New distribution record of fungi *Mycena chlorophos* (Berk. & M.A.Curtis) Sacc. (Mycenaceae) from the Konkan region of Maharashtra, India

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**Abstract:** Bioluminescence is the generation and emission of light by living things. In the present investigation, *Mycena chlorophos* is reported for the first time from the Konkan region of Maharashtra, India. We observed tiny, luminous clumps of *Mycena chlorophos* on a rotten bamboo substratum. The fungi grow in clusters of one or more individuals.

**Keywords:** Biodiversity, Bioluminescence, chemiluminescence, emission, fungi, Konkan, Mycena chlorophos, luciferin.

Mycologists have always been amazed by the fascinating diversity and evolution of bioluminescent fungi. Bioluminescence is the generation and emission of light by living things. It is a type of chemiluminescence. Many marine animals and invertebrates (Amaral et al. 2016), as well as certain fungi (Aravindakshan et al. 2012), microorganisms (Balachandar et al. 2010) and terrestrial arthropods (like fireflies) (Barua et al. 2007) exhibit bioluminescence (Chatragadda 2020). A complex compound such as luciferin is converted to light energy through oxidation under the action of luciferase which acts as a catalytic enzyme (Pandey & Sharon 2017). A full description of a biochemical process that produces bioluminescence in fungi has been published (Kotlobay et al. 2018).

Bioluminescence is recorded across 17 phyla and more than 700 genera, both in marine and terrestrial environments (Lee 2015). A new distribution record of *Roridomyces*, a bioluminescent fungus has been recorded from Namdapha National Park, Arunachal Pradesh, India (Duta et al. 2023). Desjardin et al. (2008) in their review noted 64 luminescent species. Scientists have recognized a total of 109 luminescent fungi, which can be classified into four molecular lineages (Chew et al. 2015; Mihail 2015; Cortes-Perez et al. 2019; Chang et al. 2020; Karunarathna et al. 2020): 12 in the *Omphalotus* lineage, 10 in the *Armillaria* lineage, 85 in the Mycenoid lineage (mostly Mycenaceae), and two in the Lucentipes lineage.

Konkan, a biodiversity region in the Western Ghats, is home to a wide range of fungal species, yet there is still a dearth of information about bioluminescent fungi. In India, over the past few years, there have been a few reports on bioluminescence from fungi such as *Nothopanus eugrammus* and *Omphalotus olearius* (Vrinda et al. 1999), followed by a unique taxon from Kerala, *Mycena deeptha* (Aravindakshan &
Manimohan 2014) Mycena chlorophos (Arya et al. 2021) & Armillaria mellea (Patil & Yadav 2022). In India there are 54 species of Mycena species reported in Table 1 and some bioluminescent fungi from mushroom families reported in Table 2. In this article, we report the new distribution of Mycena chlorophos (Berk. & M.A.Curtis) Sacc. (Agaricales, Mycenaceae) from Hodavade 15.866° N, 73.725° E (Image 1; Habitat) which is located in Tehsil Vengurla from Sindhudurg District a Konkan region of Maharashtra.

As we conducted a nocturnal survey on 22 July 2023, at 2010 h, for a study on nocturnal animals, we opportunistically discovered a small glowing clump of Mycena chlorophos on a rotten bamboo substratum (Image 2). We noted down the observable morphological characters and photographs were taken under both light and dark conditions (Image 3; Habit).

Field photographs of specimens were taken by Canon 760D with a 100 mm macro lens and Nikon 7500D with Tamron 90 mm lens. The fungus was identified based on the articles available (Moser 1977; Kushwaha & Hajirnis 2016; Arya et al. 2021) and also record cited on www.indexfungorum.org. Mycena chlorophos (Berk. & M.A.Curtis) Sacc., Syll. Fung. (Abellini) 5: 301 (1887) Figs 1–2 Index Fungorum number: IF147895; Faces of fungi number: FoF10625. The fungi grow in clusters of one or more individuals. Early on, the developing body, or pileus, is conical; as it matures, it becomes more rounded. Gills cover the hymenium.

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280–281.
Image 3 (a–e). Fruiting bodies of *Mycena chlorophos*: a—Early staged fruiting bodies on rotten bamboo substratum | b—Fruiting bodies in cluster on the substratum | c—Mature staged fruiting bodies on rotten bamboo | d & e—Bioluminescent fruiting bodies on the substratum.
### Table 1. Mycena species recorded from state/regions of India.

<table>
<thead>
<tr>
<th>Species</th>
<th>State/ Region</th>
<th>Author &amp; Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mycena abietina Maas Geest.</td>
<td>Kashmir</td>
<td>Maas (1992d)</td>
</tr>
<tr>
<td>Mycena aetites (Fr.) Quél.</td>
<td>Jammu &amp; Kashmir</td>
<td>Watling &amp; Gregory (1980)</td>
</tr>
<tr>
<td>Mycena alcalina (Fr.) P. Kumm.</td>
<td>Maharashtra</td>
<td>Sathe &amp; Sasangan (1977)</td>
</tr>
<tr>
<td>Mycena arata (Berk.) Sacc.</td>
<td>Sikkim</td>
<td>Berkeley (1850)</td>
</tr>
<tr>
<td>Mycena auroricolor (Berk. &amp; Broome) Petch</td>
<td>Kerala</td>
<td>Manimohan et al. (1988)</td>
</tr>
<tr>
<td>Mycena avenacea (Fr.) Quél.</td>
<td>Maharashtra</td>
<td>Trivedi (1972)</td>
</tr>
<tr>
<td>Mycena babraku Aravind. &amp; Manim.</td>
<td>Kerala</td>
<td>Aravindakshan &amp; Manimohan (2013b)</td>
</tr>
<tr>
<td>Mycena bicrinita (Berk.) Sacc.</td>
<td>West Bengal</td>
<td>Berkeley (1850)</td>
</tr>
<tr>
<td>Mycena concolor (Fr.) Quél.</td>
<td>Sikkim</td>
<td>Berkeley (1852)</td>
</tr>
<tr>
<td>Mycena conocephala Henn.</td>
<td>Uttar Pradesh</td>
<td>Hennings (1901)</td>
</tr>
<tr>
<td>Mycena cooita Maas Geest.</td>
<td>Uttar Pradesh</td>
<td>Maas (1992d)</td>
</tr>
<tr>
<td>Mycena deeptha Aravind. &amp; Manim.</td>
<td>Kerala</td>
<td>Aravindakshan et al. (2012)</td>
</tr>
<tr>
<td>Mycena dentosa (Berk.) Sacc.</td>
<td>Sikkim</td>
<td>Berkeley (1852)</td>
</tr>
<tr>
<td>Mycena discors (Berk.) Sacc.</td>
<td>Sikkim</td>
<td>Berkeley (1852)</td>
</tr>
<tr>
<td>Mycena eleganta Peck.</td>
<td>Tamil Nadu</td>
<td>Natarajan &amp; Ravin</td>
</tr>
<tr>
<td>Mycena epitetaria (Scop.) Gray</td>
<td>Sikkim</td>
<td>Berkeley (1852)</td>
</tr>
<tr>
<td>Mycena flavominiata (Berk.) Sacc.</td>
<td>Sikkim</td>
<td>Berkeley (1852)</td>
</tr>
<tr>
<td>Mycena galericulata (Scop.) Gray</td>
<td>West Bengal</td>
<td>Berkeley (1852)</td>
</tr>
<tr>
<td>Mycena himalayana Rawla</td>
<td>North Western Himalayas</td>
<td>Rawla &amp; Aarya (1991)</td>
</tr>
<tr>
<td>Mycena inclinata (Fr.) Quél.</td>
<td>Himachal Pradesh</td>
<td>Das (2010)</td>
</tr>
<tr>
<td>Mycena indica Sarwal &amp; Rawla</td>
<td>Himachal Pradesh</td>
<td>Sarwal &amp; Rawla (1983)</td>
</tr>
<tr>
<td>Mycena junicipila (Fr.) Gillet</td>
<td>Mumbai, Maharashtra</td>
<td>Sathe &amp; Deshpande (1982)</td>
</tr>
<tr>
<td>Mycena lohitha Aravind. &amp; Manim.</td>
<td>Kerala</td>
<td>Aravindakshan &amp; Manimohan (2013a)</td>
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<tr>
<td>Mycena lohwagii Singer</td>
<td>Tamil Nadu</td>
<td>Natarajan &amp; Ravindran</td>
</tr>
<tr>
<td>Mycena macrothelia (Berk.) Sacc.</td>
<td>West Bengal</td>
<td>Berkeley (1852)</td>
</tr>
<tr>
<td>Mycena manipularis (Berk.) Sacc.</td>
<td>Himalaya</td>
<td>Berkeley (1850)</td>
</tr>
<tr>
<td>Mycena metata (Secr. ex Fr.) P. Kumm.</td>
<td>Uttar Pradesh</td>
<td>Hennings (1901)</td>
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<tr>
<td>Mycena myriadea (Berk.) Sacc.</td>
<td>Sikkim</td>
<td>Berkeley (1850)</td>
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<tr>
<td>Mycena prasla (Berk.) Sacc.</td>
<td>Sikkim</td>
<td>Berkeley (1850)</td>
</tr>
<tr>
<td>Mycena profusa Manim. &amp; Leelav.</td>
<td>Kerala</td>
<td>Manimohan &amp; Leelavathy (1988a)</td>
</tr>
<tr>
<td>Mycena pura (Pers.) P. Kumm.</td>
<td>Sikkim</td>
<td>Berkeley (1852); Maas (1992d); Mohanan (2011)</td>
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Table 2. Bioluminescent fungi from the mushroom family.

<table>
<thead>
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<th>Family</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roridomyces phyllostachydus</td>
<td>Mycenaceae</td>
<td>Karunarathna et al. 2020</td>
</tr>
<tr>
<td>Mycena lucentipes Desjardin, Capelari &amp; Stevani</td>
<td>Mycenaceae</td>
<td>Bechara 2015</td>
</tr>
<tr>
<td>Mycena rosea Gramberg</td>
<td>Mycenaceae</td>
<td>Chew et al. 2014</td>
</tr>
<tr>
<td>Mycena chlorophos (Berk. &amp; M.A.Curtis) Sacc</td>
<td>Mycenaceae</td>
<td>Kenichi et al. 2011</td>
</tr>
<tr>
<td>Mycena luxaeterna</td>
<td>Mycenaceae</td>
<td>Desjardin et al. 2010</td>
</tr>
<tr>
<td>Armillaria mellea (Vahl:Fr.) P.Kummer</td>
<td>Physalacriaceae</td>
<td>Mihail 2015</td>
</tr>
<tr>
<td>Flammulina velutipes (Curtiss) Singer</td>
<td>Physalacriaceae</td>
<td>Desjardin et al. 2008</td>
</tr>
<tr>
<td>Neonothopanus nambi (Speq.) R.H.Peterson &amp; Krisai, Persoonia</td>
<td>Marasmiaceae</td>
<td>Bondar et al. 2011</td>
</tr>
<tr>
<td>Gerronema viridilucens (Desjardin, Capelari &amp; Stevani)</td>
<td>Marasmiaceae</td>
<td>Mendes et al. 2008</td>
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<tr>
<td>Nostopanus euagrammus (Mont.) Singer</td>
<td>Marasmiaceae</td>
<td>Vipla et al. 1999</td>
</tr>
<tr>
<td>Omphalotus olearius (DC ex Fr.) Singer</td>
<td>Marasmiaceae</td>
<td>Vipla et al. 1999</td>
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