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Addition of two species of *Riccia* (Mich.) L. (*R. bifurca* Hoffm. and *R. subbifurca* Warsnst. ex Croz) to bryoflora of India

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ABSTRACT

Two species of *Riccia* (Mich.) L. viz., *R. bifurca* Hoffm., collected from the hill tops of Yerraipalli Konda and *R. subbifurca* Warsnst. ex Croz., collected from Poolakunta and Duggem Hillocks, Anantapuramu district, Andhra Pradesh are being reported as new distributional records to India.

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1. Introduction

The genus *Riccia* (Mich.) L. (Ricciaceae; Marchantiales) was established by Micheli in 1729 *Nova Plantarum* and validated later by Linnaeus in 1753. *Riccia* is commonly distributed thalloid liverwort throughout the world. Genus *Riccia* is distinct in forming rosette habit, comprise mostly terrestrial forms and show very simple and primitive morphological and anatomical characters. *Riccia* comprises 250 species worldwide (Daniel *et al.*, 2014 & Soderstrom *et al.*, 2016). In India *Riccia* is represented by 38 species (Singh, 2014, Cargill *et al.*, 2019 & Asthana & Srivastava, 2020). In Andhra Pradesh, 12 species (Sandhya Rani *et al.*, 2014, Sreenath & Ravi Prasad Rao, 2019, Asthana & Srivastava, 2020 and Sreenath & Ravi Prasad Rao, 2020), have been reported.

As a part of our explorations for bryophytes in Andhra Pradesh during 2016-2020, we could collect some curious thalloid liverwort specimens which after critical investigation were found to belong to *Riccia bifurca* Hoffm. and *Riccia subbifurca* Warsnst. ex Croz., the former collected from hill tops of Yerraipalli Konda, and the latter collected from

Poolakunta and Durgam hills, both fall in Ananthapuramu district, Andhra Pradesh. Perusal of literature cited above, revealed that both the species are new distributional records to India.

2. Materials and methods

Extensive field explorations were conducted during 2016-2020. All the bryophyte specimens were collected by using sharp edged knife and were scraped by using manually bent and sharpened flat spoon. The collected specimens were placed in zip lock polythene cover with labeled field number. Field observations were recorded in the field notes and live photographs were taken using DSLR-Camera (Nikon D3300). Collected materials were brought to the laboratory, made it air dried at room temperature and preserved in brown paper packets (12 × 18 cm) with detailed label (10 × 17cm). Critical examination of the specimens was done by using temporary slides and plant parts were separated by using micro forceps (Varin) VR-15 curved, VR-11 straight with fine sharp edges. Slides were observed under light microscope (Olympus CH20i), light stereo microscope (Olympus SZ61) and micro measurements were taken by

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using ocular micro meter (ERMA) 19 mm, 100 segments in 1 cm. Photographs were taken by using Moto g3 turbo and Samsung one equipped with 13 MP camera with 4x wide digital zoom. Different dimensions were measured and identification of the specimens by using standard floras. Descriptions, habitat and ecology, voucher specimens' information, field photographs are provided for the species. Voucher specimens are deposited in Sri Krishnadevaraya University Herbarium (SKU), Ananthapuramu. Abbreviated names used for the collectors are: AS (Ananthaneni Sreenath) and BR (Boyina Ravi Prasad Rao).

3. Results

Riccia bifurca Hoffm., *Deutschl. Fl.* 2: 95. 1975; *Riccia arvensis* Aust. 1870, *Proc. Acad. Nat. Sci. Philadelphia* 21: 232; *R. pusilla* Warnst. 1895, *Verb. Bot. Vereins Prov. Brandenburg* 37: 50; *R. minutissima* Steph. 1898, *Spec. Hep.* 1: 30; *R. subcrispula* Warnst. 1902, *Kryptog. Fl. Mark Brandenburg* 1: 76; Ozenoglu *et al.*, 2019, *Turk. J. Bot.* 43: 253–261.

Plants terrestrial, thalloid, medium sized, habit more or less complete rosettes, up to 1.8 cm in diameter, thallus light green, brown at margins, yellowish-orange at base; irregularly branched, bifurcate, branching segments $1.2 - 1.7 \times 6 - 9$ mm, oblong, rounded at apex, median groove lobes narrow at apex, flat in mid lobes spreading about $\frac{1}{4}$ of the branch width; lateral edges rounded-subacute. Upper surface shows papillate like air pores. Ventral scales whitish or tinged with purple-orange colors. Rhizoids few, smooth and tuberculate; 5 – 7 times as broad as high; epidermal cells $40 - 42 \times 45 - 48$ μm wide, contains orange-brown idioblast cells in sides of thalli, sometimes these cells spread to dorsal sides of the thalli. Monoecious archegonial necks 300 – 450 μm long; sporangium common; spores dark yellowish brown, rounded, 65 - 75 μm , winged, wing up to 7 μm wide, smooth or sometimes rough.

Habitat and ecology: Terricolous in moist soils on hill tops, associated with *Oropetium roxburghianum* (Poaceae).

Specimens examined: ATP Dt., Top hill of Yerraipalli Konda, 21 September 2018, 55108, SKU, AS & PA.

Distribution: World: Afghanistan, Albania, Algeria, Armenia, Austria, Azores, Balears, Belgium, Canary Islands, Czech Republic, Corsica, Crete, Croatia, Denmark, England, Estonia, Europe, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Iran, Ireland, Latvia, Lebanon, Lithuania, Luxembourg, Macedonia, Madeira, Morocco, Norway, Poland, Portugal, Romania, Russia, Sardinia, Sicilia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine and Southwest Asia and **India:** new distributional records to India from Andhra Pradesh.

Riccia subbifurca Warnst. ex Croz. *Rav. Bryol. Lichen.* 30: 62.1903; *Riccia baumgartneri* Schiffn. 1904, *Österr. Bot. Z.* 54, 3: 88; Ozenoglu *et al.*, 2019, *Turk. J. Bot.* 43: 253 – 261.

Plants terrestrial, thallus form complete rosettes or crowded; thalli 2 – 4 times furcately branching, branching segments $0.5 - 1.5 \times 3 - 7$ mm, thalli bluish green to green, sometimes tinged with purple on dorsal and lateral sides, pale brown to base, becoming whitish with age, branching segments oblong, rounded apically, lobes wider at apex, median groove narrow, widening to about $\frac{1}{4}$ of branch width, fairly deep and distinct at apex; lateral edges rounded; margin glabrous or with cilia, cilia on margins lobes from apex to base, few, 120 – 270 μm long, papillate in upper $\frac{1}{2}$ of the segments. Ventral scales hyaline or with pale purplish spots. Rhizoids numerous and smooth. Thalli 2 – 3 times as broad as high in cross section; epidermal cells rounded, in groove rounded or pyriform. Monoecious. Antheridial and archegonia necks reddish-purple and not exceeding above the thallus. Spores brown, ovoid to rounded, 80 – 100 μm , winged, wing 6 – 9 μm wide, margin smooth.

Habitat and ecology: Terricolous, on field bunds, mostly monodominant, sometimes associated with *Cyperus rotundus* (Cyperaceae).

Specimens examined: ATP Dt., Poolakunta, 03 October 2019, 57004, SKU, AS; Durgam hills, 17 October 2019, 57100, SKU, AS & SMN.

Distribution: World: Albania, Algeria, Austria, Azores, Belgium, Canary Islands, Corsica, Crete, Croatia, England, Europe, France, Germany, the Netherlands, Hungary, Iran, Ireland, Italy, Israel, Luxembourg, Macedonia, Madeira, Montenegro, Morocco, Portugal, Slovakia, Spain, Syria, Sweden, Switzerland, Turkey, United Arab Emirates, Southwest Asia and **India:** new distributional records to India from Andhra Pradesh.

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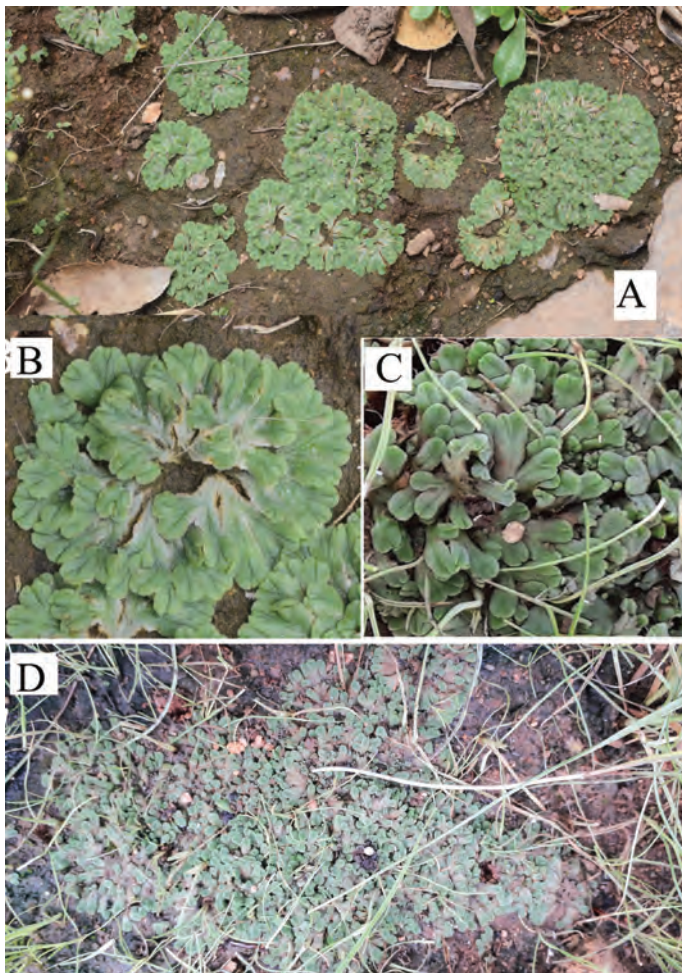


Plate. 1: A, B: *Riccia bifurca* Hoffm. A. Plant natural habit, B. Magnified view of thallus. C, D: *Riccia subbifurca* Warsnst. ex Croz. C. Magnified view of thallus, D. Plant natural Habit.

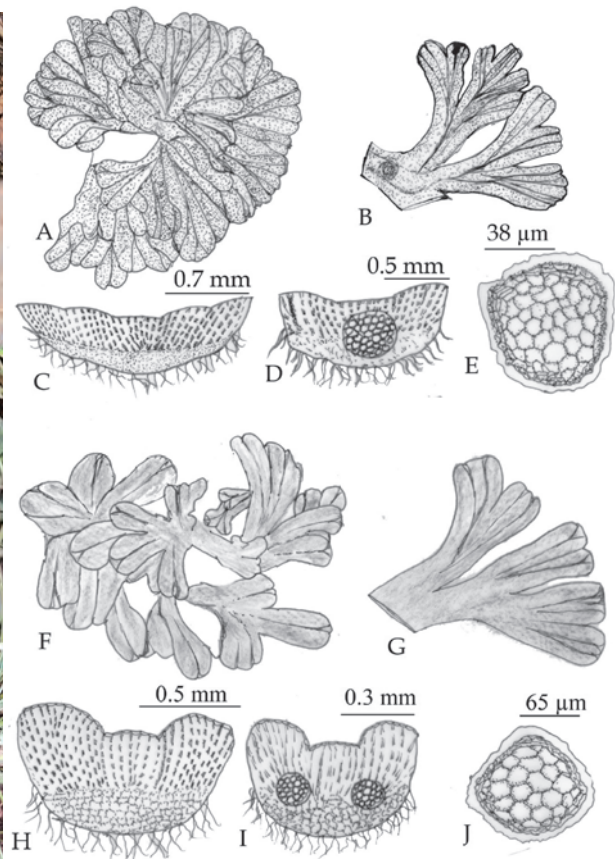


Figure. 1: A-E: *Ricciabifurca* Hoffm. A. Thallus, B. Magnified view of branching portion, C. Cross section of thallus near apex, D. Cross section of thallus through near sporophyte, E. Magnified view of Spore and F-J: *Ricciasubbifurca* Warsnst. ex Croz. F. Thallus, G. Magnified view of branching portion, H. Cross section of thallus near apex, I. Cross section of thallus through near sporophyte, J. Magnified view of spore.