	1L/1R	2
MZMU 1629	Dp	♀	3,23	2,69	5,3	2,98	446	226	3,12	3,69	14,83	6,94	0,336	195	138	15-15-11	9L/9R	4th-6th	10L/10R	1L/1R	2L/2R	2L/3R	2L/2R	1L/1R	2
MZMU 1066	Dp	♂	4,26	4,13	7,75	4,67	720	350	5,1	5,86	26,68	10,95	0,327	189	146	15-15-9	9L/9R	4th-6th	10L/10R	1L/1R	2L/2R	2L/3R	3L/2R	1L/1R	2
MZMU 1078	Dp	♂	4,22	3,89	7,55	4,89	705	385	5,06	5,58	23,82	10,14	0,353	183	147	15-15-9	9L/9R	4th-6th	10L/10R	1L/1R	2L/3R	2L/2R	3L/2R	1L/1R	1
MZMU 1079	Dp	♂	3,56	2,84	4,88	2,87	430	230	2,85	4,14	14,78	6,28	0,348	181	142	15-15-9	9L/9R	4th-6th	11L/10R	1L/1R	2L/2R	2L/2R	3L/2R	1L/1R	1
MZMU 1080	Dp	♂	2,45	2,35	4,87	2,4	357	198	3,21	4,09	13,21	6,15	0,356	186	146	15-15-9	9L/9R	4th-6th	10L/9R	1L/1R	2L/2R	3L/1R	2L/2R	1L/1R	2
MZMU 1218	Dp	♂	4,07	3,81	5,07	3,64	572	307	4,35	5,09	15,36	6,88	0,349	184	142	15-15-9	9L/9R	4th-6th	10L/10R	1L/1R	2L/2R	2L/3R	2L/2R	1L/1R	2
MZMU 1327	Dp	♂	4,15	4,15	7,42	4,53	625	360	5,4	6,59	20,44	9,58	0,365	182	145	15-15-9	9L/9R	4th-6th	10L/10R	1L/1R	2L/2R	2L/2R	3L/2R	1L/1R	1
MZMU 1370	Dp	♂	4,48	4,31	7,13	4,21	695	388	5,18	6,49	20,64	12,71	0,358	186	163	15-15-9	9L/9R	4th-6th	10L/10R	1L/1R	2L/2R	2L/2R	3L/3R	1L/1R	2
MZMU 1475	Dp	♂	3,29	2,38	4,18	2,66	315	142	3,69	4,47	13,19	5,43	0,31	183	144	15-15-9	9L/9R	4th-6th	10L/10R	1L/1R	2L/2R	2L/2R	2L/2R	1L/1R	2
MZMU 1507	Dp	♂	4,58	3,53	8,85	4,32	650	350	4,77	4,91	19,59	8,06	0,35	184	144	15-15-9	9L/9R	4th-6th	10L/10R	1L/1R	2L/2R	2L/2R	3L/2R	1L/1R	2
MZMU 1516	Dp	♂	3,18	2,19	5,89	2,52	293	145	2,94	3,03	12,13	5,58	0,331	190	142	15-15-9	9L/9R	4th-6th	9L/9R	1L/1R	2L/2R	2L/2R	2L/2R	1L/1R	1
MZMU 1529	Dp	♂	3,88	3,18	6,22	3,53	510	275	3,94	4,4	17,14	7,42	0,35	187	151	15-15-9	9L/9R	4th-6th	10L/10R	1L/1R	3L/2R	2L/2R	3L/3R	1L/1R	1
MZMU 1566	Dp	♂	4,22	3,59	6,7	3,57	545	300	3,69	5,13	16,04	7,09	0,355	180	148	15-15-9	9L/9R	4th-6th	9L/9R	1L/1R	2L/3R	2L/2R	3L/2R	1L/1R	2
MZMU 1598	Dp	♂	4,19	2,16	5,88	3,81	475	260	3,39	4,09	15,12	6,67	0,353	186	153	15-15-9	9L/9R	4th-6th	9L/9R	1L/1R	3L/2R	2L/2R	2L/2R	1L/1R	1
MZMU 1602	Dp	♂	3,12	2,45	5,28	2,48	299	144	2,79	3,37	12,03	5,95	0,325	189	152	15-15-9	8L/9R	4th-6th	9L/9R	1L/1R	2L/2R	2L/2R	2L/2R	1L/1R	2
MZMU 1603	Dp	♂	3,28	2,45	4,97	2,53	281	149	2,97	3,53	11,69	5,75	0,346	183	156	15-15-9	9L/9R	4th-6th	10L/9R	1L/1R	2L/2R	2L/2R	2L/2R	1L/1R	2
MZMU 153	Dc	♀	3,33	2,37	5,33	3,54	435	195	4,23	4,73	14,75	7,54	0,251	200	141	15-15-11	9L/9L	4th-6th	9L/9R	1L/1R	3L/2R	2L/3R	2L/2R	1L/1R	2
MZMU 1476	Dc	♀	2,25	1,83	3,67	2,04	249	120	2,63	2,87	10,19	4,6	0,325	193	152	15-15-11	9L/9L	4th-6th	10L/9R	1L/1R	2L/2R	2L/3R	2L/2R	1L/1R	2
MZMU 1560	Dc	♀	4,64	4,49	8,88	5,14	805	330	4,67	6,76	21,93	9,38	0,29	210	138	15-15-11	9L/9L	4th-6th	9L/9R	1L/1R	3L/2R	2L/2R	2L/2R	1L/1R	2
MZMU 985	Dc	♂	3,67	3,63	8,08	4,44	663	293	5,18	5,63	20,04	9,9	0,306	206	138	15-15-11	9L/9L	4th-6th	9L/10R	1L/1R	2L/3R	2L/2R	2L/2R	1L/1R	2
MZMU 1102	Dc	♂	3,45	2,55	5,28	2,68	386	214	4,71	5,19	14,2	6,83	0,356	184	153	15-15-9	9L/9L	4th-6th	9L/9R	1L/1R	3L/2R	2L/2R	2L/2R	1L/1R	2
MZMU 1472	Dc	♂	4,22	3,18	5,67	4,35	581	*	4,95	5,8	16,17	7,2	0,346	203	*	15-15-11	9L/9L	4th-6th	9L/9R	1L/1R	1L/2R	2L/2R	2L/2R	1L/1R	2
MZMU 1473	Dc	♂	3,47	3,36	5,84	3,35	565	300	5,1	5,33	17,47	7,17	0,303	189	145	15-15-11	9L/9L	4th-6th	10L/10R	1L/1R	2L/2R	2L/2R	2L/2R	1L/1R	2
MZMU 1593	Dc	♂	4,17	3,63	7,11	4	593	258	4,34	5,07	17,2	7,7	0,309	207	141	15-15-11	9L/9L	4th-6th	9L/9R	1L/1R	2L/1R	2L/2R	2L/2R	1L/1R	2
MZMU 1659	Db	♀	3,25	3,92	6,59	3,11	594	231	3,64	5,05	14,73	9,2	0,279	203	102*	13-13-11	8L/8R	4th-5th	10L/10R	1L/1R	2L/2R	2L/3R	2L/2R	1L/1R	2
MZMU 1812	Db	♂	3,03	3,13	5,77	3,18	409	227	2,59	5,04	12,48	8,16	0,357	198	137	13-13-11	8L/8R	4th-5th	10L/10R	1L/1R	1L/1R	2L/2R	2L/2R	1L/1R	2
MZMU 2051	Db	♂	2,78	3,18	5,6	2,8	434	220	2,88	4,12	13,18	6,04	0,336	190	151	13-13-11	8L/8R	4th-5th	10L/10R	1L/1R	1L/1R	2L/2R	2L/2R	1L/1R	2
#	Db	♂	4,71	4,52	8,91	5,17	898	321	4,69	6,84	22,12	9,41	0,263	191	145	13-13-11	8L/8R	4th-5th	10L/10R	2L/2R	1L/1R	2L/2R	2L/2R	1L/1R	2

APPENDIX 3. — The collateral information of the generated and database sequences of mitochondrial genes (16S rRNA, COI, and Cytb) used in the present study. Abbreviations: **ADM**, Field number of Alexander D. McKelvy; **AMNH**, American Museum of Natural History; **AMR**, Australian Museum Herpetology Collection; **CDS**, Field number of Cameron D. Siler; **CHS**, Collection of Huang Song, China; **CIB**, Chengdu Institute of Biology; **DL**, own catalogue number of Ding Li, China; **FMNH**, Field Museum of Natural History, Chicago; **KU**, Biodiversity Institute, University of Kansas; **RAP**, Field number of R. Alexander Pyron; **RMB**, Field number of Rafe M. Brown; **USNM**, Smithsonian Institution, National Museum of Natural History, Washington; **ZSI**, Zoological Survey of India, Kolkata; also see Material and methods.

Sl. nos.	Species	Voucher IDs.	Genbank accession nos.	Grid references	Locality	References
16S rRNA dataset						
1	*Dendrelaphis biloreatus*	MZMU1659_A	MT731341	24°12’13”N, 92°41’10”E	Mizoram, India	This Study
2	*Dendrelaphis biloreatus*	MZMU1659_B	MT731342	24°12’13”N, 92°41’10”E	Mizoram, India	This Study
3	*Dendrelaphis calligastra*	AMR129528	AF139569	–	–	Unpublished
4	*Dendrelaphis caudolineatus*	CIB116097	MN992041	–	Malaysia	Jiang *et al.* 2020
5	*Dendrelaphis caudolineolatus*	RAP0508	KC347357	–	Sri Lanka	Pyron *et al.* 2013
6	*Dendrelaphis formosus*	FMNH267935	KX660199	–	–	Figueroa *et al.* 2016
7	*Dendrelaphis ngansonensis*	CIB116099	MN992045	–	Yunnan, China	Jiang *et al.* 2020
8	*Dendrelaphis ngansonensis*	CIB116098	MN992044	–	Yunnan, China	Jiang *et al.* 2020
9	*Dendrelaphis ngansonensis*	AMNH147134	KX660159	–	–	Figueroa *et al.* 2016
10	*Dendrelaphis ngansonensis*	AMNH148550	KX660158	–	–	Figueroa *et al.* 2016
11	*Dendrelaphis* cf. *ngansonensis*	DL201907122	MN992043	–	Hainan, China	Jiang *et al.* 2020
12	*Dendrelaphis* cf. *ngansonensis*	DL201907121	MN992042	–	Tibet, China	Jiang *et al.* 2020
13	*Dendrelaphis proarchos*	MZMU1629	MT274567	23°23’50”N, 92°44’46”E	Mizoram, India	This Study
14	*Dendrelaphis proarchos*	MZMU1509	MT634738	23°44’24”N, 92°57’5”E	Mizoram, India	This Study
15	*Dendrelaphis proarchos*	CAS210338	KX660183	–	Myanmar	Figueroa *et al.* 2016
16	*Dendrelaphis proarchos*	CAS222690	KX660182	–	Myanmar	Figueroa *et al.* 2016
17	*Dendrelaphis subocularis*	CIB 116100	MN992046	–	Yunnan, China	Jiang *et al.* 2020
18	*Dendrelaphis subocularis*	LSUHC7429	KX660225	–	–	Figueroa *et al.* 2016
19	*Dendrelaphis* cf. *vogeli*	LSUHC6768	KX660223	–	Pulau Pinang, Malaysia	Figueroa *et al.* 2016
20	*Chrysopelea ornata*	LSUHC8851	KX660217	–	–	Figueroa *et al.* 2016
mtCOI dataset						
1	*Dendrelaphis caudolineatus*	USNM:Herp:508372	MH273753	19°4’31”N, 121°14’56”E	–	Unpublished
2	*Dendrelaphis caudolineatus*	USNM:Herp:508374	MH273752	19°4’31”N, 121°14’56”E	–	Unpublished
3	*Dendrelaphis caudolineatus*	USNM:Herp:513099	MH273751	14°56’9”N, 121°58’11”E	–	Unpublished
4	*Dendrelaphis proarchos*	MZMU1327	MT311195	23°11’51”N, 92°34’59”E	Mizoram, India	This Study
5	*Dendrelaphis proarchos*	MZMU951	MT635656	23°47’0”N, 92°43’31”E	Mizoram, India	This Study
6	*Dendrelaphis proarchos*	MZMU1432	MT635657	23°29’15”N, 92°42’43”E	Mizoram, India	This Study
7	*Dendrelaphis proarchos*	MZMU1218	MT647129	23°42’23”N, 92°42’54”E	Mizoram, India	This Study
8	*Dendrelaphis proarchos*	MZMU1370	MT647128	23°44’15”N, 92°39’45”E	Mizoram, India	This Study
9	*Dendrelaphis* cf. *proarchos*	CHS791	MK064880	–	China	Li *et al.* 2020
10	*Dendrelaphis striolatus*	USNM:Herp:577667	MH273767	7°22’11”N, 134°33’14”E	Palau Islands	Unpublished
11	*Dendrelaphis striolatus*	USNM:Herp:513654	MH273760	7°37’8”N, 134°37’58”E	Palau Islands	Unpublished
12	*Dendrelaphis subocularis*	CHS900	MK064945	–	China	Li et al 2020
13	*Chrysopelea ornata*	ZSI_SHT9/MZMU 1312	MN788512	23°43’48”N, 92°39’35”E	Mizoram, India	Unpublished
mtCytb dataset						
1	*Dendrelaphis bifrenalis*	RAP0455	KC347470	–	Sri Lanka	Pyron *et al.* 2013
2	*Dendrelaphis biloreatus*	MZMU1659	MT711167	24°12’13”N, 92°41’10”E	Mizoram, India	This Study
3	*Dendrelaphis biloreatus*	MZMU1659A	MT814708	24°12’13”N, 92°41’10”E	Mizoram, India	This Study
4	*Dendrelaphis caudolineatus*	CIB116097	MN992031	–	Malaysia	Jiang *et al.* 2020
5	*Dendrelaphis cyanochloris*	MZMU985	MT711165	23°47’35”N, 92°44’1”E	Mizoram, India	This Study
6	*Dendrelaphis formosus*	FMNH267935	KX660472	–	–	Figueroa *et al.* 2016
7	*Dendrelaphis formosus*	ADM0002	KX660438	–	–	Figueroa *et al.* 2016
8	*Dendrelaphis fuliginosus*	KU302998	JX678816	–	–	Oaks *et al.* 2013
9	*Dendrelaphis fuliginosus*	CDSGS47	JX678831	–	–	Oaks *et al.* 2013
10	*Dendrelaphis haasi*	LSUHC10042	KX660493	–	–	Figueroa *et al.* 2016
11	*Dendrelaphis marenae*	KU324552	KX660515	–	–	Figueroa *et al.* 2016
12	*Dendrelaphis pictus* Clade A	KU307456	JX678839	–	–	Oaks *et al.* 2013
13	*Dendrelaphis pictus* Clade A	KU304103	JX678838	–	–	Oaks *et al.* 2013
14	*Dendrelaphis pictus* Clade A	RMB3598	JX678837	–	–	Oaks *et al.* 2013
15	*Dendrelaphis pictus* Clade A	KU305584	JX678836	–	–	Oaks *et al.* 2013
16	*Dendrelaphis pictus* Clade A	KU305583	JX678835	–	–	Oaks *et al.* 2013
17	*Dendrelaphis pictus* Clade A	KU305582	JX678834	–	–	Oaks *et al.* 2013
18	*Dendrelaphis pictus* Clade A	KU305581	JX678833	–	–	Oaks *et al.* 2013
19	*Dendrelaphis pictus* Clade A	KU305169	JX678819	–	–	Oaks *et al.* 2013
20	*Dendrelaphis pictus* Clade B	KU303006	JX678830	–	–	Oaks *et al.* 2013
21	*Dendrelaphis pictus* Clade B	KU303005	JX678829	–	–	Oaks *et al.* 2013
22	*Dendrelaphis pictus* Clade B	KU303004	JX678828	–	–	Oaks *et al.* 2013
23	*Dendrelaphis pictus* Clade B	KU303003	JX678827	–	–	Oaks *et al.* 2013
24	*Dendrelaphis pictus* Clade B	KU303002	JX678826	–	–	Oaks *et al.* 2013

Appendix 3. — Continuation.

Sl. nos.	Species	Voucher IDs.	Genbank accession nos.	Grid references	Locality	References
25	*Dendrelaphis pictus* Clade B	KU303001	JX678825	–	–	Oaks *et al.* 2013
26	*Dendrelaphis pictus* Clade B	KU303023	JX678824	–	–	Oaks *et al.* 2013
27	*Dendrelaphis pictus* Clade B	KU303022	JX678823	–	–	Oaks *et al.* 2013
28	*Dendrelaphis pictus* Clade B	KU303021	JX678822	–	–	Oaks *et al.* 2013
29	*Dendrelaphis pictus* Clade B	KU305586	JX678818	–	–	Oaks *et al.* 2013
30	*Dendrelaphis pictus* Clade B	KU305585	JX678817	–	–	Oaks *et al.* 2013
31	*Dendrelaphis pictus* Clade B	KU303019	JX678815	–	–	Oaks *et al.* 2013
32	*Dendrelaphis pictus* Clade B	KU303017	JX678814	–	–	Oaks *et al.* 2013
33	*Dendrelaphis pictus* Clade B	KU303016	JX678813	–	–	Oaks *et al.* 2013
34	*Dendrelaphis pictus* Clade B	KU303015	JX678812	–	–	Oaks *et al.* 2013
35	*Dendrelaphis pictus* Clade B	KU303014	JX678811	–	–	Oaks *et al.* 2013
36	*Dendrelaphis pictus* Clade B	KU303013	JX678810	–	–	Oaks *et al.* 2013
37	*Dendrelaphis pictus* Clade B	KU303020	JX678809	–	–	Oaks *et al.* 2013
38	*Dendrelaphis ngansonensis*	CIB116099	MN992034	–	Yunnan, China	Jiang *et al.* 2020
39	*Dendrelaphis ngansonensis*	CIB116098	MN992033	–	Yunnan, China	Jiang *et al.* 2020
40	*Dendrelaphis* cf. *ngansonensis*	DL201907122	MN992032	–	Hainan, China	Jiang *et al.* 2020
41	*Dendrelaphis* cf. *ngansonensis*	CAS221428	KX660454	–	Kachin, Myanmar	Figueroa *et al.* 2016
42	*Dendrelaphis proarchos*	CAS210338	KX660456	–	–	Figueroa *et al.* 2016
43	*Dendrelaphis proarchos*	CAS222690	KX660455	–	–	Figueroa *et al.* 2016
44	*Dendrelaphis proarchos*	MZMU1370	MT711166	23°44’15”N, 92°39’45”E	Mizoram, India	This Study
45	*Dendrelaphis schokari*	RAP0477	KC347461	–	Sri Lanka	Pyron *et al.* 2013
46	*Dendrelaphis striatus*	LSUHC4792	KX660496	–	–	Figueroa *et al.* 2016
47	*Dendrelaphis striatus*	LSUHC10012	KX660495	–	–	Figueroa *et al.* 2016
48	*Dendrelaphis subocularis*	CIB116100	MN992035	–	–	Figueroa *et al.* 2016
49	*Dendrelaphis subocularis*	LSUHC7429	KX660494	–	–	Figueroa *et al.* 2016
50	*Dendrelaphis tristis*	RAP0492	KC347462	–	Sri Lanka	Pyron *et al.* 2013
51	*Dendrelaphis vogeli*	CIB116817	MN992027	–	Yunnan, China	Jiang *et al.* 2020
52	*Dendrelaphis vogeli*	CIB110716	MN992026	–	Yunnan, China	Jiang *et al.* 2020
53	*Dendrelaphis* cf. *vogeli*	LSUHC6768	KX660492	–	Pulau Pinang, Malaysia	Figueroa *et al.* 2016
54	*Dendrelaphis fuliginosus*	KU304098	KX660513	–	–	Figueroa *et al.* 2016
55	*Dendrelaphis* sp.	CIB110717	MN992028	–	Yunnan, China	Jiang *et al.* 2020
56	*Dendrelaphis* sp.	CIB116096	MN992029	–	Yunnan, China	Jiang *et al.* 2020
57	*Dendrelaphis* sp.	DL201907123	MN992030	–	Yunnan, China	Jiang *et al.* 2020
58	*Chrysopelea ornata*	–	LC105633	–	Bangkok, Thailand	Laopichienpong *et al.* 2016