



SOME NEW ADDITONS TO THE LICHEN FLORA OF ODISHA

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Abstract

Satkoshia Hill range is one of the prominent range of Odisha rich with a huge diversity of phanerogams. While exploring the floristic composition of the area 10 species of unknown lichen samples were collected which were critically studied for their taxonomic characterization and were found to be new records for Odisha. The newly identified lichen taxa included *Anisomeridium biforme* (Borr.) R.C. Harris, *Anisomeridium tamarindi* (Fee) R.C. Harris, *Arthonia radiata* (Pers.) Ach., *Dirinaria picta* (Sw.) Clem. & Schear, *Lecanora achroa* Nyl., *Lecanora interjecta* Müll-Arg., *Lecanora leprosa* Fée, *Lepraria incana* (L.) Ach. and *Lepraria membranacea* (Dicks.) Vain. which were recorded for the first time as not reported earlier. This paper presents a detailed taxonomic enumeration, photographs and pertinent information based on collections of lichen specimens.

Key words: Phanerogams, New records, Satkoshia, Odisha.

Introduction

The 'Satkoshia Hill range' lies between 21° 25' North latitude and 86° 22' East longitudes with an average elevation varying between 575 m to 850 m. The survey area has the highest temperature of about 44°C and lowest temperature of about 7°C with an average rainfall of about 1425 mm. 'Mahanadi' the largest river of Odisha, passes through its periphery. This hill range has a dry deciduous type forest with *Cleistanthus collinus* and *Anogeissus latifolia* of frequent occurrence. In this forest, the proportion of Sal was less as compared to that in the north Indian moist deciduous forest with a maximum frequency of 10% of the total vegetation. The other co-dominant tree species included *Lannea cormandela*, *Lagerstroemia parviflora*, *Diospyros melanoxylon*, *Terminalia tomentosa* and *Aegle marmelos*. Shrubs, such as *Helicteres isora*, *Flemingia semialata* and *Indigofera cassioides* were prominently found in this region which provided an ideal habitat for the growth of several species of lichens with a widespread diversity. The present work is a novel attempt to explore the lichen diversity of the area under study although exhaustive floristic inventory were done by earlier workers (Haines, 1921-1925; Saxena and Bramham, 1994-1996).

Materials and Methods

Extensive field tours were conducted at regular

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intervals during 2016-2018 in various locations of the study area to locate the occurrence of various lichen species before they were digitally photographed in their natural habitats in association with their respective hosts. The lichen specimens were collected using the standard method and brought to the laboratory for characterization and taxonomic analysis. All the prescribed procedures such as anatomical and chemical investigations were conducted towards confirmation of the identity of the collected samples. The species were identified with the help of pertinent literature (Awasthi, 2007) and the taxa were confirmed in consultation with the Herbarium Unit in the Lichenological laboratory, National Botanical Research Institute (NBRI), Lucknow (India). All the voucher specimens were deposited in the herbarium of Lichenological Laboratory at NBRI, Lucknow.

Results and Discussion

During the present investigation a total number of 51 species of lichens were collected and documented which belong to 34 numbers of genera included under 28 families Caliciaceae was found to be the most dominant family represented by 5 genera followed by Physciaceae.

The analysis of the inventory data revealed 10 newly recorded lichen species namely *Anisomeridium biforme* (Borr.) R.C. Harris, *Anisomeridium tamarindi* (Fee) R.C. Harris (Monoblastiaceae), *Arthonia radiata* (Pers.) Ach. (Arthoniaceae), *Dirinaria picta* (Sw.) Clem. & Schear, (Caliciaceae), *Lecanora achroa* Nyl., *Lecanora interjecta*

Müll.-Arg., *Lecanora leprosa* Fée, *Lecanora pseudistera* Nyl. (Lecanoraceae), *Lepraria incana* (L.) Ach. and *Lepraria membranacea* (Dicks.) Vain. (Stereocaulaceae) which were not reported earlier from any part of the Odisha State since they did not match with any species recorded in the earlier flora of the region (Nayak et al., 2016). The details of the new records of the lichen species are enumerated below.

Enumeration

Anisomeridium biforme (Borr.) R.C. Harris, in Vuzda, Folia Geobot. Phytotax. 20: 207. 1978. (Family-Monoblastiaceae)

Basionym: *Verrucaria biformis* Borr., Suppl. Engl. Bot. 1: 1831.

Synonym: *Acrocordia biformis* (Borr.) Arn. Fl. Regensb. 44: 537.1861.; *Acrocordia biformis* f. *biformis* (Borr.) Arn. Fl. Regensb. 44: 537.1861.; *Acrocordia biformis* var. *biformis* (Borr.) Arn. Fl. Regensb. 44: 537.1861.; *Amphisphaeria biformis* (Borr.) Rehm, Anns mycol. 4(3): 264.1906.; *Anisomeridium biforme* (Borr.) R.C. Harris, in Vuzda, Folia Geobot. Phytotax. 20:207.1978.

Vernacular name (s): Asamipatra (O).

Thallus: crustose, leioic, asymmetrical, uninterrupted, not plunged in the substrate, effuse or delineated by a graciliform, merulius hypothallus, ecorticate. **Upper surface:** leucoish to prasino-cinereous. **Photobiont:** a chlorophycean alga, *Trentepohlia*, cells 6-14 µm across. **Perithecia:** semispherical, nigrescent, hemi-plunged in the thallus, 0.4-0.7 mm diam. **Perithecial wall:** nigrescent, with a properly distinguished involucrellum, 48-100 µm thick. Lower wall: pale or achromate, uninterrupted beneath the hamathecium. **Hamathecium:** ramified pseudoparaphyses, anastomosing above the asci; **filaments:** ca. 1.2 µm wide, not sprinkled with oleic globules. Asci: cylindrical, ca. 68-100 x 10.5 µm, with eight, uniseriately arranged ascospores. **Ascospores:** perspicuous, oval, uniseptate with a scarsetly submedial euseptum, 12-16 x 5-6 µm, not ornamented, devoid of a gelatinous sheath. **Pycnidia:** abundant, dispersed all over the thallus or in perpusillus bunches probably puzzled with perithecia; two types: 100-200 µm diam. or 38-100 µm diam. **Conidia:** subglobular to ellipsoid macroconidia, respectively 2.2-4 x 1.7-2.8 µm or globuliform microconidia, 1-1.6 µm diam. **Spot tests:** all -ve, UV. **Secondary metabolites:** not observed (Fig. 1A).

Substrate and ecology: Often found on smooth or scabrid bark of latifoliate trees like *Mangifera indica*, *Tectona grandis* etc.

World distribution: Cosmopolitan

Specimen examined: Angul, Satkoshia 18. 01. 2018, RM 18-033347 (Herbarium, NBRI, Lucknow, Uttar Pradesh).

Notes: This species is recognized from other species by the pumilus, generally oval to ellipsoid, normally uniseriate ascospores and ascomata with apical ostiole. Ascomata, ascospores and conidia of the species very much related to *A. tamarindi* (Fee) R. C. Harris, which has spindle shaped, angustiformly ovoid to oblong-ovoid ascospores. This may be confused with *Acrocordia gemmata* (Ach.) A. Massal. whose perithecia are grandiform and pycnidia not abundant and devoid of nigrescent prothallus.

Anisomeridium tamarindi (Fee) R.C. Harris in S.C. Tucker & Harris, Bryol. 83: 4. 1980. (Family-Monoblastiaceae)

Basionym: *Verrucaria tamarindi* Fée, Essai Crypt. Exot., Suppl. Révis. (Paris): 85:1837.

Synonym: *Ditremis tamarindi* (Fée) R.C. Harris, Some Florida Lichens (New York): 34.1990.; *Leiophloea tamarindi* (Fée) Trevis., Conspect. Verruc.: 10. 1860.; *Porina tamarindi* (Fée) Müll. Arg., Mém. Soc. Phys. Hist. Nat. Genève 30(no. 3): 24 .1888.

Vernacular name (s): Asami patra (O).

Thallus: crustose, endophloeodal, asymmetrical, 1-4 (-7) cm across, candid to leucoish cinereous, leioic, effuse or delineated by atro-phaeocic or nigrescent prothallus, ecorticate. **photobiont:** a chlorophycean alga *Trentepohlia*, cells 7-14 µm across. **ascomata:** perithecial, abundant, generally unitary, frequently two-three agglomerated, semispherical, frequently emergent, generally hemi-plunged, 0.27-0.6 x 0.21-0.33 mm. **ostiole:** apical, flat, inapparent; wall interrupted beneath the hymenium, clypeate, carbonized, 51-86 µm thick, K+ porraceous. **hymenium:** achromate, not sprinkled with oleic globules, I-. **Pseudoparaphyses:** ramified and anastomosing 1-1.6 µm thick. Asci: clavulate, octosporous, 51-67 x 9-13 µm; **ascospores:** biseriately, achromate, spindle shaped, angustiformly oval to oblong-ovoid, or angustiformly ellipsoid, orthic to scarsely campylar, uniseptate, with submedial septum 11-17 x 4.4-6.6 µm; locules leioic, granulate, ornamented in postmature condition. **Spot tests:** Thallus K-, C-, KC-, P-, UV-. **Secondary metabolites:** not observed (Fig.-1 B).

Substrate and ecology: It grows commonly on the bark of diverse trees like *Anacardium occidentale*, *Mangifera indica* etc.

World distribution: Tropical to pan tropical.

Specimen examined: Angul, Satkoshia 18. 01. 2018, RM 18-033347 (Herbarium, NBRI, Lucknow, Uttar Pradesh).

Notes: This species is identified by its UV- thallus, spindle shaped, angustiformly oval to oblong-ovoid or angustiformly ellipsoid, orthic to scarsely campylar, uniseptate ascospores and pusillus, clavulate asci.

Dirinaria picta (Sw.) Clem. & Schear(Sw.) Schaer. ex Clem., Gen. Fung.: 323. 1931. (Family: Caliciaceae)

Basionym: *Lichen pictus* Sw., Nova Gen. Sp. Pl. 146.1788.

Synonym: *Parmelia picta* (Sw.) Ach., Methodus 211.1803.; *Physcia picta* (Sw.) Nyl., Mém. Soc. Sci. Nat. Cherbourg 3: 175.1855.; *Pyxine picta* (Sw.) Tuck., Syn. N. Amer. Lich. 1: 79. 1882.; *Parmelia plumosa* Taylor, J. Bot. (Hook.) 6: 173.1847.

Vernacular name (s): Chuli Nilayaja (O).

Thallus: foliose, appressed to clumped up to the tips of the lobe, 2-9 cm in diam. adnate to stiffly adnate, dichotomously pinnately or subpinnately lobed **lobes:** radiating, continuous, convergent, plane or convex but occasionally scarcely concave near apices, 0.5-1 mm wide, apices separate, not flabelliform towards the lobe tips **upper surface:** canescent, caeruleo-canescens or almost candid, lustrous, occasionally pruinose or epruinose, sorediate, edactylate **soredia:** farinoidal, in laminal, globular, ±capitate soralia, 0.5–1.0 mm wide **pseudocyphellae:** present, but inconspicuous, marginal, occasionally also laminal, generally confined to the circumscribal parts of the lobes, sometimes reticulately convergent **medulla:** white, lower part rarely aurantiate or flavid near the lobe tips **lower surface:** carbonaceous in center, paler towards the tip of the lobe, erhizinate. **Apothecia:** occasionally present, stalked to ±constricted at the base laminal on thallus, 0.5-1.5 mm wide **disc:** nigrescent, devoid of pruina **epihymenium:** pale phaeoic, 7-10 mm thick **hymenium:** achromate, 75- 90 mm thick **hypothecium:** rubro-phaeoic to phaeo-nigrescent, 118–200 mm thick, lenticulate **ascospores:** phaeoic, uniseptate, steno-elliptic, 12-22 x 4-9 µm. **Pycnidia:** plunged in verrucae **Conidia:** bacillioid or spindle shaped, 3-4 x 0.8-1.2 µm. **Spot tests:** upper cortex K+ flavid, C-, KC-, P+ flavid; medulla K-, C-, KC-, P-. **Secondary metabolites:** upper cortex bears atranorin; divaricatic acid and few terpenes in trace amount present in the medulla part (Fig. 1C).

Substrate and ecology: On bark and wood of *Shorea robusta*, *Cipadesa baccifera*.

World distribution: In all tropical regions of both the hemispheres.

Substrate and ecology: On bark and wood of *Shorea robusta*, *Cipadesa baccifera*.

World distribution: In all tropical regions of both the hemispheres.

Specimen examined: Angul, Satkoshia 18. 01. 2018, RM 18-033353 (Herbarium, NBRI, Lucknow, Uttar Pradesh).

Arthonia radiata (Pers.) Ach., Kongl. Vetensk. Acad. Nya Handl.: 29:131. 1808. (Family- Arthoniaceae).

Basionym: *Opegrapha radiata* Pers., Ann. Bot. (Usteri) 7: 29.1794.

Synonym(s): *Arthonia astroidea* (Ach.) Ach., Neues J. Bot. 1(3. Stück): 17. 1806.; *Arthonia astroidea* f. *parallela* Harm., Bull. Séanc. Soc. Sci. Nancy, Sér. 2 34: 66.1900.; *Arthonia astroidea* f. *radiata* (Pers.) Ach., Syn. meth. lich. (Lund): 6.1814.

Vernacular name (s): Ghrootashroongi (O), Comma lichen (E).

Thallus: crustose, endophloeodal, not prominent, plunged lowly rotund to asymmetrical, 1-2.7 cm across, leuco-cinereous to flavo-cinereous, delineated by a nigrescent line, leioic, ecorticate **photobiont:** a chlorophycean algae *Trentepohlia*, cells 6-13 µm across **Ascomata:** arthonioid, diverse shaped, subasterik, 1-1.6 mm diam., linear, asymmetrically ramified, 1-1.7 x 0.1-0.3 mm, 64-84 µm high **disc:** a mazedium, merulius, campestrial, epruinose **epithecium:** phaeoic, 9-15 µm thick, K+ porraceous **hymenium:** achromate, 34-49 µm high, 1+ endiviius **hypothecium:** achromate to pale phaeoic, 11-28 µm thick, K+ porraceous, 1+ endiviius, KI+ deep endiviius **paraphyses:** ramified and anastomosing, 1-3 µm thick; tips consistent, phaeoic walled, frequently with deep phaeoic apical caps, 2-4 µm thick **asci:** clavulate to subglobular, octo spored, 34-45 x 19-25 µm, gelatinous **tholus:** crassus; amyloid, not reacting with iodine, with amyloid tube, ring *Collema*, *Micarea*, *Porpidia*, *Psora* types etc. **ascospores:** achromate, oblong-ovate, triseptate, apical cell reduced, 9-19 x 4-7 µm, central, perispore and epispore: not apparent. **Spot test:** Thallus K-, C-, KC, P-, I-, KI+ pale caeruleus. **Secondary metabolites:** no lichen substances found (Fig.- 1D).

Substrate and ecology: Bark, cork, branches and twigs of various trees like *Madhuca indica* var. *latifolia* and *Mangifera indica*.

World distribution: Africa, Madagascar Australasia, South and Central America and Arctic zone.

Specimen examined: Angul, Satkoshia 18.01.2018, RM 18-033362 (Herbarium, NBRI, Lucknow, Uttar Pradesh).

Lecanora achroa Nyl. in J.M. Crombie, J. Bot. 14:263.1876. (Family- Lecanoraceae)

Vernacular name (s): Abrunti Manjupatra (O), Rim lichens (E).

Thallus: crustose, uninterrupted or fissured-areolate **prothallus:** carbonaceous to caeruleo-phaeoic. **areoles:** plane, psilic, obscure, ecorticate **surface:** flavo-candidus to flavo-canescens or flavo-prasinus or pale porraceous to prasino-candidus, leioic, epruinose, with an inconspicuous margin, esorediate. **Apothecia:** stalked, 0.4-0.9 mm in diam., lecanorine **disc:** aurantio-phaeoic

or flavo-phaeolic, flat or convex, epruinose or moderately leucoish-cinereous, pruinose **margin**: concolorous with thallus, psilic or crassus, persistent or becoming excluded, even, eflexuose, leioic, entire or little warty, parathecial annulus lacking **amphithecium**: persistent, with innumerable algal cells, massive crystals are present which are insoluble in K, corticated **cortex**: prominent, basally not crassus, interspersed with abundant teeny-weeny crystals, pellucid, 15-40 μm thick laterally and basally **parathecium**: vitreous, bears puny crystals insoluble in K **epihymenium**: flavo-phaeolic to aurantio-phaeolic, with pigment and crystals soluble in K. **hymenium**: vitreous, limpid. **paraphyses**: moderately ramified and scarcely thickened up to 2.7 μm wide apically, lack of any pigment. **subhymenium**: diaphanous, 14-21 μm thick **hypothecium**: pellucid, lack of oleic droplets. **asci**: club shaped, octosporous. **ascospores**: pellucid, simple, ellipsoid or broadly ellipsoid, 9.5-17.5 x 5.5-9.5 μm ; wall: > 1 μm thick. **Pycnidia**: not found. **Spot tests**: K+ flavid, C- or C+ aurantiolate, P+ pallid. **Secondary metabolites**: arthothelin (trace), atranorin (submajor), chloroatranorin (trace), 2'-O-methylperlatolic acid (major), usnic acid (major) and traces of unknown terpenes. (Fig.-1E).

Substrate and ecology: On bark of *Acacia nilotica* and *Simarouba glauca*.

World distribution: North, Central and South America, Australia, New Zealand, Papua New Guinea.

Specimen examined: Angul, Satkoshia 18. 01. 2018, RM 18-03330 (Herbarium, NBRI, Lucknow, Uttar Pradesh).

Notes: *Lecanora achroa* is identified by the approximately tiny apothecia with aurantio-phaeolic disc, tiny ascospores, and the appearance of usnic acid. It is all most alike to *Lecanora helva* and *Lecanora leprosa*, but differentiated by the separate chemistry.

Lecanora interjecta Müll.Arg. Nuovo Giorn. Bot. Ital. 23: 390.1891. (Family- Lecanoraceae)

Vernacular name (s): Khepa Manjupatra (O), Rim lichens (E).

Thallus: crustose, cornuate to lowly cornuate, flavo-cinereous to prasino-cinereous, epruinose. **soredia**: lacking **prothallus**: not observed **Apothecia**: stalked, 0.4-0.7 mm diam. **disc**: dark aurantio-phaeolic to aethon, epruinose or scarcely cinero-pruinose **margin**: same as that of the thallus, graciliform, lowly cornuate **cortex**: perspicuous, sprinkled with teeny-weeny crystals, 9-32 μm thick laterally and basally **amphithecium**: with big crystals undissolved in KOH (*Pulicaris*-type) **parathecium**: perlucidulus, 14 μm thick, with abundant puny crystals undissolved in KOH. **epihymenium**:

rubrophaeolic, ca. 9-16 μm thick, with innumerable diminutive crystals (*Pulicaris*-type); pigmentation and crystals undissolved in KOH. hymenium, subhymenium and hypothecium: perspicuous **paraphyses**: scarcely cladate and crassus apically **ascospores**: ellipsoidal, 9.5-15 x 7-10.5 μm . **Spot tests**: thallus and apothecial margin K+ flavid, C+ aurantiolate, Pd+ pale aurantiolate. **Secondary metabolites**: arthothelin, usnic acid (major), atranorin, chloroatranorin, 2, 5-dichloronorlichexanthone and 4, 5-dichloronorlichexanthone (minor) (Fig. 1F).

Substrate and ecology: On bark of *Boswellia serrata*.

World distribution: Pantropical in distribution, Central and South America, New Zealand, Australasia, India etc.

Specimen examined: Angul, Satkoshia 18. 01. 2018, RM 18-03339 (Herbarium, NBRI, Lucknow, Uttar Pradesh).

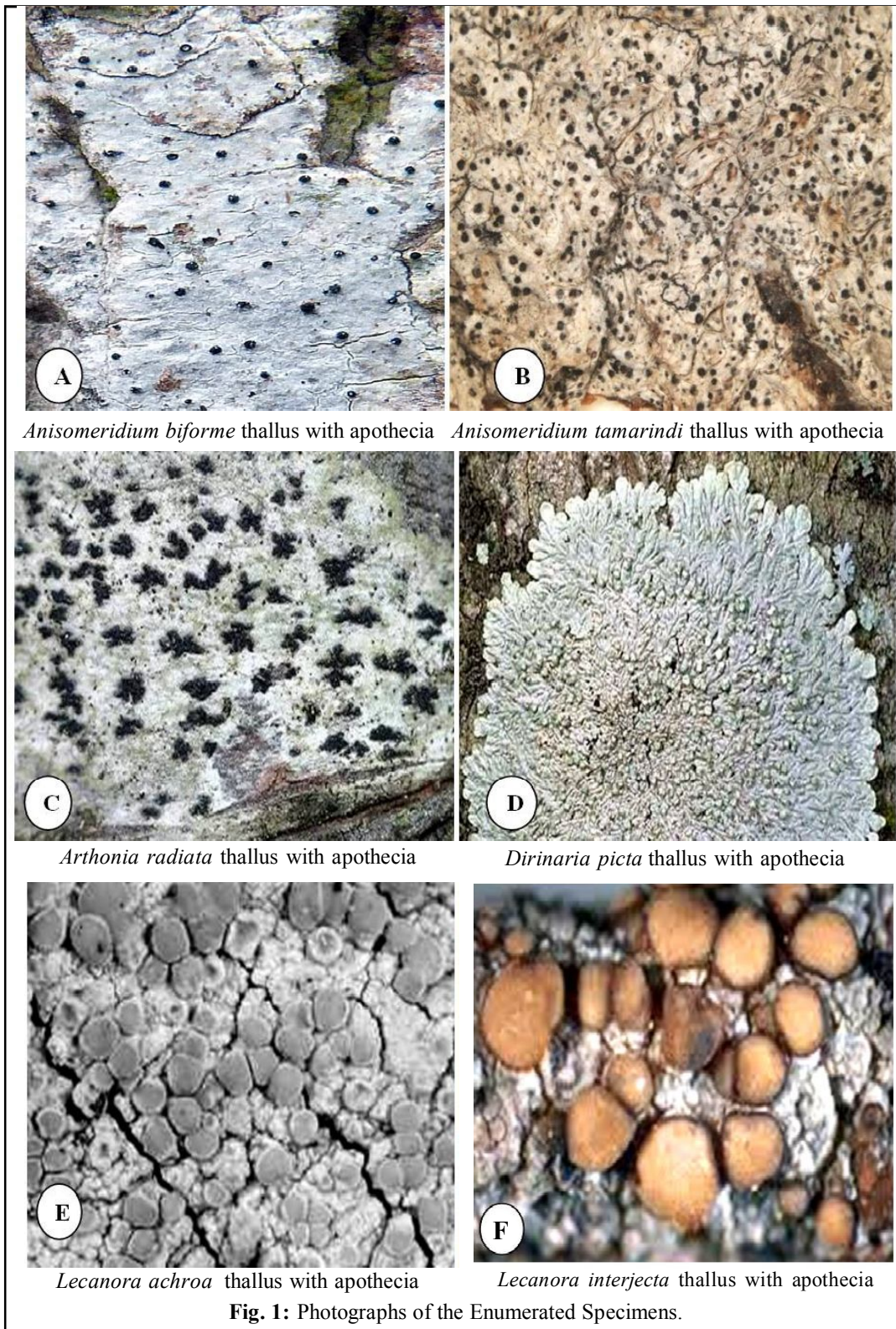
Lecanora leprosa Fée Essai Crypt. Écorc. 118. 1824. (Family- Lecanoraceae)

Vernacular name (s): Bhasma Manjupatra (O), Rim lichens (E).

Thallus: crustose, graciliform to grossus, caespitose, uninterrupted or sattered-cornuate to verruculose, flavo-candid to flavo-ravus or prasino-ravus, epruinose **soredia**: unknown **prothallus**: not observed or leuco-cinereous **Apothecia**: plunged when old, becoming estipitate, 0.3-0.6 (-1.1) mm diam. **disc**: pale aurantiolate to flavo-phaeolic, not or scarcely pruinose **margin**: conchomous with the thallus, psilic to grossus, entire, occasionally cornuate **cortex**: pellucid, \pm gelatinous, sprinkled with puny crystals, discrete, 9-15 μm thick laterally and 14-26 μm thick basally **amphithecium**: with mega crystals undissolved in KOH (*Pulicaris*-type) **parathecium**: vitreous, 9-16 μm thick, with abundant parvulus crystals undissolved in KOH. **epihymenium**: pellucid or flavo-phaeolic, ca. 9-16 μm thick, with copious tiny crystals (*Chlarotera*-type); pigmentation quickly dissolved in KOH. **hymenium and subhymenium**: pellucid **hypothecium**: perspicuous or flavus to pallid-phaeolic **paraphyses**: cladulate and grossus apically. **ascospores**: tenuiformly ellipsoidal, 9.3-13.8 x 4.5-7.5 μm . **Spot tests**: thallus and apothecial margin K+ flavid, C-, Pd+ pale aurantiolate **Secondary metabolites**: atranorin and gangaleoidin (major), chloroatranorin, chlorolecideoidin, leoidin and norgangaleoidin (minor) (Fig. 2A).

Substrate and ecology: On bark of *Madhuca indica*.

World distribution: Pantropical in distribution, Central and South America, New Zealand, Australia,



India, etc.

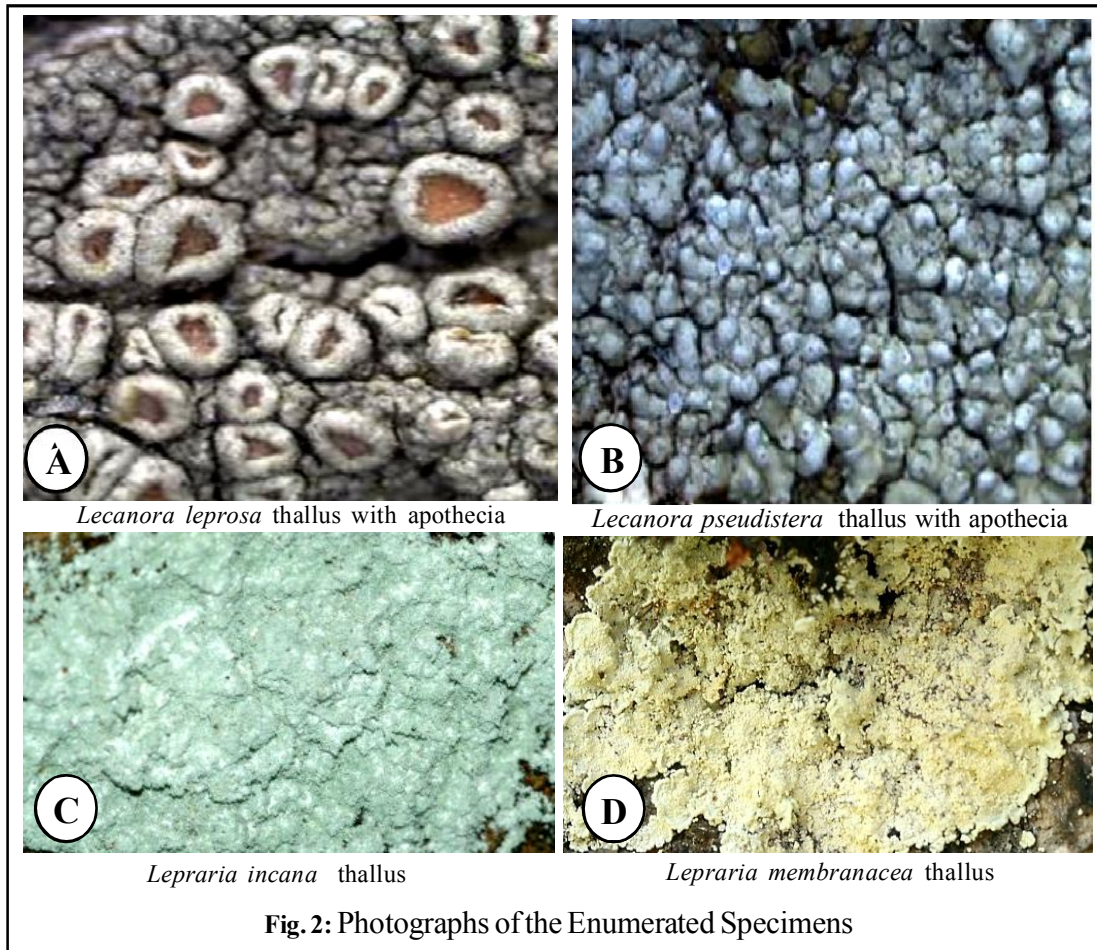
Specimen examined: Angul, Satkoshia 18. 01. 2018, RM 18-03339 (Herbarium, NBRI, Lucknow, Uttar Pradesh).

Lecanora leprosa Fée Essai Crypt. Écorc. 118.

1824. (Family- Lecanoraceae)

Vernacular name (s): Bhasma Manjupatra (O), Rim lichens (E).

Thallus: crustose, graciliform to grossus, campestrial, uninterrupted or sattered-cornuate to verruculose, flavo-



candid to flavo-ravus or prasino-ravus, epruinose **soredia**: unknown **prothallus**: not observed or leuco-cinereous **Apothecia**: plunged when old, becoming estipitate, 0.3-0.6 (-1.1) mm diam. **disc**: pale aurantiate to flavo-phaeoc, not or scarcely pruinose **margin**: conchromous with the thallus, psilic to grossus, entire, occasionally cornuate **cortex**: pellucid, ±gelatinous, sprinkled with puny crystals, discrete, 9-15 µm thick laterally and 14-26 µm thick basally **amphithecium**: with mega crystals undissolved in KOH (*Pulicaris*-type) **parathecium**: vitreous, 9-16µm thick, with abundant parvulus crystals undissolved in KOH. **epihymenium**: pellucid or flavo-phaeoc, ca. 9-16 µm thick, with copiosus tiny crystals (*Chlarotera*-type); pigmentation quickly dissolved in KOH. **hymenium and subhymenium**: pellucid **hypothecium**: perspicuous or flavus to pallid-phaeoc **paraphyses**: cladulate and grossus apically. **ascospores**: tenuiformly ellipsoidal, 9.3-13.8 × 4.5-7.5 µm. **Spot tests**: thallus and apothecial margin K+ flavid, C-, Pd+ pale aurantiate **Secondary metabolites**: atranorin and gangaleoidin (major), chloroatranorin, chlorolecideoidin, leoidin and norgangaleoidin (minor) (Fig. 2A).

Substrate and ecology: On bark of *Madhuca indica*.

World distribution: Pantropical Central and South America, Australasia, India, etc.

Specimen examined: Angul, Satkoshia 18. 01. 2018, RM 18-033315 (Herbarium, NBRI, Lucknow, Uttar Pradesh).

Lecanora pseudistera Nyl. Fl. 55: 354.1872. (Family- Lecanoraceae).

Synonym(s): *Placodium glebulare* Müll.Arg., Fl. 71: 204.1888; *Lecanora glebularis* (Müll.Arg.) Zahlbr., Cat. Lich. Univ. 5: 624.1928.; *Lecanora convexella* Räsänen, Arch. Soc. Zool.-Bot. Fenn. "Vanamo" 3: 180.1948.; *Lecanora subfuscella* Räsänen, Arch. Soc. Zool.-Bot. Fenn. "Vanamo" 3: 180.1948.

Vernacular name (s): Kuta Manjupatra (O), Rim lichens (E).

Thallus: crustose, scattered-cornuate to areolate or lowly squamulose, bulliform, flavo-albus, to flavo-cinereous or leuco-cinereous, epruinose, occasionally nitid. **soredia**: lacking **prothallus**: absent **apothecia**: plunged when old, becoming epedicellate to moderately constricted at the base, 0.3-0.9 (-1.5) mm diam. **disc**: pale to dark rubro-phaeoc, epruinose; margin conchromous with the

thallus, tenuiform, entire, ±cornuate to serrulate, frequently with a parathecial annulus **cortex**: vitreous, ±gelatinous, 14-20 µm thick laterally and 18-26 µm thick basally **amphithecium**: with magniform crystals undissolved in KOH (*Pulicaris*-type) **parathecium**: perlucidulus, 9-16 µm thick, with plentiful parvulus crystals dissolve in KOH. **epihymenium**: rufo-phaeoic, K-, devoid of crystals (*Glabrata*-type), ca. 9-16 µm thick, with a 2.6 µm thick pellucid layer above **hymenium**, **subhymenium** and **hypothecium**: pellucid **paraphyses**: cladulate and crassus apically. **ascospores**: ellipsoidal, 8.3-13.7 × 5.0-8 µm. **Spot tests**: thallus and margin of apothecia K+ flavid, C-, Pd+ pale aurantiolate. **Secondary metabolites**: atranorin, 2'-O-methylperlatolic acid (major), chloroatranorin, ±2'-O-methylhyperlatolic acid, 2'-O-methylisohyperlatolic acid and 2'-O-methylsuperlatolic acid (minor) (Fig.-2B).

Substrate and ecology: On rock.

World distribution: Europe, Americas, southern Africa, Asia, New Zealand and Oceania.

Specimen examined: Angul, Satkoshia 18. 01. 2018, RM 18-033322 (Herbarium, NBRI, Lucknow, Uttar Pradesh).

Lepraria incana (L.) Ach., Method, Sect. prior. Stockh: 4.1803. (Family - Stereocaulaceae)

Basionym: *Byssus incana* L., Sp. pl. 2: 1169.1753.

Synonym (s): *Crocynia tephra* Hue, Bull. Societ. bot. Fr. 71: 341. 1924; *Lecidea incana* (L.) Ach., Syn. method. lich. (Lund): 36 1814; *Lepra incana* (L.) Schaer., Enum. crit. lich. europe. (Bern): 239. 1850; *Lepra incana* (L.) F.H. Wigg., Prim. fl. hols. (Kil.):97.1780; *Patellaria incana* (L.) Spreng., Syst. veget., Edn 16 4(1): 265. 1827; *Pulveraria incana* (L.) Flör., Mag. Gesel. natur. Freu., Berlin 1: 7.1807; *Verrucaria incana* (L.) P. Gaertn., G. Mey. & Scherb., Oekon.-techn. Fl. Wett. 3: 228.1801.

Vernacular name (s): Dhoosar Bhasmila (O): Dust lichen (E).

Thallus: crustose, pulveraceous, placodioid, juncaceous, asymmetrical, strongly fastened to the substrate, forming a psilic strata of soredia, lobes inevident **upper surface**: deeply cinero-prasinus, frequently with a caeruleo-virens tinge, or pallido-viridis or glaucous to albocinereus. sprout upon a common hypothallus **prothallus**: byssoid araneolus, 'gossypinate' forming an asymmetrical, inconspicuously lobed margin, generally devoid of a prominent lip, not campylar **soredia**: diffuse, mostly farinose, up to 70(115)µm in diam., floccose, occasionally with pumilo-projecting hyphae, hyphae 2-5µm thick **medulla**: improperly developed or lacking, if present than

candid **photobiont**: chlorococcoid, ca. 7-19 µm diam., other than *Trentepohlia* **hypothallus**: weakly to properly developed, lax, 'lanate', 'gossypinate, rhizohyphae scanty or lacking **granules**: ecorticate, ill-developed, pollinarius (mealy) (18-)30-60(-100) µm in diam., commonly even in size but ±fasciculating in bigger clusters, up to 100 µm, normally laxly compacted, particularly with some protruding hyphae. **Spot tests**: K- or sometimes K+ faintly flavid, C-, KC- or rarely KC+ violo-rubrus, P- or rarely P+ aurantiolate, UV+ bright luteo-candid caeruleo-candid. **Rare chemotype**: (2): with anthraquinones in addition to the above mentioned substances: parietin, fallacinal, parietinic acid and citreorosein; K+ purpuro-rubrus, C-, KC+ purpuro-rubrus, Pd+ aurantiolate. Infrequent accessories include gyrophoric acid, lecanoric acid, thamnolic acid and an unidentified terpenoid. **Secondary metabolites**: atranorin, zeorin, (major), divaricatic acid and nor divaricatic acid, occasionally parietin (Fig 2C).

Substrate and ecology: on acid bark of deciduous trees, sometimes on siliceous rocks, rarely on mosses, wood and soil; in more or less shadowed places.

World distribution: cosmopolitan, except Arctic and Antarctic.

Specimen examined: Angul, Satkoshia 18. 01. 2018, RM 18-033355 (Herbarium, NBRI, Lucknow, Uttar Pradesh).

Note: *Lepraria incana* (L.) Ach. can be morphologically highly variable, occasionally forming relatively lax gossypinate cushions and rarely consisting of sparse or glutate discrete soredia only.

Lepraria membranacea (Dicks.) Vain., Acta Soc. Fa. Fl. fenn. 49(no. 2): 265.1921. (Family - Stereocaulaceae)

Basionym: *Lichen membranaceus* Dicks., Fasc. pl. cryptog. brit. (Lond.) 2: 21 .1790.

Synonym (s): *Amphiloma lanuginosum* (Ach.) Nyl., Acta. Soc. linn. Bord. 21(4): 315.1857; *Crocynia lanuginosa* (Ach.) Hue, Mém. Soc. nat. Sci. nat. Cherb. 37: 229. 1909; *Crocynia lanuginosa* var. *albescens* B. de Lesd., in Hue, Bull. Societ. bot. France. 71: 363.1924; *Crocynia lanuginosa* var. *inactiva* B. de Lesd., in Hue, Bull. Societ. bot. France. 71: 355.1924; *Crocynia lanuginosa* (Ach.) Hue, Mém. Soc. natn. Sci. nat. Cherb. 37: 229.1909 var. *lanuginosa* *Crocynia lanuginosa* var. *membranacea* (Dicks.) M. Choisy, Icon. Lich. Univers. 2: tab. 7 1928; *Crocynia membranacea* (Dicks.) Zahlbr., Cat. Lich. Univ. 2: 575.1923; *Crocynia membranacea* var. *albescens* (B. de Lesd.) Zahlbr., Cat. Lich. Univ. 8: 240.1932; *Crocynia*

membranacea (Dicks.) Zahlbr., Cat. Lich. Univ. 2: 575.1923 var. *membranacea* *Dictyolus membranaceus* (Dicks.) Maire, Bull. Séan. Societ. Sci. Nancy, Sér. 3 7: 25 (extr.) 1905; *Imbricaria lanuginosa* (Ach.) DC., Fl. fran., Edn 3 (Paris) 5/6: 188.1815; *Lecanora lanuginosa* (Ach.) Branth & Rostr., Bot. Tidssk. 3: 194. 1869; *Leproloma lanuginosum* (Ach.) Nyl. ex Cromb., Monog. Lich. Brit. 1: 348.1894; *Leproloma membranaceum* (Dicks.) Vain., Term. Füzi. 22: 293.1899 var. *membranaceum*; *Lichen lanuginosus* Ach., Lich. succ. prod. (Link.): 120. 1799; *Pannaria lanuginosa* (Ach.) Körb., Syst. liche. german. (Bresl.): 106. 1855; *Parmelia lanuginosa* Ach., Method, Sect. post. (Stockh.): 207. 1803; *Psoroma lanuginosum* (Ach.) Müll. Arg., Bull. Herb. Bois. 2(app. 1): 42.1894.

Vernacular name (s) : Jhillee Bhasmila (O): Dust lichen (E).

Thallus: crustose to lepidose, pallido-cinereous to flavo-candid, definite, composed of pulveraceous lobes, forming asymmetrical rosetiform structure to 3-4 cm wide, frequently becoming contiguous or confluent with another thalli, surface wrapped by a lax mass of convex granules or soredia, demolishing with age to form a powdery mass **margin**: with properly developed lobes to 3 mm long and wide, with an entire \pm campestral or generally conspicuously elevated rim, latiform towards the circinate tips **soredia**: fine to rough, generally \pm globular, 38–70 μ m wide, frequently bunched in consoredia 124–210 (–500) μ m wide, pumilo-radiating hyphae may or may not be present **medulla**: prominent, candid **hyphae**: 2–6 μ m thick. **photobiont**: cells are more or less spherical, 6–14 μ m diam **lower surface**: a prominent hypothallus, cinero-candid to phaeoic or griseo-nigrus, rarely candid along margin of the thallus, forming a \pm pachyform tomentum, rarely spreading well afar the thallus margin. **Spot tests**: Thallus K– or K+ flavid, C–, KC–, P– or P+ aurantiate or rubro-aurantiate, UV+ purpuro-caeruleus. **Secondary metabolites**: pannaric acid, roccellic acid/angardianic acid (major), atranorin \pm (major to trace) and infrequently norstictic acid or zeorin, satellite dibenzofurans (minors to traces) (Fig 2D).

Substrate and ecology: On rock (also on mosses), infrequently on bark or soil; shadowed to sunny sheltered from rain forest.

World distribution: Asia, North and South America, India, Europe and Africa etc.

Specimen examined: Angul, Satkoshia 18. 01. 2018, RM 18-033357 (Herbarium, NBRI, Lucknow, Uttar Pradesh).

Conclusion

The authors have gone through relevant published literature (Singh and Sinha, 2010; Upreti 1996; Singh and Kumar, 2012; Nayak *et al.*, 2015) and visited the NBRI Herbarium unit and the Herbarium of BSI Allahabad in Uttar Pradesh (India) to find out the occurrence, distribution and habitat of these species. It was observed that these species were not mentioned in any of the published papers on lichen group. On close examination of herbarium specimens and detailed scrutiny of literature published till date on these taxa, it can be claimed that these are new records for Odisha.

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