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Upretia, a new caloplacoid lichen genus (Teloschistaceae, Lichen-Forming Ascomycota) from India

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ABSTRACT

New genus *Upretia* S. Y. Kondr., A. Thell & J. S. Hur is characterized by partly pruinose, lobate to subsquamulose, olivaceous grey to brown thallus, small ascospores and narrowly bacilliform conidia. It belongs to the subfamily Caloplacoideae of the Teloschistaceae and includes the '*Caloplaca' amarkantakana* clade. The new genus is closely related to *Ioplaca* Poelt according to phylogeny analysis based on ITS1/ITS2 nrDNA, 28S nrLSU and 12S mtSSU sequences.

INTRODUCTION

The subfamilies Caloplacoideae and Xanthorioideae (family Teloschistaceae) were introduced by Gaya *et al.* (2012) based on the multilocus molecular phylogeny of the Teloschistales. Later on two more subfamilies - Teloschistoideae and Brownlielloideae were proposed (Arup *et al.* 2013b, Kondratyuk *et al.* 2015d). So far 97 genera are suggested for Teloschistaceae and are distributed under these four subfamilies (Kondratyuk *et al.* 2017). Caloplacoideae is one of the major subfamilies comprises a total of 26 genera of which 19 were described in recent years (Arup *et al.* 2013a; Kondratyuk *et al.* 2014a, 2017) (Table 1). In India Caloplacoideae comprises 74 species and 11 genera (*Blastenia, Caloplaca, Gyalolechia, Huneckia, Ioplaca, Klauderuiella, Laundonia, Leproplaca, Oxneriopsis, Pyrenodesmia*, and *Rufoplaca*).

In the present study revision of caloplacoid species endemic to India is performed using molecular phylogeny analysis. The internal transcribed spacer region (ITS1/ITS2 nrDNA), nuclear large subunit (28S nrLSU) and mitochondrial small subunit (12S mtSSU) sequences are utilized. Several new robust monophyletic clades were revealed in phylogeny analyses of which one is identified as the new genus *Upretia*.

MATERIAL AND METHODS

More than 1000 specimens belonging to various herbaria have been examined in the present study using standard microscopical techniques. The specimens were collected during 2003-2016 and deposited in lichen herbarium of CSIR-National Botanical Research Institute (LWG); collected during 2014–2017 and deposited in the herbarium of Korean Lichen Research Institute, Sunchon National University, South Korea (KoLRI); duplicates in the Hungarian Natural History Museum (BP) and the Lichen Herbarium in the M. H. Kholodny Institute of Botany of National Academy of Sciences of Ukraine (KW-L). Hand cut sections are observed under a dissecting microscope (Nikon SMZ 645; Nikon, Tokyo, Japan) while anatomical characters were observed using a Nikon Eclipse E200 microscope and a Zeiss Scope, complemented with a digital camera AxioCam ERc 5s. Sections of apothecia were tested with water, K and IKI (10% potassium iodide).

Total DNA was extracted directly from the thalli according to Ekman (1999) and was purified with DNeasy Plant Mini Kit (QIAGEN, Germany). The nuclear ribosomal RNA gene region including the internal transcribed spacers 1 and 2 and the 5.8S subunit (ITS) was amplified using the primers ITS1F (Gardes and Bruns 1993) and ITS4 (White *et*

Table 1. List of genera of the subfamily Caloplacoideae and their species diversity confirmed by molecular phylogeny.

S. No	Genus name	Type species	Original generic description /recent treatment	Species diversity
1	*Blastenia*	*Blastenia ferruginea*	Kondratyuk *et al.* (2014a)	9
2	*Bryoplaca*	*Bryoplaca sinapisperma*	Arup *et al.* (2013a)	3
3	*Caloplaca*	*Caloplaca cerina*	Kondratyuk *et al.* (2014a)	9
4	*Eilifdahlia*	*Eilifdahlia dahlii*	Kondratyuk *et al.* (2014a)	4
5	*Elenkiniana*	*Elenkiniana gloriae*	Kondratyuk *et al.* (2014a)	3
6	*Franwilsia*	*Franwilsia bastowii*	Kondratyuk *et al.* (2014a)	3
7	*Gintarasiella*	*Gintarasiella aggregata*	Kondratyuk *et al.* (2017)	1
8	*Gyalolechia*	*Gyalolechia aurea*	Arup *et al.* (2013a)	9
9	*Hanstrassia*	*Hanstrassia lenae*	Kondratyuk *et al.* (2017)	2
10	*Huneckia*	*Huneckia pollinii*	Kondratyuk *et al.* (2014a)	3
11	*Ioplaca*	*Ioplaca sphalera* [current name *I. pindarensis*]	Arup *et al.* (2013a)	1
12	*Jasonhuria*	*Jasonhuria bogilana*	Kondratyuk *et al.* (2015c)	1
13	*Klauderuiella*	*Klauderuiella thallincola*	Kondratyuk *et al.* (2017)	3
14	*Laundonia*	*Laundonia flavovirescens*	Kondratyuk *et al.* (2017)	1
15	*Leproplaca*	*Leproplaca xantholyta*	Arup *et al.* (2013a)	5
16	*Mikhtomia*	*Mikhtomia gordejevii*	Kondratyuk *et al.* (2014a)	5
17	*Loekoesiana*	*Loekoesiana austrocoreana*	Kondratyuk *et al.* (2015c)	1
18	*Olegblumia*	*Olegblumia demissa*	Kondratyuk *et al.* (2015c)	1
19	*Opeltia*	*Opeltia neobaltistanica*	Kondratyuk *et al.* (2017)	3
20	*Pyrenodesmia*	*Pyrenodesmia chalybaea*	Arup *et al.* (2013a)	6
21	*Rufoplaca*	*Rufoplaca subpallida*	Arup *et al.* (2013a)	5
22	*Seirophora*	*Seirophora magara* [current name *Seirophora villosa*]	Arup *et al.* (2013a)	4
23	*Usnochroma*	*Usnochroma carphinea*	Arup *et al.* (2013a)	2
24	*Variospora*	*Variospora velana*	Arup *et al.* (2013a)	12
25	*Xanthaptychia*	*Xanthaptychia orientalis*	Kondratyuk *et al.* (2017)	5
26	*Yoshimuria*	*Yoshimuria spodoplaca*	Kondratyuk *et al.* (2014a)	3
	Total			**102**

al. 1990), the 28S LSU using the primer LR5 (Vilgalys and Hester 1990), and the 12S mtSSU using the primers mtSSU1-mtSSU3R and mtSSU2R (Lohtander *et al.* 2002, Fedorenko *et al.* 2009, 2012).

The amplification was done using a Takara JP/TP600 PCR machine (Takara Bio Inc., Japan). One initial cycle of 5 min at 94 °C was followed by 30 cycles of the following steps: 30 seconds at 94 °C, 39 seconds at 57 °C and 1 min at 72 °C. Amplifications were ended with a final cycle at 72 °C for 10 min. The same PCR program was used for all loci studied. PCR products were then sent to the sequencing facilities of the Genotech Cooperation, Seoul, South Korea,

for cleaning and sequencing. The sequencing was carried out using the fluorescent marker Big Dye and an ABI 3730xl sequencing machine (Applied Biosystems, Carlsbad, CA, USA).

The consensus sequence was aligned with all related species sequences retrieved from the GenBank database. Sequence alignment was conducted in BioEdit and a phylogenetic tree was generated by the maximum parsimony (MP), minimum evolution (ME), and maximum likelihood (ML) analysis methods. Analyses were conducted using PAUP 4.0b10 on a Macintosh platform (Swofford 2003), and in Mega 5.0 (Tamura *et al.* 2011) with the number of bootstrap trials set to 1,000.

RESULS AND DISCUSSION

The taxon sampling consists of 61 taxa of the Caloplacoideae (Fig. 2) and *Brigantiaea ferruginea* is used as outgroup. Five sequences of *Upretia amarkantakana* were newly deposited into GenBank under the accession numbers as in table 2. Phylogenetic analysis was performed using the ITS1/ITS2 region and 28S LSU gene of nrDNA and 12S SSU mtDNA sequences retrieved from the GenBank database of which totally 135 sequences on nrDNA and mtDNA were submitted to GenBank for 62 specimens of 39 taxa within our study (Table 2). The final alignment length of ITS1/ITS2 nr DNA, 28S nrLSU and 12S mtSSU was consequently 639, 787 and 1080 characters including gaps with parsimony informative characters 362, 178 and 325 respectively. The total number of nucleotide positions in the concatenated dataset used in the phylogenetic analysis was 2081, of which 598 were parsimony informative. As it is shown in the Fig. 2 our results of the three-locus phylogeny suggest that Indian material belonging to the *Caloplaca amarkantakana* is more closely related to the genus *Ioplaca* than other genera of the *Caloplaca* clade of the subfamily Caloplacoideae (*Leproplaca, Klauderuiella* and *Variospora*). In our tree (Fig. 2) the new genus *Upretia* formed supported sister relation (bootsrap 64) with *Ioplaca pindarensis*. All the samples of *Upretia amarkantakana* formed well-supported monophyletic lineage, while the relation of the clade including the genera *Upretia* and *Ioplaca* remains unressolved owing to scarse data on *Ioplaca*.

The genus *Upretia* is also positioned more distantly from the genera of the *Gyalolechia* clade (i.e.: *Gyalolechia, Hanstrassia,, Laundonia, Mikhtomia, Opeltia, Oxneriopsis* etc.), as well as the *Pyrenodesmia* clade (i.e.: *Bryoplaca, Olegblumia, Seirophora,* and *Xanthaptychia*)(Fig. 2).

Upretia S. Y. Kondr., A. Thell & J. S. Hur **gen. nov. (Fig. 1)**

MycoBank No. **823059**

Similar to *Ioplaca* but differs in a lobate and subsquamulose thallus with dark brown to blackish brown upper surface, in brownish cells in the upper cortical layer, and in lecanorine sessile apothecia.

Type species: *Upretia amarkantakana* (Y. Joshi & Upreti) S.Y. Kondr. & A. Thell.

Thallus crustose, more or less orbicular, lobate to subsquamulose, central portion usually subsquamulose, occasionally areolate to verruculose, olive-grey to brownish grey to ash-grey; thalline lobes generally narrow to wider, branched, flat to subconvex, with pruina. Cortical layer thin, paraplectenchymatous, with uppermost cell layer consisting of brownish cells, epinecral zone absent, medulla white. Prothallus and hypothallus usually present, black.

Apothecia lecanorine, immersed when young, becoming sessile, disc orange to brownish, concave or flat, thalline margin concolorous with thallus, true exciple paraplectecnhymatous; paraphyses with oil droplets; asci 8 spored, ascospores hyaline, polaribilocular, small. Conidia narrowly bacilliform, small.

Chemistry: Thallus and thalline margin K-, C-, Pd-. Apothecium disc and epihymenium K+ purple, C-, Pd-. Parietin and an olive spot at RF class 4 present in apothecial disc (Joshi & Upreti 2006).

Ecology: Occurring on exposed bouxite rocks at an altitude of 500-600 m, growing together with species of the genera *Buellia* and *Staurothele*.

Etymology: The genus is named after well known Indian lichenologist, Dr. Dalip Kumar Upreti (*1958), Lucknow, India, as a recognition for his enormous contributions to the recent knowledge on Indian lichens.

Species diversity and distribution: Madhya Pradesh, India.

Taxonomic notes: The genus *Upretia* is primarily characterized by a partly pruinose, lobate to subsquamulose, olivaceous grey to olivaceous brown thallus, brownish cells in the uppermost cortical paraplectenchymatous layer, small ascospores, and narrowly bacilliform conidia.

The monotypic genus *Ioplaca*, occurring in the eastern Hymalayas in Nepal, is the closest related group, characterized by a dull yellow or yellow-brownish thallus, subumbilicate areolae and cryptolecanorine, immersed apothecia (Kärnefelt 1989). In the original publication Poelt

Table 2. Specimens included in the phylogenetic analysis with GenBank accession numbers. Newly submitted sequences are given in bold.

Species name	References / voucher details	ITS	LSU	mtSSU
Brigantiaea ferruginea	Kondratyuk *et al.* (2013); SK779, South Korea	KF264622		KF264684
Brigantiaea ferruginea	Kondratyuk *et al.* (2013); SK780, South Korea	KF264623		KF264685
Brigantiaea ferruginea	Kondratyuk *et al.* (2017); 121967, South Korea	KY614393		
Brigantiaea ferruginea	Kondratyuk *et al.* (2017); 121971, South Korea	KY614394		
Brigantiaea ferruginea	Kondratyuk *et al.* (2017); 121981, South Kore	KY614395		
Blastenia ferruginea	Arup *et al.* (2013a), Spain	KC179416	KC179163	KC179493
Bryoplaca sinapisperma	Arup *et al.* (2013a), Norway	KC179421		KC179495
Caloplaca cerina	Fedorenko *et al.* (2009, 2012); FNM-185, Ukraine	EU681284		EU680863
Caloplaca cerina	Gaya *et al.* (2012), U.S.A.		JQ301549	
Caloplaca pelodella	Kondratyuk *et al.* (2013b); SK-714, South Korea	KF264629		KF264689
Caloplaca stillicidiorum	Gaya *et al.* (2008), Cstil405, U.S.A.	EU639607		
Eilifdahlia dahlii	Kondratyuk *et al.* (2014a); SK-956, Australia	KJ021221	KJ021252	KJ021277
Eilifdahlia dahlii	Kondratyuk *et al.* (2014a); SK-959, Australia	KJ021318	KJ021253	KJ021279
Eilifdahlia wirthii	Kondratyuk *et al.* (2014a); SK-262, Namibia	KJ021319	KJ021254	KJ021280
Elenkiniana ehrenbergii	Søchting and Figueras (2007), Israel	DQ888715		
Elenkiniana gloriae	Kondratyuk *et al.* (2014a); SK-750, Hungary	KJ021323		
Elenkiniana gloriae	Kondratyuk *et al.* (2014a); SK-611, Spain	KJ021321	KJ021256	KJ021282
Elenkiniana gloriae	Kondratyuk *et al.* (2014a); SK-613, Spain	KJ021322		KJ021283
Franwilsia bastowii	Kondratyuk *et al.* (2014a); SK-810, Australia	KJ021324	KJ021257	KJ021284
Franwilsia kilcundaensis	Kondratyuk *et al.* (2014a); SK-920, Australia	KJ021326	KJ021259	KJ021286
Franwilsia renatae	Kondratyuk *et al.* (2014a); SK-235, Namibia	KJ021329		KJ021289
Fulgensia cranfieldii	Kondratyuk *et al.* (2014a); SK-983, Australia	KJ021333	KJ021262	KJ021292
Fulgensia fulgens	Kondratyuk *et al.* (2014a); SK-735, Bulgaria	KJ021335		KJ021295
Gintarasiella aggregata	Kondratyuk *et al.* (2017); SK-A84, Australia , holotype	KY614390	KY614448	KY614479
Gintarasiella aggregata	Kondratyuk *et al.* (2017); SK-A85, Australia , isotype	KY614391	KY614449	KY614480
Gintarasiella aggregata	Kondratyuk *et al.* (2017); SK-A86, Australia , isotype	KY614392	KY614450	KY614481
Gyalolechia aurea	Arup *et al.* (2013a), Austria	KC179434	KC179196	KC179530
Gyalolechia canariensis	Gaya *et al.* (2008), Fcan3593, Spain	EU639587		
Gyalolechia canariensis	Kondratyuk *et al.* (2014a); SK-583, Spain	KJ021332		
Hanstrassia jaeseounhurii	Kondratyuk *et al.* (2017); China, holotype	KY614399		
Hanstrassia lenae	Søchting and Figueras (2007), Russia	DQ888717		
Hanstrassia lenae	Arup *et al.* (2013a), Russia	KC179442		
Hanstrassia aff. *lenae*	Kondratyuk *et al.* (2017); SK-655, Russia	KY614401		KY614482
Huneckia pollinii	Kondratyuk *et al.* (2014a); SK-3206, U.S.A.	KJ021336	KJ021265	KJ021296
Huneckia pollinii	Kondratyuk *et al.* (2014a); SK-870, U.S.A.	KJ021337	KJ021266	KJ021297

Species name	References / voucher details	ITS	LSU	mtSSU
Huneckia rheinigera	Kondratyuk *et al.* (2014a); SK-3204, Australia	KJ021222		
Ioplaca pindarensis	Gaya *et al.* (2012), China	JQ301672		
Jasonhuria bogilana	Kondratyuk *et al.* (2015c); KoLRI 120454, South Korea	KT220196	KT220205	KT220214
Jasonhuria bogilana	Kondratyuk *et al.* (2015c); KoLRI 120469, South Korea	KT220197	KT220206	KT220215
Jasonhuria bogilana	Kondratyuk *et al.* (2015c); KoLRI 120641, South Korea	KT220198	KT220207	KT220216
Klauderuiella aurantia	Arup *et al.* (2013a), Spain	KC179470	KC179261	KC179600
Klauderuiella aurantia	Gaya *et al.* (2008), Caur13326, Spain	EU639602		
Klauderuiella aurantia	Gaya *et al.* (2015), Caur13326, Spain			KT291479
Klauderuiella flavescens	Kondratyuk *et al.* (2017); SK-561, Spain	KY614416		KY614495
Klauderuiella thallincola	Kondratyuk *et al.* (2017); SK-527, the UK	KY614415		KY614494
Laundonia flavovirescens	Kondratyuk *et al.* (2017); SK-657, Russia	KY614417		KY614496
Laundonia flavovirescens	Arup and Grube (1999), Austria	AF353966		
Laundonia flavovirescens	Arup *et al.* (2013a), Austria		KC179198	KC179532
Laundonia persimilis	Arup *et al.* (2013a), U.S.A.	KC179444		
Laundonia persimilis	Vondrák *et al.* (unpubl.), JV7486	KT804978		
Laundonia persimilis	Vondrák *et al.* (unpubl.), U.S.A.	KT804979		
Leproplaca obliterans	Arup *et al.* (2013a), Sweden	KC179449		KC179207
Leproplaca xantholyta	Arup *et al.* (2013a), Austria	KC179451	KC179208	KC179542
Leproplaca xantholyta	Gaya *et al.* (2012), Greece	JQ301670		JQ301565
Loekoesia austrocoreana	Kondratyuk *et al.*(2015c); KoLRI 120511, South Korea	KT220200	KT220209	KT220218
Loekoesia austrocoreana	Kondratyuk *et al.*(2015c); KoLRI 120523, South Korea	KT220201	KT220210	KT220219
Loekoesia austrocoreana	Kondratyuk *et al.* (2015c); SK-261, South Korea	KT220202	KT220211	KT220220
Mikhtomia gordejevii	Kondratyuk *et al.* (2014a); SK-80515, South Korea	KJ021231		KJ021307
Mikhtomia gordejevii	Kondratyuk *et al.* (2017); South Korea	KY614420	KY614457	
Mikhtomia gordejevii	Kondratyuk *et al.* (2017); South Korea	KY614421	KY614458	
Mikhtomia gordejevii	Kondratyuk *et al.*(2014a); SK-80646, South Korea	KJ021232		KJ021308
Mikhtomia multicolor	Kondratyuk *et al.* (2014a); SK-A14, South Korea		KJ021272	
Mikhtomia multicolor	Kondratyuk *et al.* (2017); South Korea	KY614422	KY614459	
Mikhtomia multicolor	Kondratyuk *et al.* (2017); South Korea	KY614423	KY614460	
Mikhtomia multicolor	Kondratyuk *et al.* (2017); SK A19, South Korea	KY614424		
Mikhtomia multicolor	Kondratyuk *et al.* (2017); South Korea		KY614461	
Mikhtomia subflavorubencens	Kondratyuk *et al.* (2014a as *M. oxnerii*); SK-90117, South Korea	KJ021233		KJ021311
Mikhtomia subflavorubencens	Kondratyuk *et al.*(2014a as *M. oxnerii*); SK-90755, South Korea	KJ021234		KJ021312

Species name	References / voucher details	ITS	LSU	mtSSU
Olegblumia demissa	Kondratyuk *et al.* (2015c); SK-C65, Ukraine	KT220203	KT220212	KT220221
Opeltia arizonica	Arup *et al.* (2013a), U.S.A.	KC179433	KC179195	KC179529
Opeltia juniperina	Kondratyuk *et al.* (2017); SK-D10, China	KY614429		KY614504
Opeltia juniperina	Vondrák and Halici (unpubl.), Turkey	JN813383		
Opeltia neobaltistanica	Kondratyuk *et al.* (2017); SK-D09, China	KY614428		KY614503
Pyrenodesmia alociza	Kondratyuk *et al.* (2014a); SK-747, Ukraine	KJ021239		KJ021313
Pyrenodesmia chalybaea	Gaya *et al.* (2012), Gaya 38, Sweden	JQ301550		
Pyrenodesmia teicholyta	Vondrák *et al.* (2012), Ukraine	JN641791		
Pyrenodesmia teicholyta	Arup *et al.* (2013a), Denmark		KC179176	
Pyrenodesmia variabilis	Gaya *et al.* (2008), Spain	AY233224		
Rufoplaca scotoplaca	Arup *et al.* (2013a), Sweden	KC179457	KC179235	KC179573
Seirophora californica	Arup *et al.* (2013a), U.S.A.	KC179643		
Seirophora lacunosa	Kondratyuk *et al.* (2015c); SK-B07, Ukraine	KT220204	KT220213	KT220222
Seirophora villosa	Kondratyuk *et al.* (2017); SK-D16, Morocco	KY614436	KY614469	KY614511
Seirophora villosa	Martin and Winka (2000), Spain	AF098407		
Upretia amarkantakana	**SK E23, India, 10-013313/B (LWG), this paper**	**MG652763**		
Upretia amarkantakana	**SK J20, India, 10-013313/B (LWG), this paper**	**MG652764**		**MG652767**
Upretia amarkantakana	**SK J21, India, 10-013313 (LWG), this paper**	**MG652765**		
Upretia amarkantakana	**SK J59, India, 10-013313 (LWG), this paper**	**MG652766**		
Usnochroma carphinea	Arup *et al.* (2013a), France	KC179468	KC179259	KC179598
Usnochroma carphinea	Gaya *et al.* (2008), Spain	EU639595		
Usnochroma carphinea	Gaya *et al.* (2012), Spain		JQ301548	
Usnochroma scoriophila	Gaya *et al.* (2012), Spain	JQ301664	JQ301560	
Variospora kudratovii	Kondratyuk *et al.* (2014a); SK-487, Iran	KJ021244	KJ021276	KJ023192
Variospora kudratovii	Kondratyuk *et al.* (2014a); SK-485, Iran	KJ021243	KJ021275	KJ023191
Variospora kudratovii	Kondratyuk *et al.* (2014a); SK-484, Iran	KJ021242	KJ021274	KJ023190
Variospora latzelii	Vondrák *et al.* (unpubl.), Greece	JN813418		
Variospora macrocarpa	Arup and Grube (1999), U355, Austria	AF353956		
Variospora velana	Arup *et al.* (2013a), Italy	KC179476	KC179265	KC179605
Xanthaptychia aurantiaca	Arup *et al.* (2013a, as *Seirophora aurantiaca*), Canada	KC179461		
Xanthaptychia blumii	Kondratyuk *et al.* (2015d, as *Seirophora blumii*); SK-A65, Iran	KT456219	KT456234	KT456249
Xanthaptychia contortuplicata	Arup *et al.* (2013a, as *Seirophora contortuplicata*), U.S.A.	KC179464		
Xanthaptychia contortuplicata	Gaya *et al.* (2015, as *Seirophora contortuplicata*), Secon177, Tajikistan	KT291471		KT291522
Xanthaptychia contortuplicata	Kondratyuk *et al.* (2014a, as *Seirophora contortuplicata*); SK- 775, China			KJ021316
Xanthaptychia orientalis	Fedorenko *et al.* (2009, as *Seirophora orientalis*); FNM-153, Tajikistan	EU681287		

Species name	References / voucher details	ITS	LSU	mtSSU
Xanthaptychia orientalis	Kondratyuk *et al.* (2014a, as *Seirophora orientalis*); SK-755, China	KJ021240		KJ023189
Yoshimuria cerussata	Kondratyuk *et al.* (2014a); SK-768, Antarctica	KJ021248		
Yoshimuria galbina	Kondratyuk *et al.* (2014a); SK-704, South Korea			KJ023197
Yoshimuria spodoplaca	Kondratyuk *et al.* (2014a); SK-725, South Korea	KJ021249		KJ023194

(1977) described the new species *Ioplaca sphalera* Poelt, to constitute a monotypic genus. Later *I. sphalera* was corrected as synonym of *I. pindarensis* (Räs.) Poelt & Hinteregger (Poelt and Hinteregger 1993). However, the ascospore size for *I. sphalera*, presented by Poelt (1977), *Callopisma pindarense* Räsänen (Räsänen 1951) do not overlap; 18-22 x 8-11 µm for *Ioplaca sphalera* and 13 x 5 µm for *Callopisma pindarense* (in our study 11-13 x 7-9 µm), indicating that *Ioplaca sphalera* and *I. pindarensis* should be treated as separate species. Molecular data on the sister group *Ioplaca* is sparse and the common clade of the two genera has weak support. The large difference in morphology and anatomy was convincing enough to propose a new genus for *U. amarkantakana*.

Ioplaca has also been compared with the genera *Acarospora*, *Heppia* and *Aspicilia* characterized by the apothecia referred as cryptolecanorine or aspicilioid (Poelt 1977). The umbilicate thallus with a central attachment exhibited by *Ioplaca* has been keyed out together with the South American genus *Xanthopeltis* R. Sant. (Poelt & Hafellner 1980). However, *Xanthopeltis* differs in having a monofoliose umbilicate thallus and one-septate and twisted ascospores.

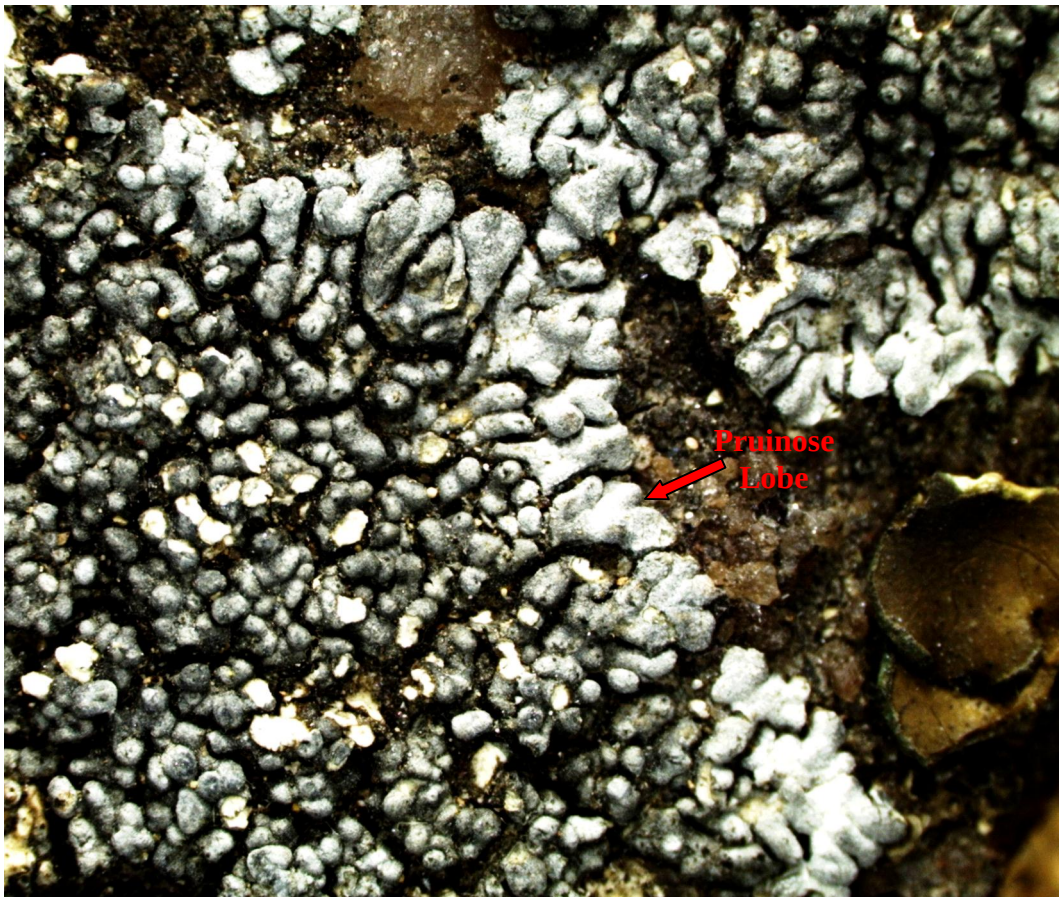

Fig. 1. Habit and thallus morphology of *Upretia amarkantakana* (Y. Joshi & Upreti) S.Y. Kondra. & A. Thell **Scale:** 2 mm.

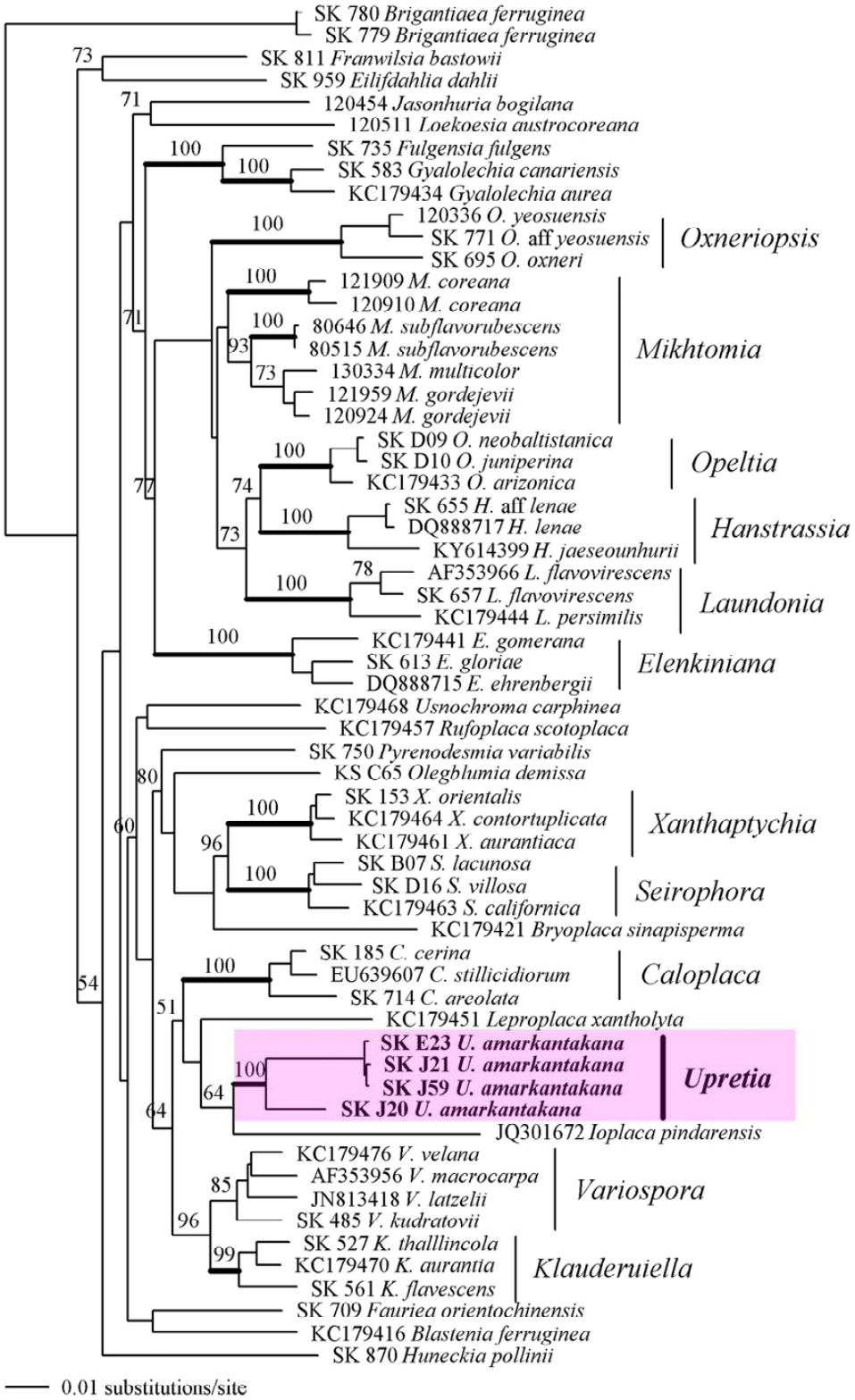

Fig. 2. Phylogenetic tree of the members of the subfamily Caloplacoideae after combined data set based on ITS1/ITS2 nr DNA, 28S nrLSU and 12S mtSSU sequences

Morphologically, the genus *Upretia* is similar to some representatives of *Caloplaca* Th. Fr. (i.e. *C. pelodella* (Nyl.) Hasse) and *Elenkiniana* S. Y. Kondr., Kärnefelt, Elix, A. Thell & J.-S. Hur (i.e. *E. ehrenbergii* (Müll. Arg.) S. Y. Kondr., Kärnefelt, A. Thell, Elix, J. Kim, A. S. Kondratiuk & J.-S. Hur). However these two taxa differs from *Upretia* primarily in an apruinose lobate thallus, larger ascospores, wider conidia and presence of depsidones.

New combination

Upretia amarkantakana (Y. Joshi & Upreti) S.Y. Kondr. & A. Thell **comb. nov.** MycoBank No. **823060.** Basionym: *Caloplaca amarkantakana* Y. Joshi & Upreti, Lichenologist 38(6): 537 (2006). **Type**: INDIA, Madhya Pradesh, Shahdol district, Amarkantak, on way to Jwaleshwar temple, on exposed rocks, 29.09.1987, D. K. Upreti 201785 (Holotype-LWG).

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