



ISSN
Online 0974-7907
Print 0974-7893

OPEN ACCESS

In India much of the lichenological investigations are restricted to either Himalayan or Western Ghats region. Systematic studies in the recent times indicated that the Deccan Plateau and the Eastern Ghats also have a rich diversity of lichens; Nayaka et al. (2013) estimated the occurrence of about 180 species in these areas. Keeping this in view a thorough exploration of lichens is being undertaken in Andhra Pradesh. Reddy et al. (2011) compiled the earlier studies on lichens of Andhra Pradesh and enumerated 43 species for the state. In continuation of the same study Nayaka et al. (2013) reported a total of 26 new records for Andhra Pradesh including a new record for India (*Peltula farinosa* Büdel). It is now clear that Andhra Pradesh records a total of 69 lichen species.

The current study is restricted to lichen exploration in the Rayalaseema region which includes four districts; Anantapur, Chittoor, Kadapa and Kurnool. The area is interesting in terms of its unique biodiversity as the major tract of the Eastern Ghats passes through the region with 21.38% forest cover. A large number of lichen specimens were collected from these areas which resulted in several interesting taxa. Out of these a total of 10 species are reported here as new records for Andhra Pradesh.

MATERIAL & METHODS: The morphological features of lichen thallus and ascomata were observed under Leica S8AP0 stereozoom microscope. Spot test for colour reaction were carried out by 10% aqueous solution of potassium hydroxide (K), Steiner's stable para-phenylenediamine solution (PD) and Calcium hypochlorite solution (C). For anatomical investigation

FURTHER NEW ADDITIONS TO THE LICHEN MYCOTA OF ANDHRA PRADESH, INDIA

Satish Mohabe¹, A. Madhusudhana Reddy², B. Anjali Devi³, Sanjeeva Nayaka⁴ & P. Chandramati Shankar⁵

^{1,2,3} Department of Botany, Yogi Vemana University, Vemanapuram, Kadapa, Andhra Pradesh 516003, India
⁴ Lichenology Laboratory, CSIR-National Botanical Research Institute, Rana Pratap Marg, Lucknow, Uttar Pradesh 226001, India
⁵ Department of Biotechnology, Yogi Vemana University, Vemanapuram, Kadapa, Andhra Pradesh, 516003, India
¹satish.nbri09@gmail.com, ²grassced@yahoo.com, ³anjalidevi634@gmail.com, ⁴nayaka.sanjeeva@gmail.com (corresponding author), ⁵pchandra20@gmail.com

of fruiting bodies Leica DM500 compound microscope was used. All the measurements of anatomical structures were taken in water. The lichen substances were identified with Thin Layer Chromatography in solvent system 'A' following White & James (1985). The other literature followed for identification include Awasthi (1991), Joshi (2008), Mayrhofer et al. (1996), Nayaka (2005), Upreti (1994). Further, Lumbsch & Huhndorf (2010) was followed for nomenclature and classification, while Singh & Sinha (2010) was consulted for distribution of the taxa. Identified specimens were labelled, documented, digitalized and preserved at the herbarium in the Department of Botany at Yogi Vemana University (YVUH), Kadapa and voucher specimens were deposited at the herbarium of CSIR-National Botanical Research Institute, Lucknow (LWG).

RESULT: It can be noted that in the two earlier studies (Reddy et al. 2011; Nayaka et al. 2013) mostly foliose lichens are included. In the present study, species being reported are mostly crustose and squamulose forms.

DOI: <http://dx.doi.org/10.11609/JoTT.o3726.6122-6>

Editor: G.P. Sinha, Botanical Survey of India, Allahabad, India.

Date of publication: 26 July 2014 (online & print)

Manuscript details: Ms # o3726 | Received 27 July 2013 | Final received 20 June 2014 | Finally accepted 08 July 2014

Citation: Mohabe, S., A.M. Reddy, B.A. Devi, S. Nayaka & P.C. Shankar (2014). Further new additions to the lichen mycota of Andhra Pradesh, India. *Journal of Threatened Taxa* 6(8): 6122-6126; <http://dx.doi.org/10.11609/JoTT.o3726.6122-6>

Copyright: © Mohabe et al. 2014. Creative Commons Attribution 4.0 International License. JoTT allows unrestricted use of this article in any medium, reproduction and distribution by providing adequate credit to the authors and the source of publication.

Funding: Council of Scientific and Industrial Research, New Delhi.

Competing Interest: The authors declare no competing interests.

Acknowledgements: The Authors are grateful to Director, CSIR-National Botanical Research Institute, Lucknow for providing laboratory facilities and Dr. D.K. Upreti, for his kind help and encouragement during the identification of lichens. Council of Scientific and Industrial Research, New Delhi is thanked for financial support under sponsored scheme. Authors also thank Forest Officials of Andhra Pradesh for their cooperation during the study.



Except for *L. psuedistera* and *D. tenuis* all the other species were found growing on the bark of various trees. The species *L. psuedistera* and *D. tenuis* not only have saxicolous habitat, but also have squamulose to lobate thallus.

1. *Biatorrella conspersa* (Fée) Vain. (Biatorrellaceae) Image 1A.

Specimen examined: 2348 (YVUH), 25.vi.2012, elevation 328m, on bark, 8km from Diguvamitta on the way to GBM, Vankamanu Gundla, Kurnool District, Andhra Pradesh, coll. A. Madhusudhana Reddy.

This crustose, corticolous species is characterized by greenish-yellow to yellow or yellowish-orange, granular soorediate thallus; sessile 0.3–0.6 mm diameter, biatorine apothecia, yellow pruinose disc; multispored asci with hyaline rounded to globose, 1–3×0.5–2.5 µm spores.

The species is known from Australia, Nepal and in India it was earlier reported from Manipur.

2. *Caloplaca bassiae* (Willd. ex Ach.) Zahlbr. (Teloschistaceae) Image 1B.

Specimen examined: 2009 (YVUH), 12.vi.2012, on bark, Horsley hills, Chittoor District, Andhra Pradesh, coll. A. Madhusudhana Reddy, Anjali Devi B. & Sanjeeva Nayaka.

This crustose, corticolous, greenish-yellow to yellowish-orange species is characterized by numerous yellowish-orange, simple to coralloid branched isidia; rare, scattered, sessile, 0.3–0.8 mm diameter, biatorine apothecia with orange to brownish-orange disc, sometimes isidiate, paler margin; K+ purple epihymenium; 8-spored asci with 10–15×4–8 µm spores and with parietin as lichen substance.

The species is known from tropical America and Nepal. In India, it was earlier reported from Andaman & Nicobar Islands, Arunachal Pradesh, Assam, Bihar, Himachal Pradesh, Jammu & Kashmir, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Sikkim, Tamil Nadu and Uttar Pradesh.

3. *Caloplaca poliotera* (Nyl.) Stein (Teloschistaceae) Image 1C.

Specimen examined: 1850/A (YVUH), 13.vi.2012, elevation 746.5m, on bark, Japali Anjneya Swami Temple, Chittoor District, Andhra Pradesh, coll. A. Madhusudhana Reddy & Sanjeeva Nayaka.

This crustose, saxicolous species is characterized by greenish-grey to grey, rimose areolate thallus with black prothallus; numerous, rounded, sessile apothecia of size 0.2–0.5 mm in diameter, mostly present at the centre of the thallus; yellowish to reddish-brown disc,

biatorine to lecidine, brownish to black margin; K+ purple epihymenium, absence of algal cells in exciple; 8-spored asci; hyaline, polaribilocular, elongate to ellipsoidal, 12.0–14.0×8.0–9.5 µm ascospores and with anthraquinones as lichen substance.

The species is known from the tropical regions of the world and in India it was earlier reported from Madhya Pradesh, Tamil Nadu and West Bengal.

4. *Dimelaena tenuis* (Müll. Arg.) H. Mayrhofer & Wipple (Physciaceae) Image 1D.

Specimen examined: 2178 (YVUH), 15.vii.12, on rock, backside of Javakaladinnnae, Gorantla, Anantapur District, Andhra Pradesh, coll. A. Madhusudhana Reddy.

This effigurate, squamulose species, found growing tightly on rock and characterized by yellowish-green to greenish-brown central part and greenish to yellowish or brownish marginal area, rhizines lacking; innate to sessile, rounded to irregular, 0.3–0.7 mm in diameter, biatorine to lecanorine apothecia, dark brown to brown black disc; 8-spored asci; brown, 1 septate, 9.0–11.0×4.0–7.0 µm ascospores and with gyrophoric acid as lichen substance.

The species is known from North America and in India it was earlier reported from Madhya Pradesh.

5. *Lecanora chlarotera* Nyl. (Lecanoraceae) Image 1E.

Specimens examined: 1806/B (YVUH), 13.vi.2012, on bark, on the backside of the arch, Shilathoranam, Chittoor District, Andhra Pradesh, coll. A. Madhusudhana Reddy & Sanjeeva Nayaka; 1822 (YVUH), 13.vi.2012, elevation 746.5m, on bark, Japali Anjneya Swami Temple, coll. A. Madhusudhana Reddy & Sanjeeva Nayaka.

This crustose, corticolous species characterized by greenish-grey to grey, verruculose to verrucose thallus; numerous, 0.2–0.9 mm in diameter, lecanorine apothecia, pale orange to orange brown or reddish brown disc; large crystals and algal cells in exciple, yellowish to brownish epihymenium dissolving in K; 8-spored asci; simple to ellipsoidal, 11.0–15.0×8.0–10.0 µm ascospores and with atranorin, zeorin as lichen substance.

The species is widely distributed in Asia, Europe and America. In India it was earlier reported from Jammu & Kashmir, Karnataka, Maharashtra, Manipur, Nagaland, Rajasthan, Tamil Nadu, Uttarakhand and West Bengal.

6. *Lecanora helva* Stizenb. (Lecanoraceae) Image 1F.

Specimen examined: 1896 (YVUH), 12.vi.2012, on bark, Horsley hills, Chittoor District, Andhra Pradesh, coll. A. Madhusudhana Reddy, Sanjeeva Nayaka & B.

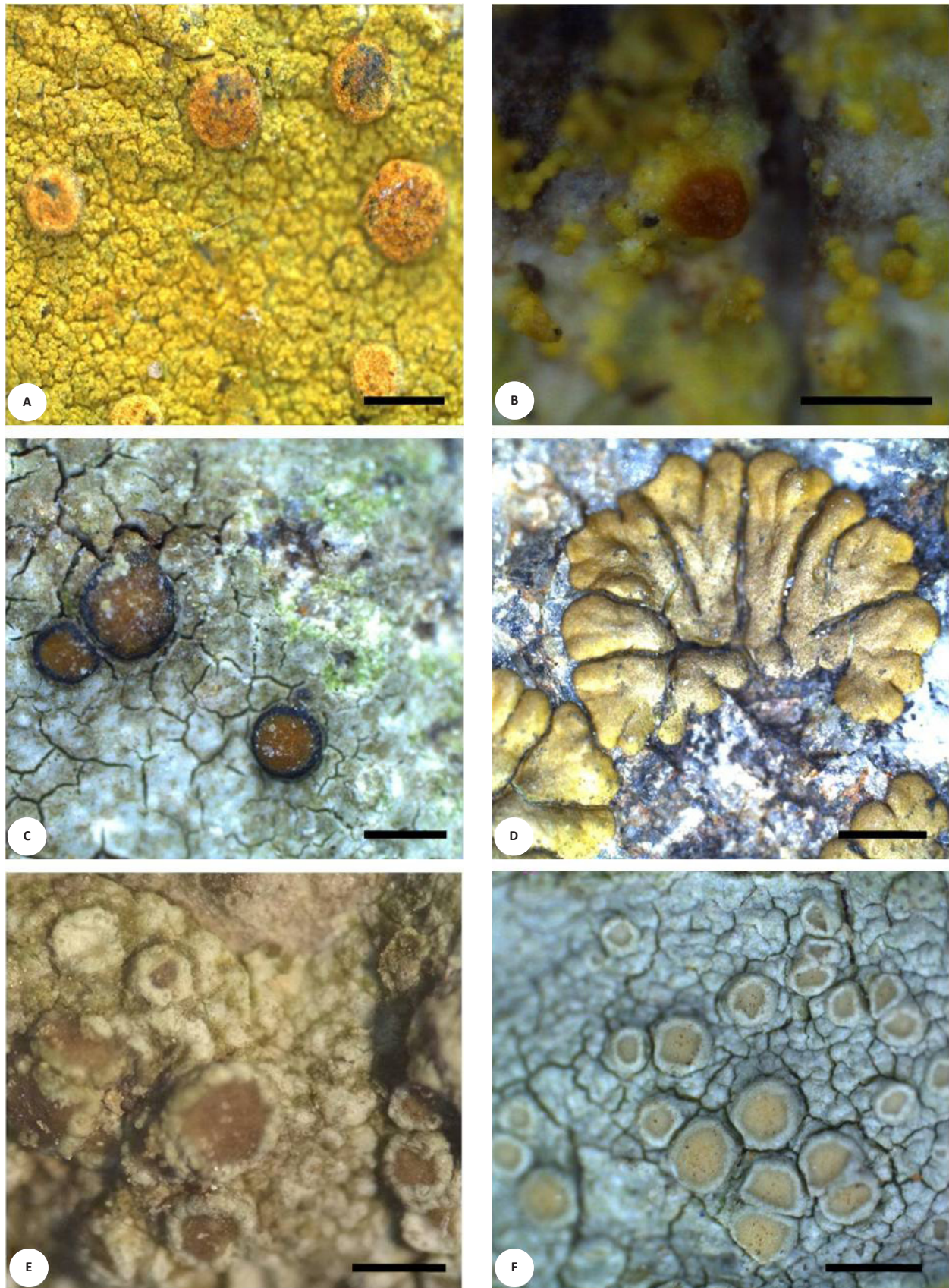


Image 1. A - *Biatorella conspersa* (2348); B - *Caloplaca bassiae* (2009); C - *Caloplaca poliotera* (1850/A); D - *Dimelaena tenuis* (2178); E - *Lecanora chlarotera* (1822); F - *Lecanora helva* (1896). Scale bars: A, B, C, D, F = 0.5mm, E = 1mm.

Anjali Devi.

This crustose, corticolous species characterized by greenish-grey to grey, smooth to verruculose thallus; crowded, round, 0.2–1.0 mm in diameter, lecanorine apothecia; pale yellow to brownish-yellow or orange disc; large crystals and algal cells in exciple; yellowish to brownish epihymenium dissolving in K; 8-spored asci; simple, colourless, 8.0–11.0×5.0–7.0 μm ascospores and atranorin as lichen substance.

The species is distributed in Africa, Australasia, Pacific regions, South America and Thailand. In India it was earlier reported from Assam, Goa, Himachal Pradesh, Kerala, Madhya Pradesh, Maharashtra and Tamil Nadu.

7. *Lecanora interjecta* Müll. Arg. (Lecanoraceae) Image 2G.

Specimens examined: 1817, 1818, 1824, 1839 (YVUH), 13.vi.2012, elevation 746.5m, on bark, Japali Anjaneya Swami Temple, Chittoor District, Andhra Pradesh, coll. A. Madhusudhana Reddy & Sanjeeva Nayaka.

This crustose, corticolous species characterized by greenish-grey, verruculose to verrucose thallus; numerous, sessile, lecanorine, 0.2–1.0 mm in diameter, apothecia, pale brown to orange brown disc; large crystals and algal cells in exciple; yellowish to pale brown epihymenium dissolving in K; 8-spored asci; hyaline, ellipsoidal, 9.0–13.0×4.0–7.0 μm ascospores and with atranorin, usnic acid as lichen substances.

The species is distributed in Africa, Australia, Atlantic Islands, Chile, Europe and New Zealand. In India it was earlier reported from Arunachal Pradesh and Himachal Pradesh.

8. *Lecanora pseudistera* Nyl. (Lecanoraceae) Image 2H.

Specimens examined: 2136, 2139, 2143, 2159 (YVUH), 15.vii.2012, on rock, Javakaladinnæ, Gorantla, Ananthapur District, Andhra Pradesh, coll. A. Madhusudhana Reddy; 1485, 2175 (YVUH), 14.i.2012, on rock, backside of Javakaladinnæ, coll. A. Madhusudhana Reddy.

This crustose, saxicolous species characterized by whitish-grey to grey, areolate to subsquamulose thallus; 0.5–1.0 mm in diameter, lecanorine apothecia; yellowish-orange to reddish-brown disc; small crystals and algal cells in exciple; yellowish to orange brown epihymenium dissolving in K; 8-spored asci; hyaline, ellipsoidal, 8.0–11.0×5.0–7.0 μm ascospores and with atranorin, 2-O-methylperlatolic acid as lichen substance.

The species is known from all continents except

Antarctica and in India it was earlier reported from Himachal Pradesh, Karnataka, Madhya Pradesh, Rajasthan, Tamil Nadu and Uttarakhand.

9. *Pertusaria melastomella* Nyl. (Pertusariaceae) Image 2I.

Specimen examined: 2009 (YVUH), 12.vi.2012, on bark, Horsley hills, Chittoor District, Andhra Pradesh, coll. A. Madhusudhana Reddy, Sanjeeva Nayaka & B. Anjali Devi.

This crustose, corticolous species characterized by whitish grey or greenish-grey, verrucose thallus; perithecioid apothecia, 1–2 per verrucae; verrucae not constricted at base, 0.3–0.4 mm high, 0.6–0.8 mm wide; 6–8 spored asci; large, ellipsoidal, double walled, smooth, 59.0–87.0×24.0–34.0 μm ascospores.

The species is known from Sri Lanka and In India it was earlier reported from Himachal Pradesh, Madhya Pradesh and Tamil Nadu.

10. *Porina tetracerae* (Afz.) Müll. Arg. (Porinaceae) Image 2J.

Specimen examined: 1826 (YVUH), 13.vi.2012, elevation 746.5m, on bark, starting point on the left side of rocky zone, Japali, Chittoor District, Andhra Pradesh, coll. A. Madhusudhana Reddy & Sanjeeva Nayaka.

This crustose, corticolous species characterized by greenish-brown to brown thallus; solitary, semiglobose to globular perithecia; punctiform, pale brown ostioles; slightly yellowish peridium, yellowish to brown involucrellum; 6-spored asci; hyaline, fusiform, transversely 1–7 septate, 34.0–44.0×6.0–8.0 μm ascospores.

The species is distributed in Brazil, Ecuador, French Guiana, Mexico and Peru. In India it was earlier recorded from Andaman & Nicobar Islands, Arunachal Pradesh, Goa, Karnataka, Madhya Pradesh, Nagaland, Orissa, Sikkim, Tamil Nadu and West Bengal.

REFERENCES

- Awasthi, D.D. (1991). *A Key to the Microlichens of India, Nepal and Sri Lanka*. Bibliotheca Lichenologica, J. Cramer, Berlin, Stuttgart 40: ii+337pp.
- Joshi, Y. (2008). Morphotaxonomic studies on lichen family Teloschistaceae from India. PhD Thesis. University of Kumaun. Nainital, India, 293pp.
- Lumbsch, H.T. & S.M. Huhndorf (2010). Outline of Ascomycota - 2009. *Mycotax* 14: 1–64; <http://dx.doi.org/10.3158/1557.1>
- Mayrhofer, H., M. Matzer, A. Wippel & J.A. Elix (1996). Genus *Dimelaena* (Lichenized Ascomycetes, Physciaceae) in the Southern Hemisphere. *Mycotaxon* 58: 293–311.
- Nayaka, S. (2005). Revisionary studies on lichen genus *Lecanora* sensu lato in India. PhD. Thesis. Dr. Ram Manohar Lohia Avadh University, Faizabad, India, 241pp.

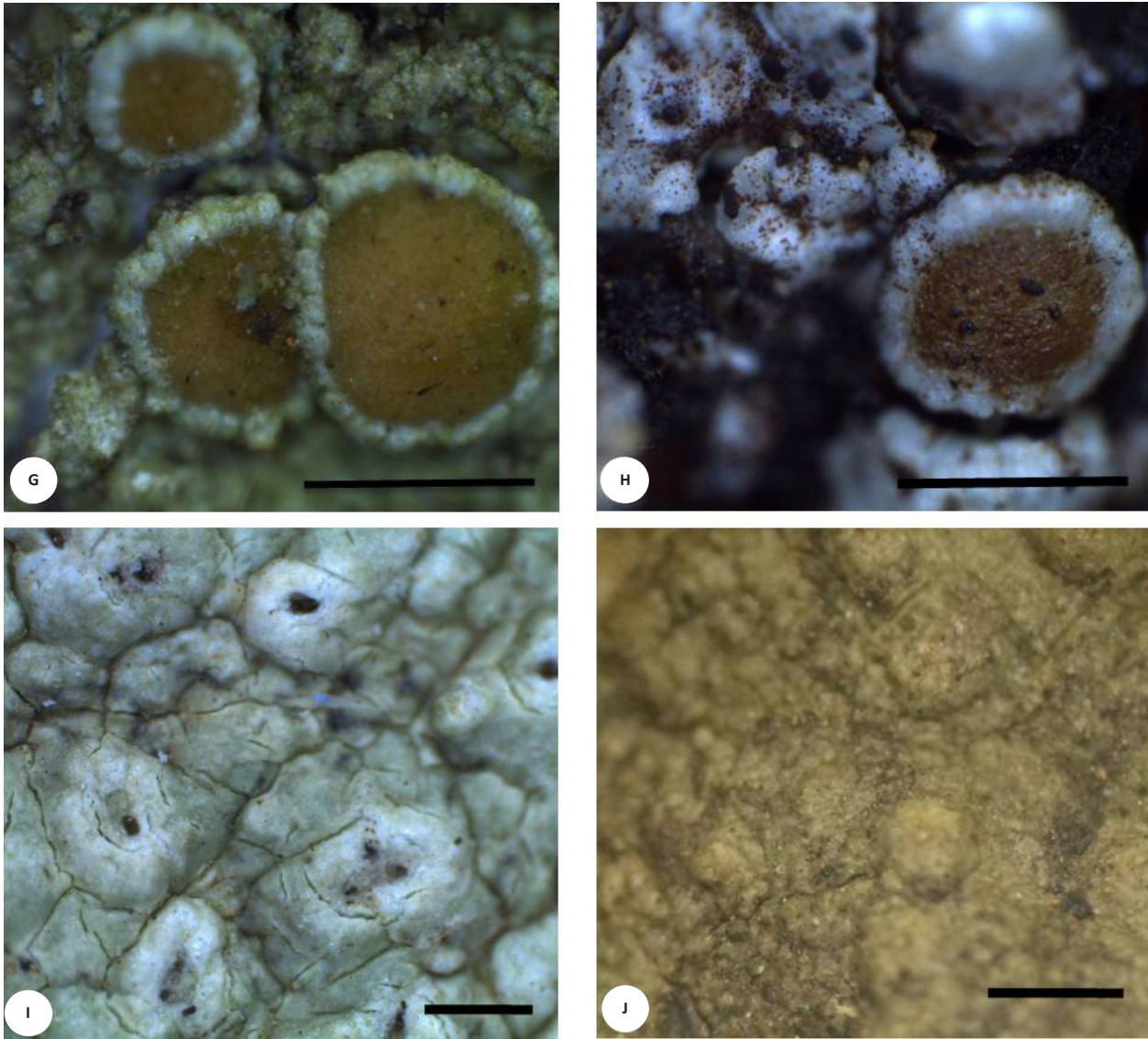


Image 2. G - *Lecanora interjecta* (1817); H - *Lecanora pseudistera* (2175); I - *Pertusaria melastomella* (2009); J - *Porina tetracerae* (1826).
Scale bars: G = 0.2mm, H, J = 0.5mm, I = 1mm.

Nayaka, S., M.A. Reddy, P. Ponmurugan, A.B. Devi, G. Ayyappadasan & D.K. Upreti (2013). Eastern Ghats, biodiversity reserves with unexplored lichen wealth. *Current Science* 104(7): 821–825.

Reddy, M.A., S. Nayaka, P.C. Shankar, S.R. Reddy & B.R.P. Rao (2011). New distributional records and checklist of lichens for Andhra Pradesh, India. *Indian Forester* 137: 1371–1376.

Singh, K.P. & G.P. Sinha (2010). *Indian Lichens: Annotated Checklist*. Botanical Survey of India, Kolkata, 572pp.

Upreti, D.K. (1994). Notes on corticolous and saxicolous species of *Porina* from India with *Porina subhibernica* sp. nov. *Bryologist* 97(1): 73–79.

White, F.J. & P.W. James (1985). A new guide to the microchemical technique for the identification of lichen substances. *British Lichen Society Bulletin* 57(suppl.): 1–41.

