

## New Records and a Checklist of *Xylaria* from Andaman and Nicobar Islands

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### ABSTRACT

***Xylaria* is a macro ascomycetous genus distributed worldwide. Examination of dead and decaying twig samples of tree plant species fallen on the forest floor in the South, Middle, and North Andaman Islands of India yielded 18 new records of *Xylaria* species from the Island region. This paper describes and illustrates these with a table showing a *Xylaria* spp., checklist from the Andaman Islands.**

**Keywords:** Andaman Islands, Ascomycota, Sordariomycetes, Taxonomy, Xylariomycetidae,

### INTRODUCTION

Xylariaceae, the type and largest family of the order Xylariales, has undergone several revisions to recognize the number of genera this family comprises. Maharachchikumbura *et al.* (2016) have accepted 87 genera under Xylariaceae, which included the subfamilies Xylaroideae and Hypoxyloideae. However, Wendt *et al.* (2018) have resurrected the family Hypoxylaceae (= Hypoxyloideae) based on morphology, phylogeny and secondary metabolite analyses. Hyde *et al.* (2020a, b) have accepted 32 genera in Xylariaceae and provided detailed notes for each of the accepted genera. However, later studies by Wijayawardane *et al.* (2022) reported 38 genera without detailed annotations. Currently, 43 genera are accepted in the Xylariaceae by Li *et al.* (2024a, b). Meanwhile, Karimi *et al.* (2024); Li *et al.* (2024a, b), and Zeng *et al.* (2024) published >70 novel species in 2024 with detailed descriptions supported by phylogenetic trees. Members of Xylariaceae exhibit diverse lifestyles including saprobic, pathogenic, or endophytic, or thriving in ant and termite nests, or colonising dung, wood, leaves, branches, and fruits (Proffer 1988; Hartman *et al.*, 2008; Hyde *et al.*, 2020a; Jayawardena *et al.*, 2023; Suwannasai, 2023). In addition, some are facultative parasites being opportunistic and weakly pathogenic to plant species.

*Xylaria* is one of the largest genera, with 936 specific epithets currently recorded, of which around 410 were recognized distinct species (IndexFungorum 2025, accessed on January 19, 2025), though it was previously reported to have 572

species (Wijayawardane *et al.*, 2022). Since its discovery, this genus has attracted taxonomists due to its micromorphology and its resemblance to lower plants. As of August 19, 2023, the molecular sequence data for this genus included 46,938 sequences (NCBI, 2025). In the past three years, <100 new species have been described (Wangsawat *et al.*, 2021; Ju and Hsieh 2023; IndexFungorum, 2025), contributing to the global annual average of nearly 2,000 newly described fungal species (Wu *et al.*, 2019; Kew Gardens, 2023). World key to *Xylaria* on fallen fruits and seeds (Ju *et al.*, 2018, Ma *et al.*, 2022), fallen leaves and petioles (Ju *et al.*, 2023), saprophytes (Fournier *et al.*, 2018, 2019, 2020) have been provided. Most of the new species described, based on morphology (Ju and Hsieh, 2023; Li *et al.*, 2024), have molecular data, which is crucial for the accurate placement of new taxa and helps prevent synonymy with existing species.

In the present paper species names are not assigned for two taxa, which on further study and comparison may turn out to be altogether new. All the species, included in the present work, are fully described and illustrated from localities of the Andaman and Nicobar Islands. Seven species recorded in the present study have previously been reported and have been critically studied and reviewed earlier by Dargan (1976), Jayawardena *et al.*, (2022), Boonmee *et al.*, (2021). A table has been provided at the end that depicts the dimensions of the ascomata, asci and ascospores of all the species.

### MATERIAL AND METHODS

Dead and decaying twig samples fallen on the forest floor in the reserved forests of South, Middle and

North Andaman Islands, India were collected and transferred into zip lock plastic bags, air dried overnight, and packed into new plastic bags for shipment to the laboratory for further processing. Before undertaking the microscopic examination, the twigs were placed individually into plastic bread boxes lined with sterile tissue paper, rehydrated by sprinkling sterile water and incubated before examination. The samples were then examined under a Stereo Zoom microscope (Optika SZM-LED, Italy) to locate the fungal fruiting structures. Hand sections were taken wherever necessary. The fruit bodies were cut with a razor blade, and the spore constituents were transferred to a microslide mounted with stains like Lacto phenol, Lactophenol cotton blue, Lugol's reagent and India ink. These slides were then examined under the Nikon ECLIPSE TiU upright microscope with DIC objectives fitted with Nikon DS-Fi2 digital camera Japan to take photomicrographs. Measurements were taken with Nikon NIS-Elements-Imaging Software version 4.4 program, plate photos made with Microsoft powerpoint, and Adobe Photoshop version 7.0. Morphological identification was carried out by referring to various monographs and individual publications (Ainsworth *et al.*, 1973; Alaka, 2008; Hyde *et al.*, 2013; Maharachchikumbura *et al.*, 2016). The herbarium materials of the holotype were deposited at Ajrekar Mycological Herbarium (AMH), Agharkar Research Institute (ARI), Pune, India.

Single spore isolation method was followed to isolate the fungi (Choi *et al.*, 1999). Ascostromata were cut laterally to open the fruiting bodies, the internal content was carefully transferred, using a sterilized needle, to a sterilized cavity slide that has a few drops of sterilized distilled water. The spore contents were then crushed to separate the spores and obtain a spore suspension. The suspension was inoculated onto fresh, Water agar (WA) and Malt Extract Agar (MEA), plates and incubated at room temperature. Germinating ascospores were aseptically transferred to fresh culture plates. Colonies were photographed and characters were noted.

DNA extraction, PCR amplification, sequencing and phylogenetic analyses were carried out as per standard protocols. Fresh fungal mycelium grown on MEA for 1 week at room temperature was scraped from the colony margin and was used for genomic DNA extraction using a GeneJET Plant

Genomic DNA Purification Mini Kit (Thermo Scientific Lithuania). PCR amplification and sequencing of the LSU region using the primer pair LROR/LR5 and ITS region using the primer pair ITS5/ITS4, were performed by GeneJET PCR Purification Mini Kit (Thermo Scientific Lithuania). The PCR products were visualized on 0.8 % agarose electrophoresis gel stained with ethidium bromide. Purification and sequencing of PCR products were carried out at AgriGenome Labs Pvt Ltd. Smart City Kochi, Kerala, India. The DNA sequences generated from this study were deposited at GenBank. The sequences generated in this study were supplemented with additional sequences obtained from GenBank based on blast searches and published literature. Multiple sequence alignments were generated with MAFFT v. 7 (<http://mafft.cbrc.jp/alignment/server/index.html>); the alignment was improved with BioEdit v. 7.0.5.2 (Hall 1999). The phylogenetic analyses were performed for Maximum Likelihood in RAXML 7.4.2 RAXML GUI (Stamatakis 2006; Stamatakis *et al.*, 2008), Maximum Parsimony in PAUP v. 4.0b10 (Swofford, 2003), or Bayesian inference in MrBayes v. 3.2.1 (Ronquist *et al.* 2012) as specified in the legend of phylogenetic tree.

## RESULTS AND DISCUSSION

### Taxonomy

Species within the genus *Xylaria* Hill ex Schrank are predominantly saprobic or endophytic. This genus exhibits highly variable stromata in size and shape, ranging from simple to branched at the base. The stromata may be nearly sessile or develop from long, rooted stipes. When young, they are whitish, gradually transitioning to silvery grey and eventually becoming black. They develop longitudinal furrows that form narrow strips, with perithecial contours often indistinct in well-developed stromata. The stromata are leathery and black, with a solid, homogeneous white to cream-coloured interior, sometimes with a slightly darker core. The stipes are cylindrical to strap-like, black, and possess a hairy-tomentose broadened base. The ascomata are subglobose and can be either immersed or slightly exposed. Ostioles appear raised and discoid, with colors ranging from grey and brown to black, often featuring a low conical papilla at the center. The hamathecium consists of sparse, hypha-like, hyaline, and septate paraphyses. The asci are unitunicate, 8-spored, cylindrical, and long-pedicellate, typically containing a J+ apical

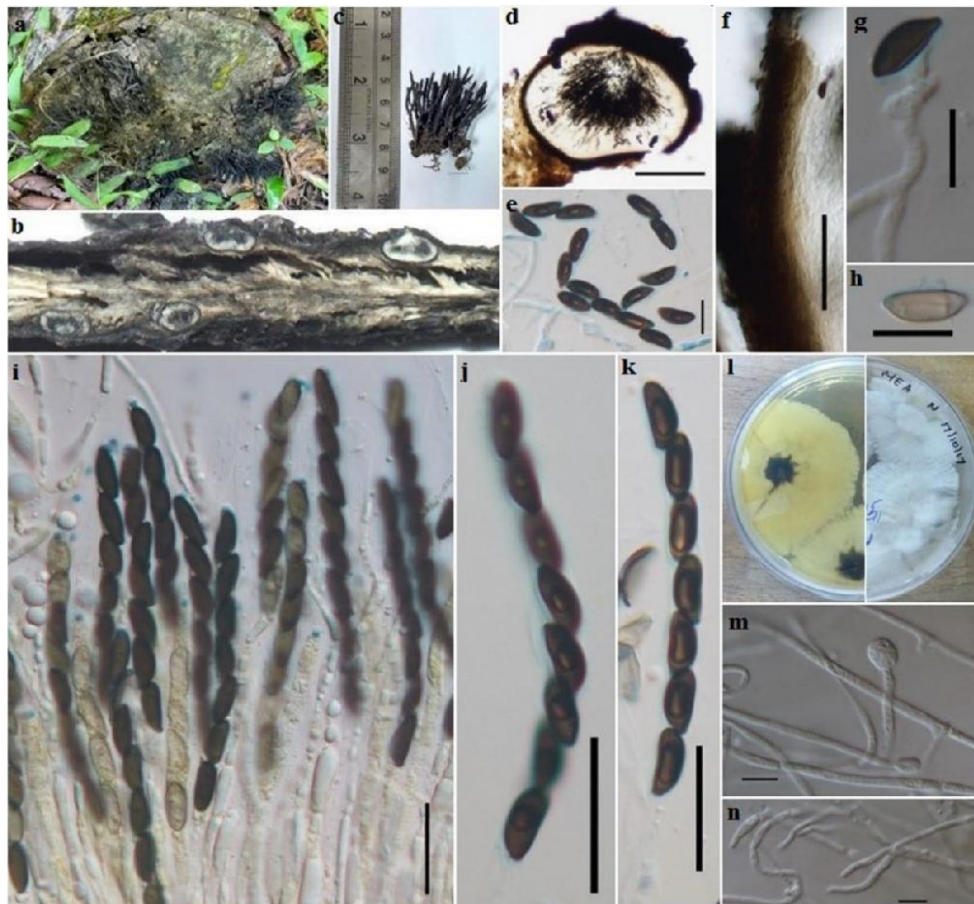
apparatus. Ascospores are arranged in an overlapping uniseriate manner within the ascus, ellipsoid-inequilateral, with narrowly to broadly rounded ends, medium brown, and smooth-walled. Some spores exhibit cellular appendages that disappear at maturity. They generally contain two large guttules and have a distinct straight germ slit extending half to four-fifths of the spore length on the flattened side. The type species of this genus is *Xylaria hypoxylon* (L.) Grev. The new records of *Xylaria* spp. of the present study are described and illustrated in alphabetical order.

*Xylaria brevipes* Sacc. & Fairm., in Saccardo, J. Mycol. 12(2): 47 (1906)

**Index Fungorum number:** IF 187462 **Figure 1**

On a decaying twig. **Telomorph:** Stromata 35 mm high  $\times$  3 mm wide, superficial, aggregated into clusters with blackish-brown scales. They lack a central stalk. Ascomata perithecial, 380–520  $\times$  470–510  $\mu\text{m}$  ( $\bar{x}$  = 442.4  $\times$  490,  $n$  = 5), globose, erumpent, pulvinate, 6–8 in a horizontal cross-section.

Peridium 23.9  $\mu\text{m}$  diam., composed of brown to hyaline textura porrecta cell layers. Hamathecium: Paraphyses 2.8  $\mu\text{m}$  diam., septate, branched, longer than asci, sparsely present. Asci 100–135  $\times$  4.4–6.6  $\mu\text{m}$  ( $\bar{x}$  = 133.4  $\times$  5.2  $\mu\text{m}$ ,  $n$  = 25), unitunicate, 8-spored, cylindrical, apically rounded, with a J+ve apical ring 1.2–2.4  $\times$  0.9–1.7  $\mu\text{m}$  ( $\bar{x}$  = 1.6  $\times$  1.3,  $n$  = 25), long-pedicellate. Ascospores (9.7) 10.2–13.8  $\times$  4.4–5.1  $\mu\text{m}$  ( $\bar{x}$  = 11.5  $\times$  4.6,  $n$  = 25), overlapping uniseriate, hyaline when young, brown at maturity, ovoid, with a straight germ slit, guttulate, with obtuse ends, smooth-walled. **Anamorph:** Observed on malt extract agar (MEA) plates, colonies reach a diameter of 6.7 cm in one week. Mycelia exhibit two-dimensional growth, initially hyaline and velvety, soon becoming grey, then pale brown, and eventually developing a secondary aerial mycelium. Mycelia hyaline, hyphae branched, septate, Nodulisporium-like, form synnematal projections, have filamentous margins, centrally flat with lateral elevation, rough surface, bright, non-pigmented, opaque. Reverse side centrally black and radially white.



**Figure 1:** *Xylaria brevipes* (NFCC-4366). **a-c**, Stromata on decaying host; **d**, Vertical section of ascomata; **e** and **h**, Ascospores; **f**, Peridium; **g**, Germinating spore; **i-k**, Asci; **l**, Culture on MEA plate; **m** and **n**, Hypha with Chlamydospores. Scale bars: **d** = 200  $\mu\text{m}$ ; **f** = 50  $\mu\text{m}$ ; **i-k** = 20  $\mu\text{m}$ ; **e**, **g**, **h**, **m**, **n** = 10  $\mu\text{m}$ .

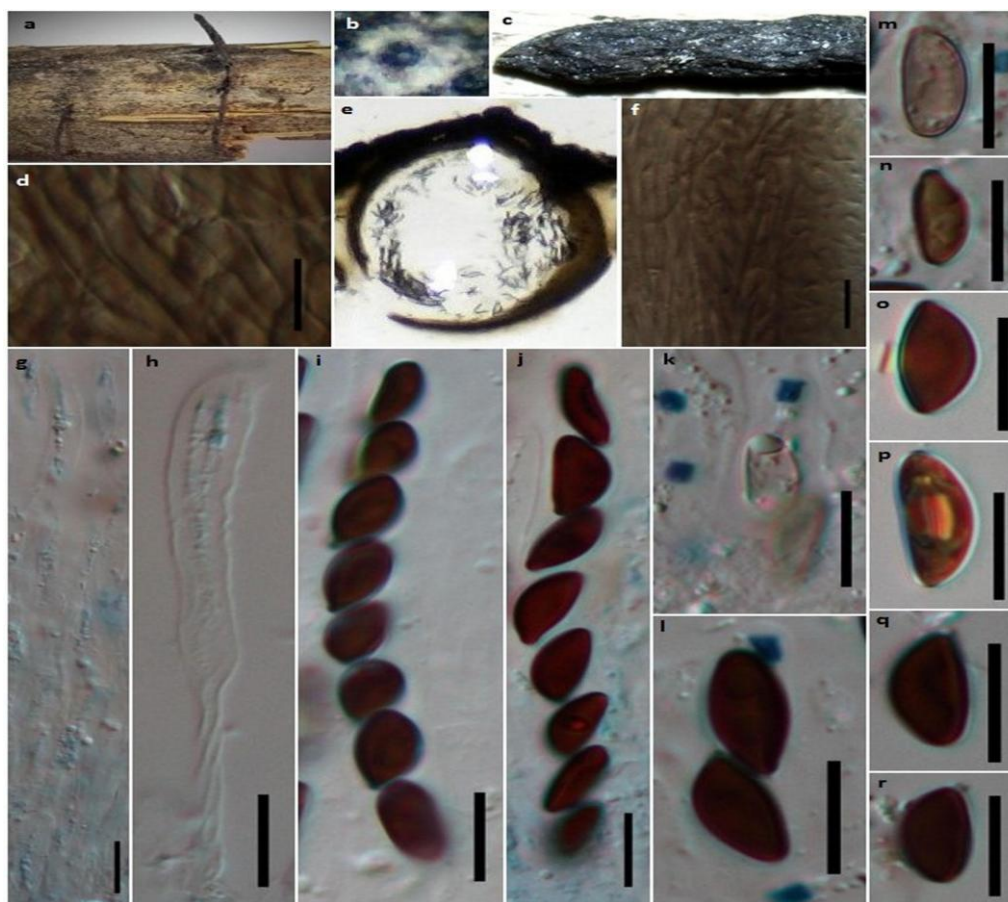
**GenBank number:** ITS OR462371.

**Material examined:** INDIA, Andaman and Nicobar Islands, South Andaman, Mount Harriet, (11°71'09.8"N 92°73'30.6"E). Recorded on an unidentified decaying log, December 11, 2017. Collected by M. Niranjan & V.V. Sarma (PUFNI 1762). Herbarium specimen was submitted to Ajrekar Mycological Herbarium, ARI, Pune (AMH-10067) and a living culture (NFCC-4366) was deposited at National Fungal Culture Collection of India (NFCCI), ARI, Pune, India.

**Notes:** In India, *Xylaria* cf. *brevipes* was first reported by Kshirsagar *et al.* (2009) from Mulashi forest (Maharashtra). It has all similarities except that the ascospores are smaller than the current record (7.5 – 12 x 3 – 4.5 vs. 10.2–13.8 × 4.4–5.1 µm). This species has also been recorded from Jalgaon of Maharashtra state (Firdousi and Khan, 2021). In the present study, in addition to the morphological description, and photomicrographic plate, we provide sequence data and molecular phylogram for this record. *X. brevipes* widely distributed in the world.

*Xylaria bulbosa* (Pers.) Berk. & Broome Outlines of British Fungology: 385 (1860). **Figure 2**

Saprobic on unidentified twig. **Teleomorph:** Stromata 30 mm long, solitary, grey to brown, cylindrical to clavate, light carbonaceous, straight cracks on the fertile surface, 1/3 sterile stalk, stalk brown with hairs, base of stalk broadly spread on host to hold the stroma and contents, consists of 2 layers outer carbonaceous layer and remain hyaline spongy tissue with central pale yellow colored stalk. Ascomata perithecial, parallel, 4–6 ascomata in a single plane of a stroma, soft, papillate. Peridium outer pale brown, black at subapical to apical end black, textura porrecta and inner hyaline textura cells. Hamathecium paraphyses septate, unbranched. Asci 51–76 × 5–7.5 µm ( $\bar{x}$  = 64.5 × 7.2, n=26), unitunicate, 8–spored, uniseriate or overlapping uniseriate, cylindrical, J+ve apical ring with central pore, persistent, narrow towards down, pedicellate. Ascospores 10–12.5 × 4.5–5.5 µm ( $\bar{x}$  = 11.3 × 5.06, n=26), hyaline when young, dark brown at maturity, ovoid to broad fusoid with a straight germ-slit, smooth-walled. **Anamorph:** Undetermined.



**Figure 2:** *Xylaria bulbosa* (PUFNI 369). a–c, Stroma; e, vertical section of ascoma; d, Textura porrecta; f, Peridium; g, Paraphyses; h–j, Asci; k, l, Apical ring; m–r, Ascospores. Scale bars: d, f–r = 10 µm.

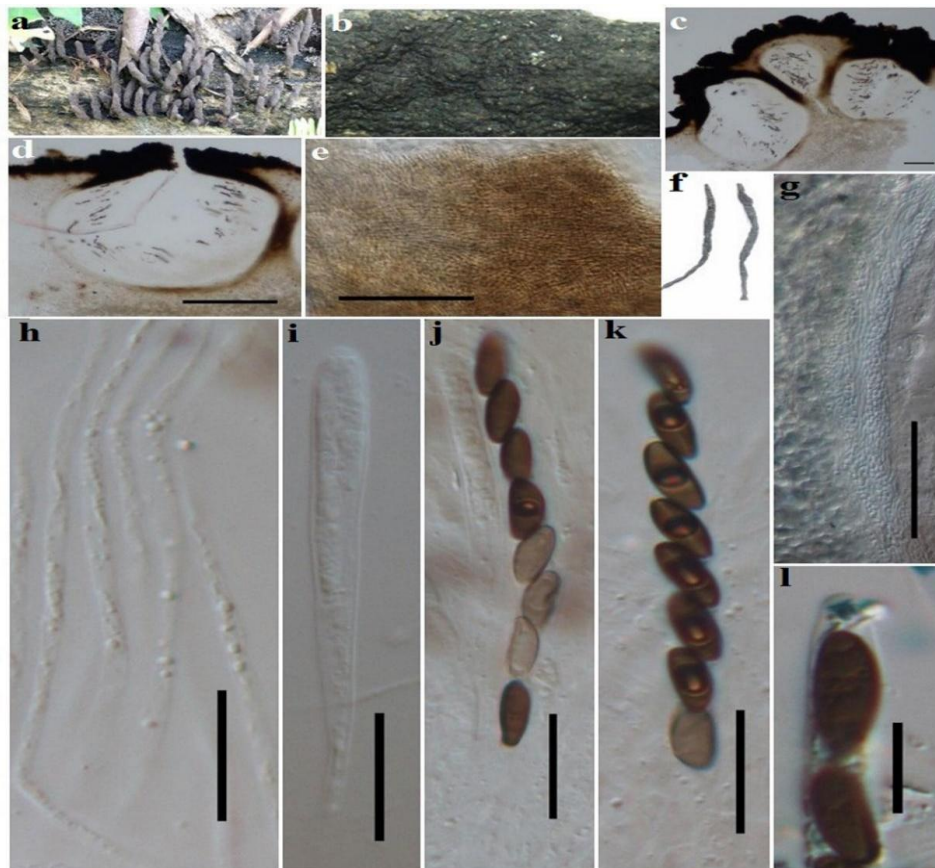
**Specimen examined:** INDIA, Andaman and Nicobar Islands, South Andaman, Chidiya Tapu. Recorded on unidentified twig, 7 February, 2016, M.Niranjan & V.V.Sarma (PUFNI 369). Additional specimens examined: South Andaman, Port Blair, Chidiya Tapu (11°31'7" N 92°42'52"E) (T100F2) on unidentified twig, 07 February, 2016.

**Notes:** Complete description of *Xylaria bulbosa* was mentioned in Rogers (1983) and Læssøe (1993). The type species produces larger stromata, pedicel when compared to the present record (Rogers, 1983). Though its distribution is worldwide and more frequently observed in Europe and USA on conifers and mosses, the current isolate is found on dead and decaying twigs. The present record of *Xylaria bulbosa* from the Andaman Islands confirms its presence in the region, and it is also widely distributed in the world.

*Xylaria castorea* Berk. Hooker Flora NovaeZelandiae II. p. 204. 1855. **Figure 3**

Saprobic on decaying twig. **Teleomorph:** Stromata 3.2–3.5 cm long, 1/3 fertile portion consists of the

Ascomata. Ascomata superficial, aggregated in clusters, warty surface, thick-walled, 4.6 µm wide, stromatic soft tissue around the perithecia, central part, filamentous hyaline, no definite central stalk branched 2.6 µm wide, perithecial, 330–390 × 376–495 µm ( $\bar{x}$  = 367.3 × 431.0, n=5), globose, erumpent, clypeate. Necks 77–130 ( $\bar{x}$  = 104.4, n=5) µm long, without periphyses, surrounded with thick carbonaceous textura angularis cell layers. Peridium 18.4 – 20 µm wide, with brown to hyaline, textura porrecta cell layers. *Hamathecium*; *Paraphyses* 2 – 2.7 ( $\bar{x}$  = 2.5, n=5) µm diam., uneven, septate, unbranched, longer than asci, guttulate. *Asci* 92 – 118 × 5.6 – 7.3 µm ( $\bar{x}$  = 105.9 × 6.3, n=25), unitunicate, 8-spored, cylindrical, apically rounded, long pedicellate, persistent, cylindrical, J+ve apical ring 4.0–5.4 × 1.8 – 2.4 µm ( $\bar{x}$  = 4.7 × 2.1, n=25), wider at apical ends. *Ascospores* (11.0–) 11.4 – 13.7 (17.0) × 4.9–6.4 µm ( $\bar{x}$  = 12.7 × 5.6, n=25), overlapping uniseriate, hyaline to brown and becoming dirty brown at maturity, cylindrical, slightly curved germslit, obtuse ends, asymmetrical, rarely show a pseudo-septatum, smooth-walled. **Anamorph:** Undetermined.



**Figure 3:** *Xylaria castorea* (PUFNI 17610). **a and f,** Stromata; **b,** Verrucose stromata surface; **c and d,** Horizontal section of ascoma; **e,** Textura intricate; **g,** Peridium; **h,** Paraphyses; **i–k,** Asci; **l,** Apical ring. Scale bars: **d** = 200 µm; **c** = 100 µm; **e, g** = 50 µm; **h–i** = 20 µm.

**Specimens examined:** INDIA, Andaman and Nicobar Islands, South Andaman, Chidiya Tapu, Viewpoint area, (11°48'10"N 92°71'08"E). Recorded on decaying log 9 December, 2017. M.Niranjan & V.V.Sarma (PUFNI 17610).

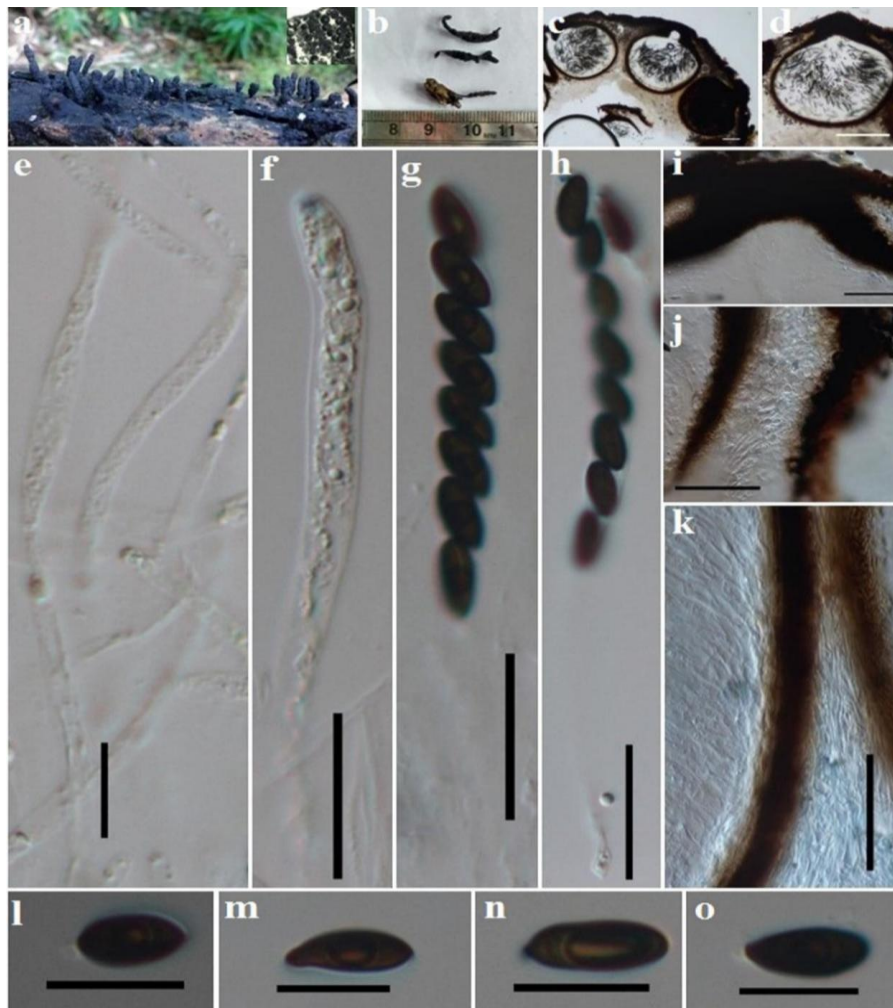
**Notes:** *Xylaria castorea*, is distributed throughout the world including India ([https://www.gbif.org/occurrence/search?offset=900&taxon\\_key=5255090](https://www.gbif.org/occurrence/search?offset=900&taxon_key=5255090)). The asci of current isolate are smaller and ascospores are larger when compared to the existing record. Present record has a straight germ-slit when compared to the obscure ones found in the type (Rogers and Samuels, 1986).

*Xylaria feejeensis* (Berk.) Fr Nova Acta Regiae Societatis Scientiarum Upsaliensis 1: 128 (1851).

**Figure 4**

Saprobic on decaying twig. **Teleomorph:** *Stromata* 0.9 – 1.2 cm superficial, aggregated, surface warty,

rarely branched, apically black, carbonaceous, centrally with long pale brown stalks up to apical ends. *Ascomata* 330 – 456 × 360 – 495 μm ( $\bar{x}$  = 376.6 × 416.3, n=10), globose, erumpent, pulvinate, clypeate, periphysate neck 98 – 125.5 μm ( $\bar{x}$  = 114.6, n=5) long. Peridium 19.8 – 24.4 μm wide, with brown to hyaline, textura porrecta cell layers. *Hamathecium:* Paraphyses 2.5–3.5 μm wide, septate, branched, longer than asci, sparsely present. *Asci* 85 – 124 × 5.5 – 8.2 μm ( $\bar{x}$  = 101.7 × 6.4, n=25), unitunicate, 8-spored, overlapping uniseriate, cylindrical, apically rounded, long pedicellate, persistent, apical rings 0.8–1.1 × 1.7–2.1 μm ( $\bar{x}$  = 0.9 × 1.9, n=25), J+ve in Lugol's solution. *Ascospores* 9.3 – 12.2 × 3.9 – 7.2 μm ( $\bar{x}$  = 10.6 × 5.3, n=25), hyaline to brown at maturity, cylindrical to ovoid, hyaline, apiculate at one end, asymmetrical, uni-guttulate, straight germ-slit, obtuse ends, smooth-walled. **Anamorph:** Undetermined.



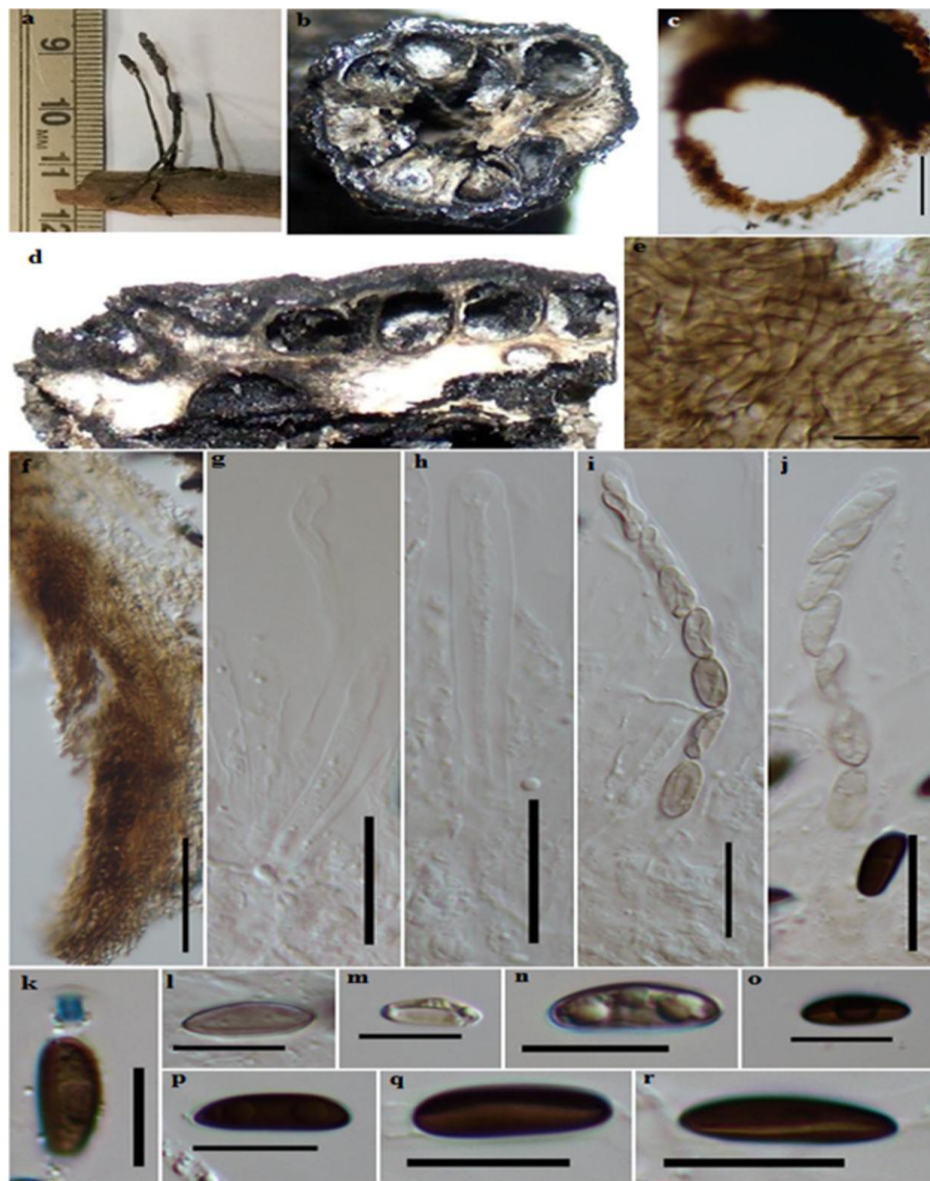
**Figure 4:** *Xylaria feejeensis* (PUFNI 1767). **a and b**, Stromata; **c and d**, Vertical section of ascomata; **e**, Paraphyses; **f–h**, Asci; **i**, Neck; **j**, Cross section of stroma; **k**, Peridium; **l–o**, Ascospores. Scale bars: **d** = 200 μm; **c** = 100 μm; **i–k**=50 μm; **f–h** = 20 μm; **e, l–o** = 10 μm.

**Specimens examined:** INDIA, Andaman and Nicobar Islands, South Andaman, Chidiya Tapu, Viewpoint Area (11°48'10"N 92°71'08"E). Recorded on decaying log, 9 December 2017. M. Niranjana & V.V.Sarma (PUFNI 1767).

**Notes:** *Xylaria feejeensis* is recorded in Mulashi forest (Maharashtra), India and throughout the world ([https://www.gbif.org/occurrence/search?offset=100&taxon\\_key=7257227](https://www.gbif.org/occurrence/search?offset=100&taxon_key=7257227), Karun and Sridhar, 2015). Ascostromata of the current record are larger than the type and have narrower asci and larger ascospores (Rogers, 1983).

*Xylaria filiformis* (Alb. & Schwein.) Fr. Summa vegetabilium Scandinaviae 2: 382 (1849) **Figure 5**

Saprobic on unidentified twig. **Teleomorph:** *Stromata* 20 – 50 mm long, scattered to clustered, dark brown, vertical, bipartite, outer thin grey colour, inner white parenchymatous tissue with central stalks. *Ascomata* multi peritheciate, ostiolate, globose, narrow towards apical end, horizontal. *Hamathecium:* *Paraphyses* unbranched, longer than asci, even. *Asci* 70–100×6.2–8.7µm ( $\bar{x}$  = 79.2 × 7.1, n=25), unitunicate, 8-spored, cylindrical, J+ve apical ring in Lugol's solution 2.6–3.1 × 1.6–2 µm, pedicellate, persistent. *Ascospores* 11.3–15×5.5–7µm ( $\bar{x}$  = 12.7 × 6.4, n=25), subhyaline to brown, dark brown, overlapping uniseriate, cylindrical, rounded ends, covered germ-slit, smooth-walled. **Anamorph:** Undetermined.



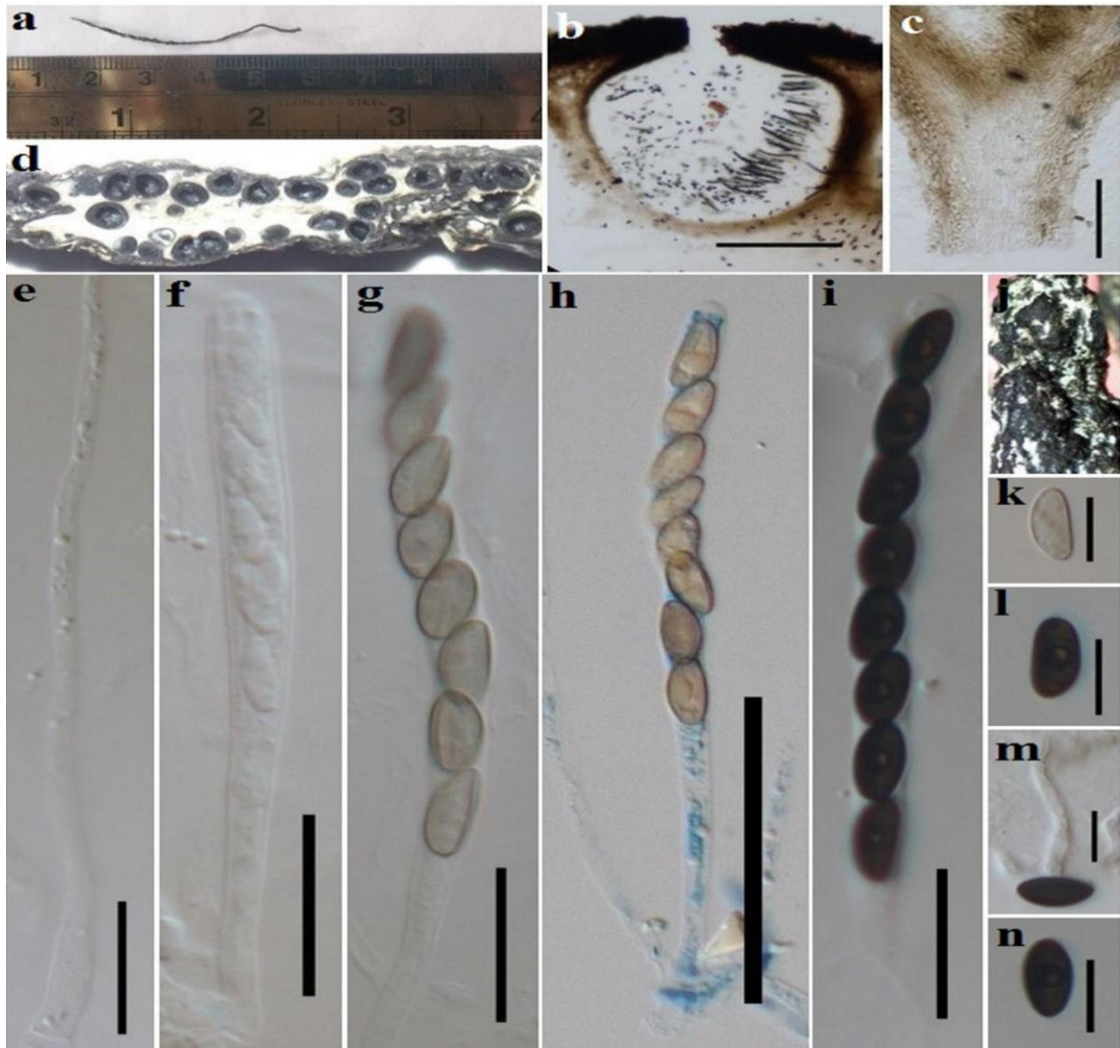
**Figure 5:** *Xylaria filiformis* (PUFNI 17457). **A**, Ascostromata; **b and d**, Transverse section; **c**, Vertical section of ascostoma; **e**, Textura intricata layer; **f**, Peridium; **g**, Paraphyses; **h–j**, Asci; **k**, J+apical ring; **l–r**, Ascospores. Scale bars: **c**=100µm; **f**=50 µm; **g–j**= 20 µm; **e,g, k–r**=10 µm.

**Specimen examined:** INDIA, Andaman and Nicobar Islands, South Andaman, Port Blair, Chidiya Tapu (11°29'23"N 92°42'36"E). Recorded on unidentified twig, 8 January, 2017, M.Niranjan & V.V.Sarma (PUFNI 17457).

**Notes:** *Xylaria filiformis* recorded in the present study is similar to the type with slight differences in the dimensions of ascostromata and apical ring (Dülger *et al.*, 2007; Ju and Hsieh 2023). Earlier reported from Sholaforest, Sampaje, Karnataka (Karun and Sridhar, 2015), this fungus also has worldwide distribution. This is the first record of this fungus from Andaman Islands thus extending its geographical range.

*Xylaria fissilis* Ces. Atti dell'Accademia di Scienze Fisiche e Matematiche Napoli 8 (3): 16 (1879).  
**Figure 6**

Saprobic on decaying twig. **Teleomorph:** *Stromata* 45 × 2 mm diam superficial, aggregated into clusters, minute sterile central stalk, the fertile part having immersed perithecia. *Ascomata* 350–460 × 370–450 µm ( $\bar{x}$  = 413.2 × 401.3, n=5), globose, erumpent, pulvinate, clypeate, periphysate. Necks 76–98 µm long. Peridium wall 10 µm wide, with brown to hyaline, textura porrecta cell layers. *Hamathecium:* Paraphyses 2.2–4.7 µm wide, septate, branched, longer than asci, sparsely present. *Asci* (93.8) 95.5–137.2 × (5.3) 5.5–7.9 µm ( $\bar{x}$  = 115.7 × 6.5, n=25), 8-spored, unitunicate, cylindrical, apically rounded, J+ve apical ring 2.0–3.2 × 1.4–2.3 µm ( $\bar{x}$  = 2.9 × 2.0, n=25), long pedicellate, persistent. *Ascospores* (9.8) 10.2–12.9 × 4.8–5.9 µm ( $\bar{x}$  = 11.7 × 5.3, n=25), overlapping uniseriate, hyaline to brown at maturity, ovoid, straight germslit, obtuse ends, smooth-walled. **Anamorph:** Undetermined.



**Figure 6:** *Xylaria fissilis* (PUFNI 1764). **a**, Stromata on a decaying host; **b**, Vertical section of ascoma; **d**, Vertical section of stromata; **c**, Peridium; **e**, Paraphyses; **f–i**, Asci; **j**, Stromata surface; **k–n**, Ascospores. Scale bars: **b** = 200 µm; **c**=50 µm; **e–i** = 20 µm; **k–n** = 10 µm.

**Distribution:** Brazil, China, Costa Rica, Ecuador, French Guiana, Guadeloupe, India (Present study), Martinique, Malaysia, Indonesia Panama, Philippines, Spain  
([https://www.gbif.org/occurrence/search?offset=40&taxon\\_key=5487949](https://www.gbif.org/occurrence/search?offset=40&taxon_key=5487949)).

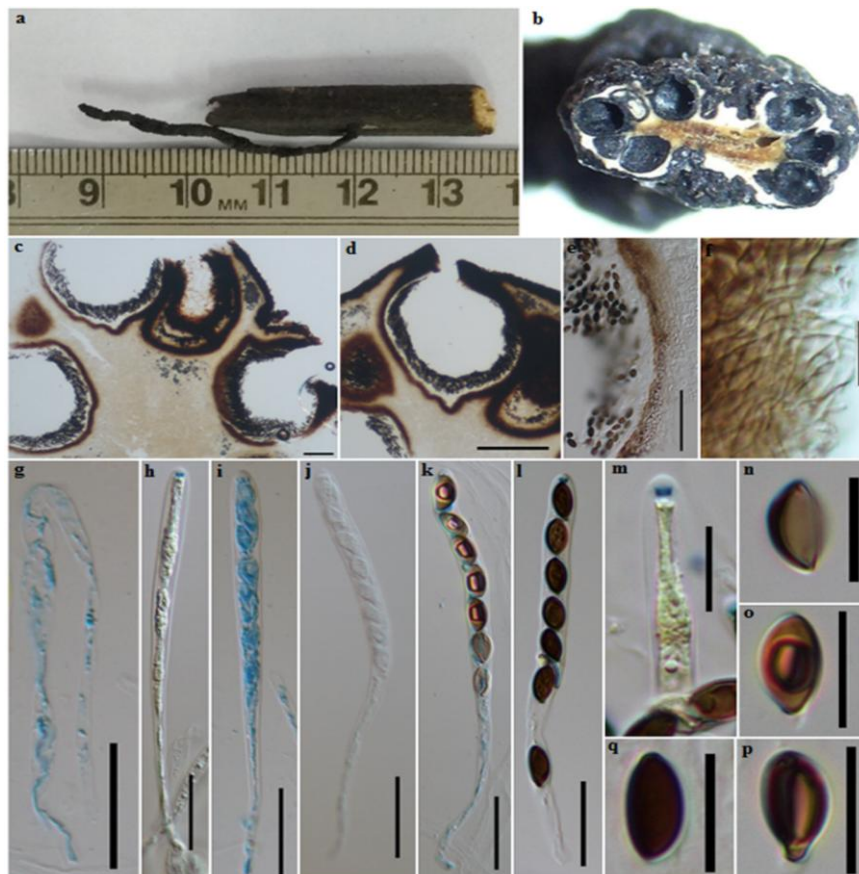
**Specimens examined:** INDIA, Andaman and Nicobar Islands, South Andaman, Mount Harriet (11°71'09.8"N 92°73'30.6"E). Recorded on decaying log 7 December 2017. M. Niranjana & V.V.Sarma (PUFNI 1764). Herbarium submitted in Ajrekar Mycological Herbarium-AMH (AMH-10069) and Living culture (NFCC-4368) deposited in National Fungal Culture Collection of India (NFCCI), Pune.

**Notes:** Guevara (2018) recorded *Xylaria fissilis* from Ecuador, provided supporting sequence data, and reported as an endophyte (Thomas *et al.*, 2016). The present record of *X. fissilis* is slightly different from the type in having smaller ascomata, asci, ascospores and bigger apical rings  $2.0\text{--}3.2 \times 1.4\text{--}2.3$  vs.  $1.9\text{--}2.4 \times 1.4\text{--}1.8$   $\mu\text{m}$  (Fournier, 2018). The occurrence of this

taxon for the first time from Andaman Islands extends its geographical range.

*Xylaria multiplex* (Kunze ex Fr.) Fr. Nova Acta Regiae Societatis Scientiarum Upsaliensis 1: 127 (1851) **Figure 7**

Saprobic on unidentified twig. **Teleomorph:** *Stromata* dark brown, vertical, outer thin grey colour  $25\text{--}30$   $\mu\text{m}$  thick, remaining inner white parenchymatous tissue with central stalk. *Ascomata*  $430\text{--}500 \times 420\text{--}430$   $\mu\text{m}$ , perithecial, globose, ostiolate, small neck, wall layer brown, textura globose. Peridium  $17.5$   $\mu\text{m}$  thickening. *Hamathecium:* Paraphyses  $2$   $\mu\text{m}$  wide, longer than asci, aseptate, unbranched. *Asci*  $100\text{--}137.5 \times 5\text{--}5.5$   $\mu\text{m}$  ( $\bar{x} = 51.75 \times 5.75$ ,  $n=25$ ), unitunicate, cylindrical, J+ve apical ring in Lugol's solution,  $1.2 \times 2.3$   $\mu\text{m}$ , long-pedicellate. *Ascospores*  $9.2\text{--}11.2 \times 5\text{--}6.2$  ( $7$ )  $\mu\text{m}$  ( $\bar{x} = 10.1 \times 5.3$ ,  $n=25$ ), 8-spored, overlapping uniseriate, broadly cylindrical, slightly narrow towards end, hyaline to strongly brown, straight germ-slit, acute ends, smooth-walled. **Anamorph:** Undetermined.



**Figure 7:** *Xylaria multiplex* (PUFNI 17458) **a**, Ascostromata; **b** Transverse section of ascostromata **c**, **d** Vertical section of ascomata **e** Peridium **f** Texture intricata of wall layer **g** Paraphyses **h**–**i** Asci **j**–**l** J+ve apical ring **n**–**q** Ascospores. Scale bars: **c**, **d** =  $100\mu\text{m}$  **e** =  $50\mu\text{m}$  **g**–**i** =  $20\mu\text{m}$  **f**, **m**–**q** =  $10\mu\text{m}$ . **Notes:** The *Xylaria multiplex* of present study is slightly different in having the larger asci when compared to the type (Fournier *et al.*, 2018). The occurrence of this taxon in Andaman Islands extends its geographical range.

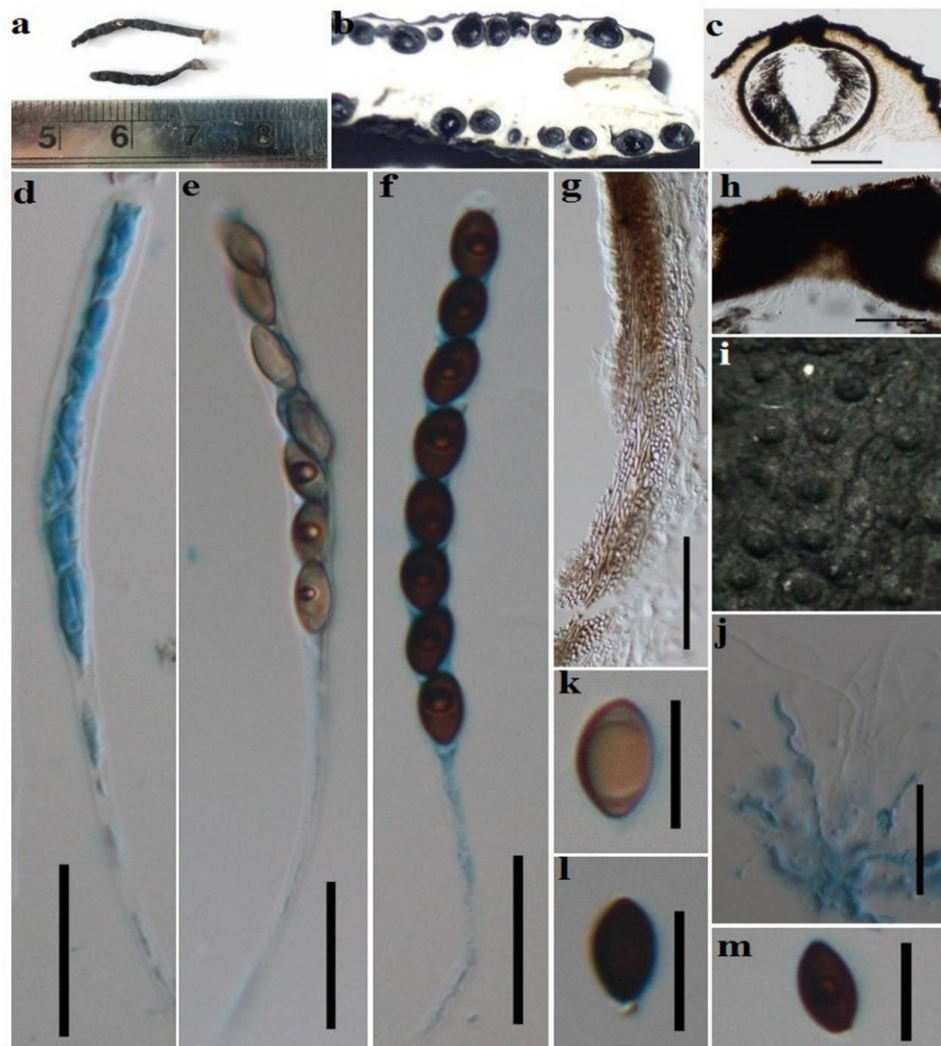
**Distribution:** Throughout the world.

**Specimen examined:** INDIA, Andaman and Nicobar Islands, South Andaman, Port Blair, Chidiya Tapu (11°29'23"N 92°42'36"E). Recorded on unidentified twig, 8 January, 2017, M.Niranjan & V.V.Sarma (PUFNI 17458).

*Xylaria laevis* Lloyd Xylaria notes, (7):8(1918).  
**Figure 8**

Saprobic on decaying twig. **Teleomorph:** *Ascostromata* 1.8–2.2 cm long, superficial, rough, pits and ridges, short basal stalk, no definite stalk. *Ascomata* 362.5–472.5 × 351.0–437.2 µm ( $\bar{x}$  = 397.4 × 405, n=5), perithecial, globose, erumpent to subglobose, pullvinate, clypeate, periphysate, neck

84.1–130.3 ( $\bar{x}$  = 108.3, n=5) µm long. Peridium 18.9–21.6 µm wide, with brown to hyaline, inner layers thin hyaline textura angularis cell layers and outer thick brown textura porrecta cell layers. *Hamathecium* paraphyses 5.3 µm wide septate, unbranched, longer than asci, freely floating in ascomata. *Asci* 89.5–135.3 × 5.3–6.5 µm ( $\bar{x}$  = 103.4 × 5.9, n=25), 8-spored, unitunicate, overlapping uniseriate, cylindrical, apical rounded end, long pedicellate, persistent, rectangular J+ve apical ring 0.97–1.5 × 1.2–2.6 µm ( $\bar{x}$  = 1.2 × 1.9, n=25). *Ascospores* (8.0 –) 8.4–10.7 × (4.0 –) 4.3–5.7 (6.2) µm ( $\bar{x}$  = 9.6 × 5.7, n=25), hyaline to brown at maturity, cylindrical to ovoid, straight germ slit, uni-guttulate, obtuse ends, smooth walls. **Anamorph:** Undetermined.



**Figure 8:** *Xylaria laevis* (PUFNI 1769) **a** Stromata, **b** Stromata in longitudinal septa **c** Vertical section of ascoma, **d–f** Asci **g** Peridium **h** Neck **i** Papilla appearance on stroma, **j** Paraphyses **k–m** Ascospores. Scale bars: **c** = 200 µm, **g, h** = 50 µm **d–f, j** = 20 µm **k–m** = 10 µm.

**Distribution:** Australia, Brazil, Cameroon, China, Christmas Island, Colombia, Democratic Republic of the Congo, Gabon, Democratic Republic, Ecuador,

Gabon, India, Malaysia, Martinique, Mexico, Philippines, Taiwan, Uganda.

**Specimens examined:** INDIA, Andaman and Nicobar Islands, South Andaman, Chidiya Tapu, Viewpoint Area, (11°48'10"N 92°71'08"E). Recorded on decaying log 9 December 2017. M. Niranjana & V.V.Sarma (PUFNI 1769).

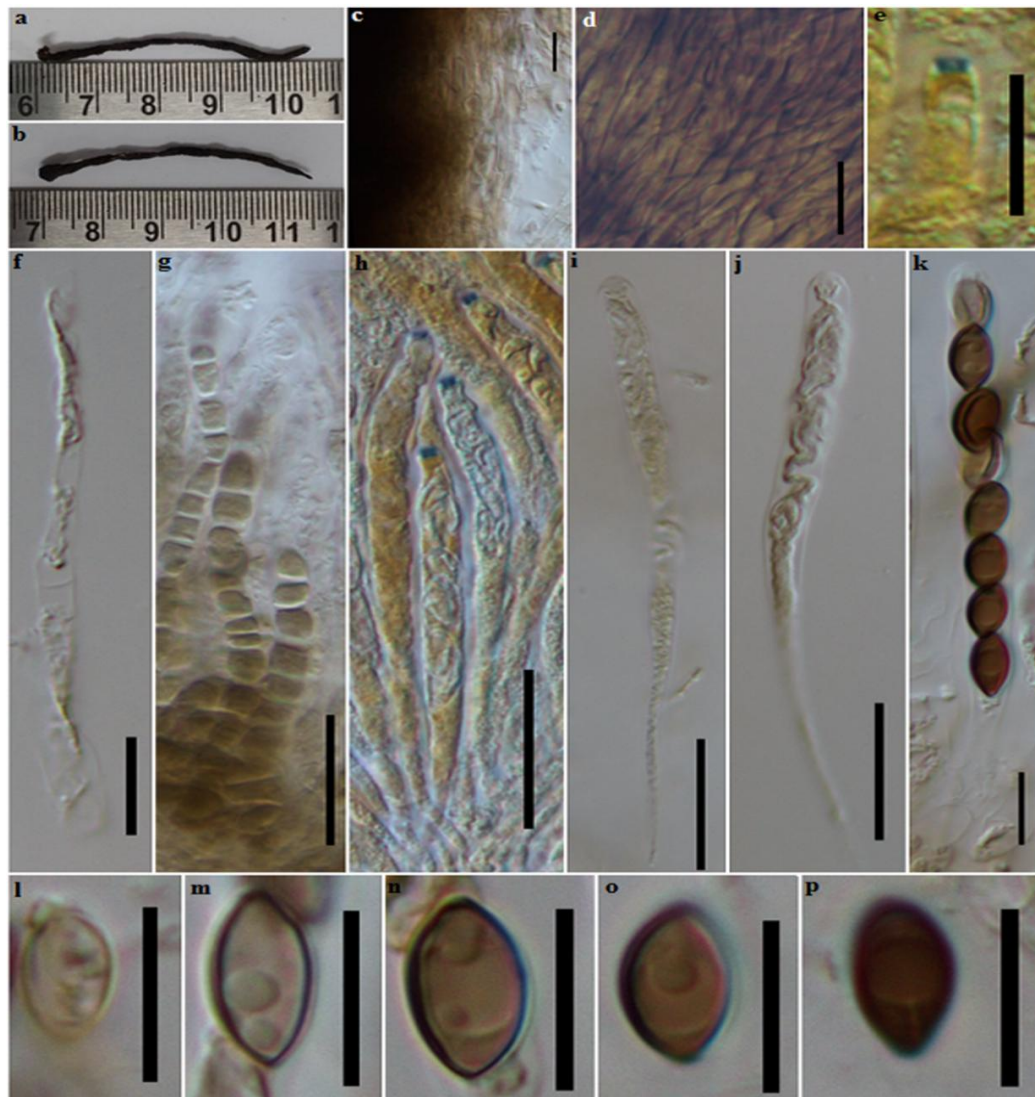
**Notes:** The current record of *X. laevis* is close to the type with slightly larger ascospores  $8-9.5 \times 4-4.5$  vs.  $8.4-10.7 \times 4.3-5.7$   $\mu\text{m}$  (Ju *et al.*, 2016). A unique feature is having the hyaline apiculate end on the basal side of ascospores compared to the type. The occurrence of *X. laevis* in Andaman Islands extends its geographical range.

***Xylaria palmicola*** G. Winter Grevillea 15 (75): 89 (1887).

**Figure 9**

Saprobic on *Pterocarpus dalbergioides* **Teleomorph:** *Stromata* dark brown, vertical, spiral, branched, full

length consists of ascomata, outer thin grey colour, inner white parenchymatous tissue with central stalk  $4.5 \times 2$  cm. *Ascomata* multi peritheciate, ostiolate, globose, narrow towards apical end, horizontal. Peridium outer thick, brown with textura porrecta and inner brown textura angularis cell layers. *Hamathecium:* Paraphyses septate, unbranched, two different types including normal and cellular, uneven,  $1-5$   $\mu\text{m}$  wide. *Asci*  $75.5-125 \times 7.5-11.5$   $\mu\text{m}$  ( $\bar{x} = 93.5 \times 9.3$ ,  $n=25$ ), unitunicate, 8-spored, cylindrical, pedicellate, apical apparatus rectangular, narrowing towards base, J+ve in Lugol's solution, subapical, persistent ring. *Ascospores*  $7.5-12.4 \times 3.75-7.5$   $\mu\text{m}$  ( $\bar{x} = 11.1 \times 5.45$ ,  $n=25$ ), overlapping uniseriate, sub-hyaline to brown or dark brown, cylindrical, rounded ends, slightly covered germ-slit, smooth-walled. **Anamorph:** Undetermined.



**Figure 9:** *Xylaria palmicola* (PUFNI 1747). **a and b,** Ascostromata; **c,** Peridium; **d,** Textura intricate; **e,** J+ve apical ring in Lugol's reagent; **f,** Paraphyses; **g,** Cellular paraphyses; **h-k,** Asci; **l-p,** Ascospores. Scale bars: **g-j** =20  $\mu\text{m}$ ; **c-f, k-p** =10  $\mu\text{m}$ .

**Distribution:** Bahamas, Brazil, Ecuador, New Zealand, Puerto Rico, South Africa.

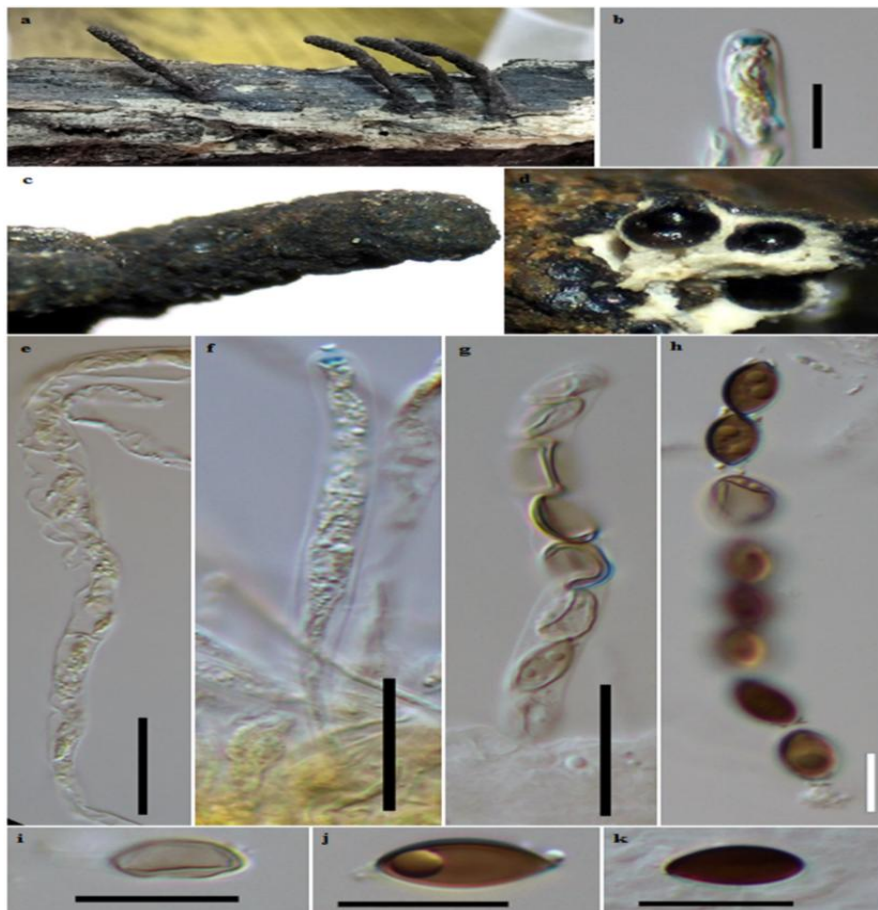
**Specimens examined:** INDIA, Andaman and Nicobar Islands, North Andaman, Diglipur, Mohanpur (12°13'21.8"N 92°48'15.7"E), on *Pterocarpus dalbergioides*, 6 January, 2017, identified by M. Niranjan & V.V. Sarma (PUFNI 1747).

**Notes:** *Xylaria palmicola* collected from fruits of palms in New Zealand (Ma *et al.*, 2022) has ascospores larger than the present record  $7.5\text{--}12.4 \times 3.75\text{--}7.5 \mu\text{m}$  vs.  $14\text{--}16.5 \times 6.5\text{--}7.5 (-8.5) \mu\text{m}$ . Occurrence of *X. palmicola* in Andaman Islands in the present study extends its geographical range.

*Xylaria primorskensis* Y.M. Ju, H.M. Hsieh, Lar.N. Vassiljeva & Akulov. Mycologia 101 (4): 549 (2009)

**Figure 10**

Saprobic on unidentified twig. **Teleomorph:** *Stromata* superficial, grey to black, fertile, rounded apex, thin, carbonaceous, rough surface, compartmentalized with irregular cracks. *Ascomata* perithecial, immersed in stroma, globose, slightly raised, centrally ostiolate, apical ends with black papilla. *Hamathecium:* Paraphyses longer than asci, cellular, septate, unbranched. *Asci*  $130\text{--}160 \times 9.7\text{--}11.0 \mu\text{m}$ , unitunicate, 8-spored, uniseriate, cylindrical, rounded apical end with J+ve broad apical ring, pedicellate. *Ascospores*  $7.5\text{--}10 \times 5.0 (6.2) \mu\text{m}$ , hyaline to dark brown, broadly ovoid, inequilateral, straight germ-slit, 1–2 guttulate, smooth-walled. **Anamorph:** Undetermined.



**Figure 10:** *Xylaria primorskensis* (PUFNI 16316). **a and c**, Stromata on host; **b**, Asci with apical ring; **d**, Cross section of stromata; **e**, Paraphyses; **f–h**, Asci; **i–k**, Ascospores. Scale bars: **b**=10µm; **c–h**= 20 µm; **i–k**=10 µm.

**Distribution:** Argentina, Canada, China, Czechia, Denmark, Estonia, French Guiana, India, Republic of Korea, Russia, South Africa, Spain, Sri Lanka, UK, USA  
([https://www.gbif.org/occurrence/search?offset=80&taxon\\_key=5896676](https://www.gbif.org/occurrence/search?offset=80&taxon_key=5896676))

**Specimen examined:** INDIA, Andaman and Nicobar Islands, South Andaman, Chidiya Tapu, Viewpoint (11°33'03.5"N 92°43'58.1"E), Recorded on an unidentified twig, 11 August, 2016, M.Niranjan & V.V.Sarma (PUFNI 16316).

**Notes:** In comparison to the type (Ju *et al.*, 2009), the present record of *X. primorskensis* has smaller but wider asci and ascospores. This report on the occurrence of *X. primorskensis* in Andaman Islands extends its geographical range.

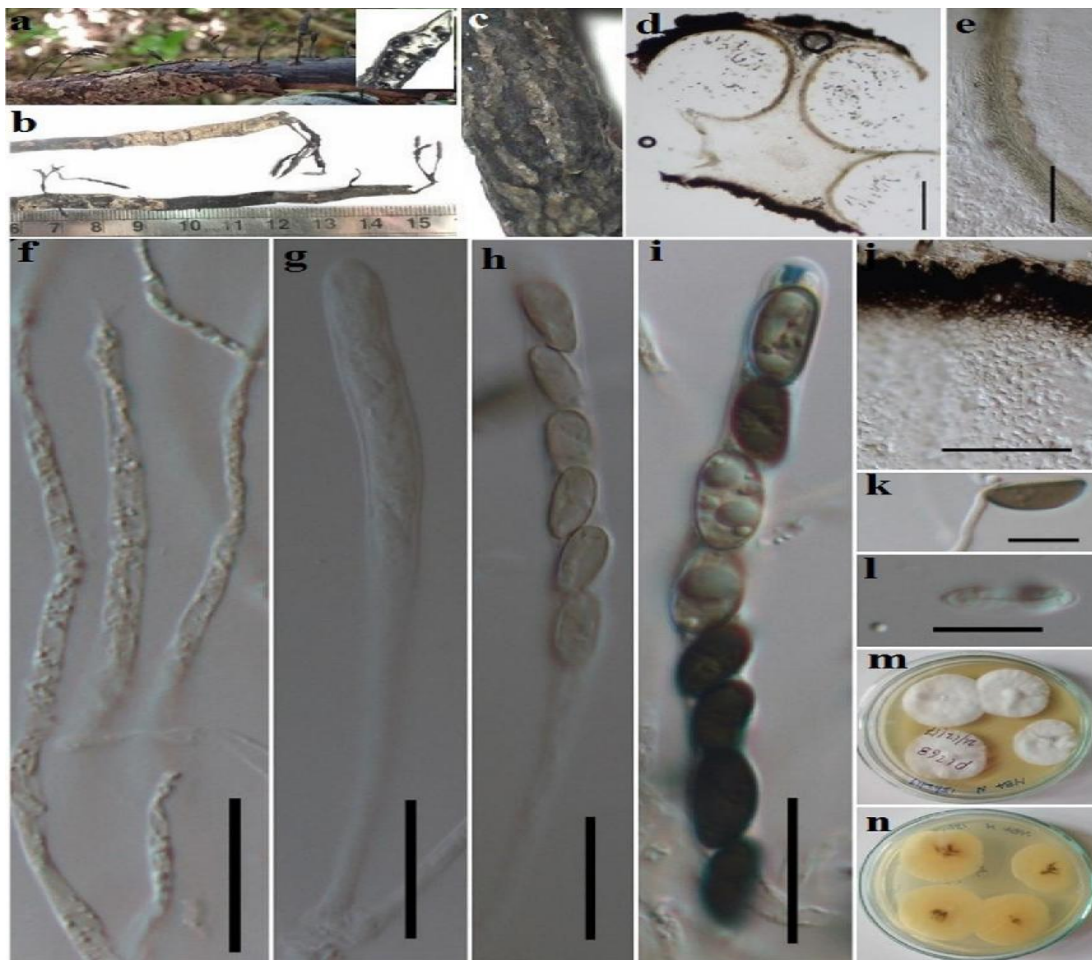
*Xylaria venosula* Speg., Boln Acad. nac. Cienc. Córdoba 11(4): 511 (1889) **Figure 11a**

**Index Fungorum number:** IF 247711; Figure 2

Saprobic on an unidentified decaying twig.

**Telomorph:** Stromata superficial, aggregated, branched, single to clusters, rough, thick, carbonaceous, stromata apical layer 39.5 µm long, below a hyaline, thick canal-like tissue between perithecia, thin, hyaline, filamentous, comprising crystals around the perithecia, central stalk absent. Ascomata 320–455 × 365–595 µm ( $\bar{x}$  = 411.5 × 446.8, n=8), globose, erumpent, pulvinate, clypeate, periphysate. Necks 136 µm long. Peridium 22 µm wide, with brown to hyaline, textura porrecta cell layers. *Hamathecium*: Paraphyses 2.6 – 3.5 µm wide,

septate, unbranched, guttulate, longer than asci, sparsely present. *Asci* (111.5–) 115–155 (–161) × 5.5–7.9 µm ( $\bar{x}$  = 131 × 6.6, n=25), unitunicate, 8-spored, cylindrical, apically rounded, persistent, with a J+ve apical ring 2.3–3.4 × 1.9–2.9 µm ( $\bar{x}$  = 2.8 × 2.3, n=25), in Lugol's solution, ring initially cylindrical (immature asci), becoming U-shaped, later on T-shaped, long pedicellate. *Ascospores* (11.6–) 12.1–14.0 (–14.2) × (4.5–) 5–6.6 (–7.2) µm ( $\bar{x}$  = 13 × 5.6, n=25), overlapping uniseriate, initially hyaline and brown at maturity, ovoid, curved germ-slits, obtuse ends, smooth-walled. **Anamorph:** On malt extract agar, the colony reaches 5.5 cm dia within a week, at room temperature. The colony exhibits two-dimensional growth, forming a circular, continuous structure with entire margins. It is hyaline, with a bright appearance, centrally elevated, and laterally flattened. The reverse side of the culture plate shows a central pale brown area with hyaline lateral portions. Microscopic examination reveals filamentous hyphae that are 2.7 µm wide, septate, and branched.



**Figure 11a:** *Xylaria venosula* (NFCC4371). **a and b**, Stromata; **c**, Stroma surface; **d**, Horizontal section of ascoma; **e**, Peridium; **f**, Paraphyses; **g–i**, Asci; **j**, Neck; **k**, Cross section of stroma; **k**, Germinating spore; **l**, Ascospores; **m, n**, Culture on MEA plates. Scale bars: **d** = 200 µm; **e, j**=50 µm; **f–h** = 20 µm; **k, l** = 10 µm.

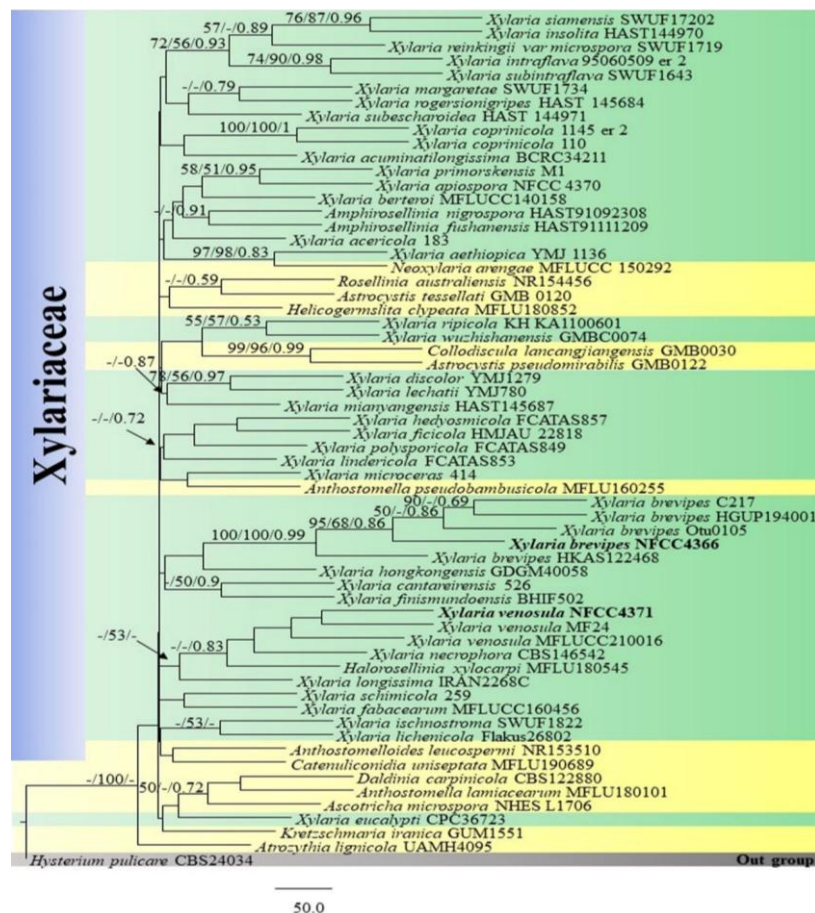
**Distribution:** Brazil, China, India (Present study) and the USA.

**GenBank number:** ITS MZ292906

**Material examined:** INDIA, Andaman and Nicobar Islands, South Andaman, Chidiya Tapu, Viewpoint Area (11°48'43"N 92°71'07"E). Recorded on unidentified decaying log 9 December, 2017. M. Niranjan & V.V. Sarma (PUFNI 1768). Herbarium submitted at Ajrekar Mycological Herbarium, ARI, Pune (AMH-10072) and Living culture (NFCC4371) deposited at National Fungal Culture Collection of India (NFCCI), ARI, Pune, India.

**Molecular Phylogeny:** We analyzed the phylogeny of *Xylaria brevipes* and *Xylaria venosula* alongside other taxa from Xylariaceae (Figure 3), with *Hysterium pulicare* CBS24034 serving as the outgroup. The RAxML analysis produced a minimum scoring tree with a final maximum likelihood (ML) optimization likelihood value of -8999.909739. The matrix contained 342 distinct alignment patterns, with 4.60% of undetermined characters or gaps. Estimated base

frequencies were as follows: A = 0.255436, C = 0.248731, G = 0.227540, T = 0.268293; substitution rates were AC = 1.926826, AG = 2.429631, AT = 1.752876, CG = 0.950331, CT = 5.719517, GT = 1.000000. The proportion of invariable sites (I) was 0.206596, and the gamma distribution shape parameter ( $\alpha$ ) was 0.517975. The maximum parsimony (MP) dataset consisted of 503 characters, of which 157 were constant, 231 were parsimony-informative, and 115 were parsimony-uninformative. Parsimony analysis of the data matrix yielded 1,000 equally parsimonious trees, with a length of 2,026 steps (CI = 0.311, RI = 0.405, RC = 0.126, HI = 0.689) in the first tree. The overall topology of the phylogenetic trees generated by ML and MP was similar and congruent with previous studies. The phylogenetic analysis showed that our *Xylaria brevipes* NFCC4366 clustered with *Xylaria brevipes* Otu0105 with strong bootstrap support of 95/68/0.86% for ML, MP, and MB, respectively. Our *Xylaria venosula* NFCC4371 clustered with *Xylaria venosula* MF24 with weak bootstrap support. (Figure 11b)

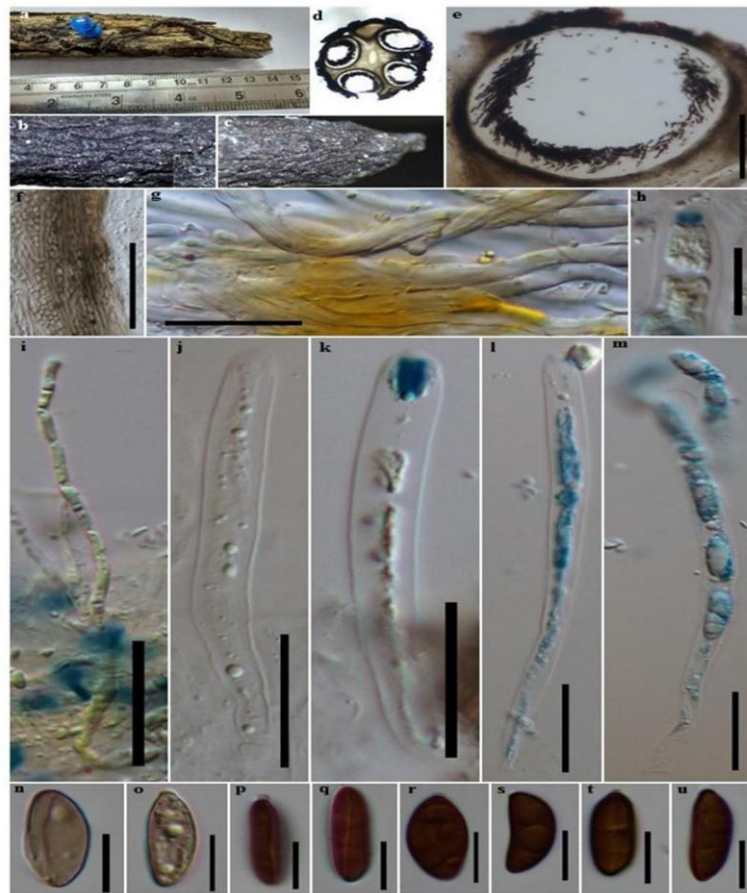


**Figure 11b:** Maximum Parsimony tree of Xylariaceae species with ITS sequence. Data set consists of 61 sequences and the rooted with *Hysterium pulicare* CBS24034 and ML, MP and BI values mentioned in above nodes.

***Xylaria* sp. 1** M. Niranjan and V.V. Sarma **Figure 12**

Saprobic on a Karmi twig. **Sexual state:** *Stomata superficial*, long stalks, start from apical end, branched, grey, outer layer looking like neck bark and remaining inner hyaline tissue with central stalk, narrow towards apical ends. *Ascomata* perithecial, globose, papillate, soft ascomata, immersed in stromata, peridium bipartite, both dark and hyaline layers with textura porrecta cells. Thick, blackened at apical ends. *Hamathecium*: *Paraphyses* hyaline, septate, branched, immersed, 1–2.5 µm diam. *Asci*

unitunicate, 45–72.5 × 12.5–32.2 µm ( $\bar{x}$  = 62.3 × 14.2, n=8), cylindrical, ocular chamber with apical ring with J+ve in lugol's reagent, pedicellate, narrowing towards basal apex, smooth-walled, germinating from base lateral side of ascoma, cylindrical, central apical ring 1.3–1.6 × 0.8–1 µm. *Ascospores* (11) 15–18 × 5–7.25 (7.5) µm ( $\bar{x}$  = 18.55 × 5.58, n=25), 8–spored, overlapping uniseriate, brown– ovoid, smooth walled, slight curved germ slit, small, apical node-like structure appearing as appendage or minute cell (apical cap) at one end. **Asexual state:** Undetermined.



**Figure 12:** *Xylaria* sp.1 (PUFNI 411) (Material examined: INDIA, Andaman and Nicobar Islands, North Andaman, Radha nagar. Isolated on karmi twigs 4<sup>th</sup> February 2016). **a–d**, Fruit bodies; **e**, vertical section of ascoma; **f**, thin layer of stroma; **g**, textura porrecta; **h**, apical ring; **i**, paraphysis; **j–m**, asci; **n–u**, ascospores. Scale bars: **e**=200 µm; **f**=50 µm; **i–m**=20 µm; **g, h, n–u**=10 µm.

**Specimen examined:** INDIA, Andaman and Nicobar Islands, North Andaman, Radha nagar. Isolated from a unidentified twig 4<sup>th</sup> February, 2016, M.Niranjan & V.V.Sarma (PUFNI 411).

***Xylaria* sp.2**

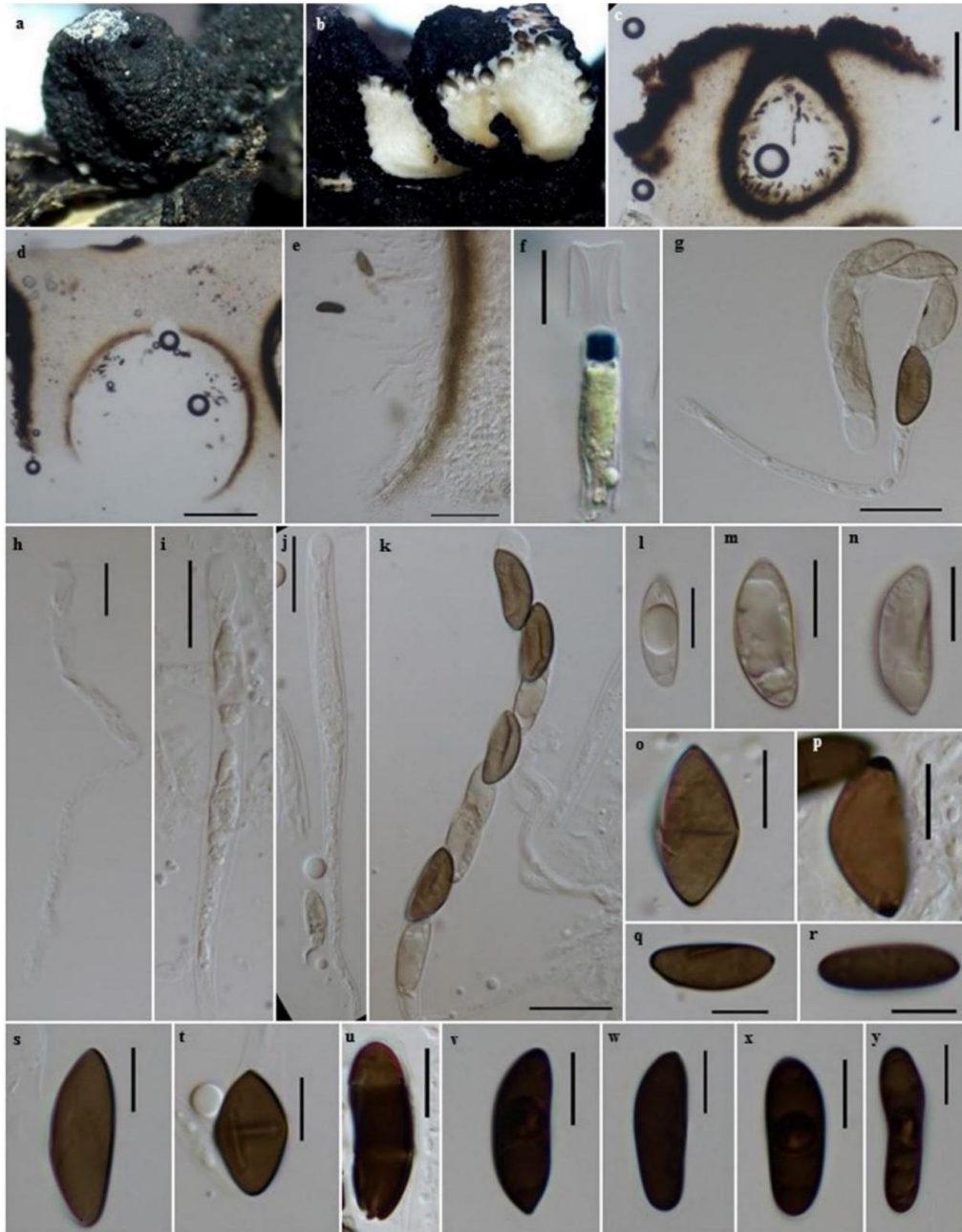
**Figure 13**

Saprobic on *Planchonia andamanica*. **Teleomorph:** *Ascostromata* superficial, scattered, short cylindrical, knob-like appearance, black, with rough surface,

basally consists of small stalk attached to the host surface, inner spongy parenchymatous tissue around the ascomata, perithecial, arranged in apical part of the stroma, centrally ostiolate. Peridium is composed of brown to hyaline, textura angularis cell layers. *Hamathecium*: Paraphyses septate, large cellular type. *Asci* 150–240 × 8.75–12.5 µm ( $\bar{x}$  = 185 × 11.4, n=25), unitunicate, 8–spored, cylindrical, long-pedicellate, massive cylindrical sub–apical ring, J+ in Lugol's

solution. *Ascospores* (18)  $20.5\text{--}26.25 \times 8\text{--}11.25 \mu\text{m}$  ( $\bar{x} = 25.6 \times 10.2$ ,  $n=25$ ), overlapping uniseriate, hyaline to sub hyaline to dark brown with oil globules, slightly curved, black apical ends, 2 small straight gem slits, one is vertical and another central, horizontal, smooth-walled. **Anamorph:** Undetermined.

**Specimen examined:** INDIA, Andaman and Nicobar Islands, South Andaman, Port Blair, Shoal Bay–10 ( $11^{\circ}52'16''\text{N } 92^{\circ}44'18.8''\text{E}$ ). Recorded on *Planchonia andamanica*, 6 February, 2016, M.Niranjan & V.V.Sarma (PUFNI 392).



**Figure 13:** *Xylaria* sp.2 (PUFNI 392) **a and b**, Ascostroamta; **c and d**, Vertical section of ascoma; **e**, Peridium; **f**, Apical ring; **h**, Paraphyses; **g, i-k**, Asci; **l-y**, Ascospores. Scale bars: **c, d**=200  $\mu\text{m}$ ; **e**=50  $\mu\text{m}$ ; **g, i-k**=20  $\mu\text{m}$ ; **f, h, l-y**=10  $\mu\text{m}$ .

## DISCUSSION

Several identified species of *Xylaria* reported in the present research paper are new geographical records of Andaman and Nicobar Islands and the same has been mentioned in the description of the particular

species. We have provided the primer-based molecular sequence data for a few taxa. The 14 new records and one new species of taxa belonging to *Xylaria* add to the list of ascomycetous fungi in the Island region. When Niranjan and Sarma (2018)

reviewed, more than 450 fungal species have been reported from the Andaman region. The new additions increase the number of fungi reported from the Island region. Andaman and Nicobar Islands have remained neglected for fungal diversity until recently. A list on the fungi reported from Andaman region shows that around 450 species were reported until 2018, although more than 2000 angiosperm species occur in the Islands. Our sustained efforts to survey the fungi in this region yielded several

novelties (new genera and species). While the new species and new genera of fungi have been reported elsewhere in various other publications (Niranjan and Sarma 2018a, b, c, d, e, f; 2019, Niranjan and Sarma 2018a; Niranjan and Sarma 2020, Hongsanan *et al.*, 2020; Hyde *et al.*, 2020; Niranjan *et al.*, 2021; Chethana *et al.*, 2021; Jayawardena *et al.*, 2022), in the present paper the new records of *Xylaria* have been described and illustrated.

**Table 1.** List of *Xylaria* species recorded from the Andaman Islands

| S.No | Fungi name                        | Code                    | Stroma <sup>^</sup> | Ascomata*                                         | Asci*                                   | Ascospore*                                              | Apical ring*                                   |
|------|-----------------------------------|-------------------------|---------------------|---------------------------------------------------|-----------------------------------------|---------------------------------------------------------|------------------------------------------------|
| 1.   | <i>Xylaria apiospora</i> **       | PUFNI 1766 <sup>#</sup> | —                   | (192.7–)284.7–<br>460.4 × (180.6–)<br>215.5–259.3 | 91.2–126.3<br>× 4.6–5.9                 | 11.8–14.6 ×<br>3.9–5.3                                  | 1.5–1.9<br>× 1.5–2.0                           |
| 2.   | <i>Xylaria brevipes</i> **        | PUFNI 1762              | 35                  | 382–519 × 471.7–<br>512.9                         | 100.2–<br>135.4 × 4.4–<br>6.6           | (9.7)10.1–13.8<br>× 4.4–5.1                             | 1.2–2.4<br>× 0.9–1.7                           |
| 3.   | <i>Xylaria bulbosa</i>            | PUFNI 369               | —                   | —                                                 | —                                       | 8.75–10 × 4.5–5                                         | —                                              |
| 4.   | <i>Xylaria castorea</i>           | PUFNI 17610             | 32–35               | 331.4–388.6 ×<br>376.6–495.2                      | 91.7–118.0 ×<br>5.6–7.3                 | (11.0–)11.4–<br>13.7 (17.0) ×<br>4.9–6.4                | 4.0–5.4<br>× 1.8–2.4                           |
| 5.   | <i>Xylaria feejeensis</i>         | PUFNI 1767              | 9–12                | 333.3–456.5 ×<br>359.9–493.7                      | 85.4–124.3<br>× 5.5–8.2                 | 9.3–12.2 × 3.9<br>– 7.2                                 | 0.8–1.1<br>× 1.7–2.1                           |
| 6.   | <i>Xylaria filiformis</i>         | PUFNI 17457             | 20–50               | —                                                 | 70–<br>100 × 6.25–<br>8.75              | 11.25–<br>15.25 × 5.5–7                                 | 2.6–<br>3.1 × 1.6–2                            |
| 7.   | <i>Xylaria fissilis</i> **        | PUFNI 1764              | —                   | 348.8–460.4<br>× 370.7–449.9                      | (93.8)95.5–<br>137.2 × (5.3)<br>5.5–7.9 | (9.8) 10.2–<br>12.9 × 4.8–5.9                           | 2.0–3.2<br>× 1.4–2.3                           |
| 8.   | <i>Xylaria haemorrhoidalis</i> ** | PUFNI 1765 <sup>#</sup> | —                   | 477.7–629.9<br>× 493.1–579.8                      | 140–206<br>× (10.3) 12–<br>18.2 (20.7)  | (9.8) 10.2–<br>12.9 × 4.8–5.9                           | (5.7) 6.0–<br>9.8 (10.2) ×<br>4.2–5.4<br>(5.8) |
| 9.   | <i>Xylaria multiplex</i>          | PUFNI 17458             | —                   | 430–500 × 420–<br>430                             | 100–<br>137.5 × 5–5.5                   | 9.25–11.25 × 5–<br>6.2 (7)                              | 1.2 × 2.3                                      |
| 10.  | <i>Xylaria laevis</i>             | PUFNI 1769              | 18–22               | 362.5–472.5 ×<br>351.0–437.2                      | 89.5–135.3 ×<br>5.3–6.5                 | (8.0–) 8.4–<br>10.7 × (4.0–)<br>4.3–5.7 (6.2)           | 0.97–1.5<br>× 1.2–2.6                          |
| 11.  | <i>Xylaria palmicola</i>          | PUFNI 1747              | 45 × 20             | —                                                 | 47.5–115 ×<br>7–10.5                    | 8.75–13 ×<br>3.75–7.5                                   | —                                              |
| 12.  | <i>Xylaria primorskensis</i>      | PUFNI 16316             | —                   | —                                                 | 130–<br>190 × 18.75–<br>30.5            | 7.5–15 × 2.5                                            | —                                              |
| 13.  | <i>Xylaria venosula</i> **        | PUFNI 1763 <sup>#</sup> | —                   | 338.3–<br>383.1 × 370.7–<br>449.9                 | 109.2–132<br>× 5.6–7.9                  | (12.4) 12.8–<br>15.2 (15.7) ×<br>(4.7) 5.0–6.7<br>(7.1) | 2.6–3.6<br>× 1.7–2.3                           |
| 14.  | <i>Xylaria</i> sp.                | PUFNI 411               | —                   | —                                                 | 150–<br>136 × 8.75–10                   | 17–20.5 × 5–<br>8.75                                    | —                                              |
| 15.  | <i>Xylaria</i> sp.                | PUFNI 392               | —                   | —                                                 | 150–240 ×<br>8.75–12.5                  | 20.5–26.25 ×<br>8–11.25                                 | —                                              |

Bold = New species, <sup>^</sup> in mm; \* in  $\mu$ m; \*\* = Having the molecular data

*Xylaria apoda*, *Xylaria englosa*, *Xylaria hispidissima*, *Xylaria hypoxylon* in the check list (Niranjan and Sarma, 2018)

<sup>#</sup> PUFNI 1763 in Jayawardena *et al.*, 2022; PUFNI 1765 & PUFNI 1766 Boonmee *et al.*, 2021

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## CONFLICT OF INTEREST

Authors do not have any conflict of interest.

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