NOTE

Frullania evelynae (Frullaniacae, Marchantiophyta) – a Very Rare Species from Mizoram, India

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ABSTRACT: *Frullania evelynae* S. Hatt. & Thaith.- a very rare species of family Frullaniaceae of Hepaticae is recorded from Mizoram, India for the first time. A detailed taxonomic description along with line drawing plate is provided for its easy identification. A note on diversity and distribution of Indian *Frullania's* which is in chaos in recent past is also provided.

KEY WORDS: *Frullania evelynae,* Hepaticopsida, Mizoram, India.

INTRODUCTION

The genus *Frullania* Raddi (Frullaniaceae) is represented by *ca.* 1000 species in the world (Yuzawa, 1991). In India the genus is represented by approximately 66 taxa incl. 3 subspecies, 8 varieties and 2 forma (Mitten, 1861; Stepahni, 1910; Verdoorn, 1930; Kashyap, 1932; Chopra, 1943; Hattori, 1966, 1971, 1972, 1973, 1974, 1975, 1978, 1980, 1980a, 1981, 1982, 1986; Hattori and Lin 1985; Hattori and Thaithong, 1978, 1978a, 1978b; Srivastava, 1979; Lal, 1979; Lal and Parihar, 1979; Udar and Nath, 1981; Udar and Kumar, 1983; Nath, 1984; Nath andUdar, 1984; Joshi et al., 1989; Nath and Asthana, 1992, 1998; Parihar et al., 1994; Bapna and Kachroo, 2000; Srivastava and Alam, 2002, 2004; Singh and Nath, 2004, 2007; Singh and Singh 2003, 2005, 2007; Nath and Singh 2006; Dey and Singh, 2008; Dey et al., 2009; Daniels, 2010), distributed mainly in Eastern Himalaya, Western Himalaya and Western Ghats (Table 1).

Frullania evelynae belongs to the subgenus *Trachycolea* Spruce was descried originally by Hattori and Thaithong in 1978 on the basis of collections made by Sharp and Iwatsuki from Khasi & Jaintia Hills and Darjeeling area in India. This species never reported either from India or elsewhere except by Sinske Hattori and P.J. Lin from Yunnan, China (Hattori and Lin, 1985). However, the area was thoroughly surveyed by many bryologists in recent past but could not be collected from any locality including its type locality. Recently, a comprehensive work has been done and Floristic account was published by Singh and Nath on *Hepaticae of Khasi and Jaintia Hills* (Singh and Nath, 2007) but they could describe this species on the basis of its type collection only.

Recently, during a field exploration to document the Bryoflora (Hepaticae and Anthocerotae) of Mizoram, in 2008, the senior author came across with a small epiphytic population of this species. Critical study of the plants followed by scrutiny of literature reveals it's identity as *Frullania evelynae*. It is interesting to note that this species is new record for State of Mizoram and also constitutes the second collection from India after its Type.

TAXONOMIC TREATMENTS

Frullania evelynae S**.** Hatt. & Thaith. in J. Hattori Bot. Lab. 44: 179.1978; S. Hatt. & P. J. Lin in J. Hattori Bot. Lab. 59: 134. 1985. (Fig. 1: 1-21.)

Plants light green, 35-45 mm long, 1.4-2.0 mm wide, irregularly 1-2 pinnately branched. Stem in cross-section spherical in outline, 0.4-0.5 mm, 10-12 cells across, not differentiated into cortex and medulla; cells triangular to subquadrangular or globose, 17.5-35.0 × 12.5-25.0 µm. Leaves complicate-bilobed, leaf-lobe ovate to nearly orbicular, imbricate, wide spreading, dorsally extending beyond the farther edge of stem, slightly concave, 1.2-1.5 mm long, 1.0-1.1 mm wide, more or less incurved at apex, marginal cells towards apex quadrangular, 12.5-20 × 12.5-17.5 µm, walls slightly flexuose, median cells subquadrangular to polygonal, 20-30 × 15-25 µm, with incrassate and confluent trigones, basal cells pentagonal, 20-50 × 17.5-30 µm, with nodulose-bulging trigones, intermediate thickening gives impression of sinuate thickenings; leaf lobule cucullate, contiguous to the stem, truncate, with incurved beak extending slightly downward beyond the ventral margin, 0.3-1.0 mm long,

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Table 1. Distribution of genus *Frullania* In India

	Species name	EH	WH	WG	CI	A&N	References
1.	*F. acutiloba* Mitt.	+		+			Mitten, 1861; Hattori & Lin, 1985; Nath & Asthana, 1998; Srivastava & Alam, 2002; Singh & Nath, 2007; Daniels, 2010 [Hattori, 1973 as *F. asperula* Mitt.; Hattori, 1975a as *F. hampeana* var. *acutiloba* (Mitt.) S.Hatt.]
2.	*F. alstonii* Verd. var. *pfleidereri* S. Hatt.	+					Hattori & Thaithong, 1978; Singh & Nath, 2007
3.	*F. apiculata* (Reinw. et al.) Dumort.	+		+		+	Mitten, 1861; Hattori & Thaithong, 1978; Nath & Asthana, 1998; Singh & Nath, 2007; [Hattori & Thaithong, 1978a as *F. apiculata* (Reinw. et al.) Dumort. var. *obtusata* S.Hatt. & Thaith.]
4.	*F. arecae* (Spreng.) Gottsche	+	+	+			Yuzawa, 1991; Daniels, 2010 [Stepahni, 1910 as *F. indica* Steph; Mitten, 1861; Hattori, 1966, 1975; Nath & Asthana, 1998; Srivastava & Alam 2002; Singh & Nath, 2007 as *F. wallichiana* Mitt.]
5.	*F. campanulata* Sande Lac.			+			Nath & Asthana, 1998; Srivastava & Alam, 2002
6.	*F. debilis* Steph. ex S. Hatt.			+			Hattori, 1974; Daniels, 2010
7.	*F. davurica* Hampe	+					Hattori & Lin, 1985 [Singh & Nath, 2004, 2007 as *F. rotudistipula* Steph.]
8.	*F. densiloba* Steph.						Srivastava & Alam, 2004
9.	*F. dialatata* (L.) subsp. *asiatica* S. Hatt.	+	+				Hattori, 1982; Hattori & Thaithong, 1978b
10.	*F. dialatata* (L.) subsp. *dilatata*		+				Singh & Singh, 2007
11.	*F. duthiana* Steph. var. *duthiana*	+	+				Stephani, 1910; Hattori, 1966; Hattori & Thaithong, 1978; Nath & Udar, 1984
12.	*F. duthiana* Steph. var. *appendiculata* S. Hatt.	+					Hattori, 1973, 1978
13.	*F. ericoides* (Nees) Mont.	+	+	+	+	+	Hattori, 1971; Hattori & Thaithong, 1978, 1978a; Bapna & Kachroo, 2000 [Hattori, 1966; Nath & Asthana, 1998; Srivastava & Alam, 2002; Singh & Nath, 2007as *F. squarrosa*; Singh & Singh, 2003 as *F. squarrosa* f. *ericoides* (Verd.) Nees; Mitten, 1861 as *F. squarrosa* and also *F. ericoides*]
14.	*F. evelynae* S. Hatt. & Thaith.	+					Hattori & Thaithong, 1978; Nath & Udar, 1984
15.	*F. evoluta* Mitt.	+		+			Hattori, 1974, 1975; Daniels, 2010
16.	*F. gaudichaudii* (Nees & Mont.) Nees & Mont.			+		+	Nath & Asthana, 1998; Joshi et al., 1989; Hattori, 1966, 1972; Hattori & Lin, 1985 [Mitten 1961 as *F. recurvata* Lehm. & Lindenb. and also as *F. ceylanica* Nees]
17.	*F. gemmulosa* S. Hatt. & Thaith.	+					Hattori & Thaithong, 1978
18.	*F. gracilis* (Reinw. et al.) Dumort.					+	Hattori, 1974
19.	*F. gracilis* (Reinw. et al.) Dumort. subsp. *zennoskei*. & Thaith.	+					Hattori & Thaithong, 1978
20.	*F. giraldiana* Massal.	+					Singh & Nath, 2007
21.	*F. grandistipula* Lindb.	+	+	+			Hattori, 1986; Nath, 1984; Singh & Nath, 2007
22.	*F. hattoriantha* Udar & Nath	+					Udar & Nath, 1981; Dey et al., 2009
23.	*F. himalayensis* Steph.		+				Hattori & Thaithong, 1978; Hattori, 1978
24.	*F. inflexa* Mitt.	+		+			Mitten, 1861; Stephani, 1910; Hattori, 1975; Hattori & Thaithong, 1978; Nath & Asthana, 1998 [Hattori, 1966, 1971 *as F. delavayi* Steph.]
25.	*F. inftata* Gottsche	+	+				Hattori & Lin, 1985; Hattori & Thaithong, 1978 [Parihar et al, 1994 as *F. mayebarae* S. Hatt.]
26.	*F. inftata* Gottsche var. *dioica* S. Hatt. & Thaith.		+				Hattori & Thaithong, 1978
27.	*F. intermedia* (Reinw. et al.) Dumort.					+	Joshi et al., 1989; Nath & Asthana, 1998; Hattori, 1980a
28.	*F. larjiana* Sushil K. Singh & D. K. Singh		+				Singh & Singh, 2005
29.	*F. meyeniana* Lindenb.	+					Hattori & Thaithong, 1978
30.	*F. monocera* (Tayl.) Tayl.	+					Bapna & Kachroo, 2000 [Robinson, 1964 as *F. hampeana* Nees]
31.	*F. montana* Steph.	+					Hattori & Thaithong, 1978

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Table 1. Continued.

	Species name	EH	WH	WG	CI	A&N	References
32.	*F. muscicola* Steph.	+	+	+	+		Robinson, 1964; Srivastava, 1979; Kashyap, 1932; Hattori, 1966; Hattori & Thaithong, 1978; Nath & Asthana, 1998; Bapna & Kachroo, 2000; Narayan et al., 2001; Srivastava & Alam, 2002; Singh & Nath 2007
33.	*F. muscicola* Steph. var. *inaeana* (Steph.) Kamim.	+			+		Lal & Parihar, 1979; Dey et al., 2009
34.	*F. nepalensis* (Spreng.) Lehm. & Lindenb.	+	+				Mitten, 1861; Hattori, 1966; Nath, 1977; Hattori & Thaithong, 1978, 1978a [Hattori, 1966, 1971 also as *F. grevilleana* Taylor]
35.	*F. nepalensis* (Spreng.) Lehm. & Lindenb. f. *amphigastriis* Mitt.	+	+				Mitten, 1861; Chopra, 1943; Hattori, 1966.
36.	*F. neurota* Taylor	+	+	+			Mitten, 1861; Hattori, 1966, 1971; Yuzawa, 1991; Nath & Asthana, 1992; Singh & Nath, 2007; [Mitten 1861 also as *F. breviuscula* Mitt.]
37.	*F. neurota* Taylor var. *pfleidereri* S. Hatt.	+					Hattori, 1972
38.	*F. nodulosa* (Reinw. et al.) Nees			+		+	Hattori, 1980a; Daniels, 2010
39.	*F. pallide-virens* Steph.	+					Hattori & Thaithong, 1978; Dey et al., 2009
40.	*F. pariharii* S. Hatt. & Thaith.	+		+			Hattori & Thaithong, 1978, 1978a
41.	*F. pariharii* S. Hatt. & Thaith. f. *intermedia* Thaith.	+					Hattori & Thaithong, 1978
42.	*F. physantha* Mitt.	+					Mitten, 1861; Stephani, 1910; Hattori, 1966, 1971; Hattori & Thaithong, 1978; Nath & Udar, 1984
43.	*F. pran-nathii* M. Dey & D. K. Singh	+					Dey & Singh, 2008.
44.	*F. polyptera* Taylor		+	+			Hattori, 1980; Hattori & Lin, 1985 [Kashyap, 1932 as *F. pyriflora* Steph. also as *F. gollani* Steph.; Mitten, 1861 as *F. subinflata* Mitt.]
45.	*F. pseudoschensiana* S. Hatt.	+					Hattori, 1980; Dey et al., 2009
46.	*F. pseudoschensiana* S. Hatt. var. *darjeelingensis* S. Hatt.	+					Hattori, 1981; Singh & Nath, 2007
47.	*F. ramuligera* (Nees) Mont.			+			Daniels, 2010
48.	*F. retusa* Mitt. var. *retusa*	+	+				Chopra, 1943; Hattori, 1966, 1971; Hattori & Thaithong, 1978a; Nath & Udar, 1984
49.	*F. retusa* Mitt. var. *hirsuta* S. Hatt. & Thaith.	+	+				Hattori & Thaithong, 1978
50.	*F. retusa* Mitt. var. *gymnantha* S. Hatt. & Thaith.		+				Hattori & Thaithong, 1978a
51.	*F. rhytidanta* S.Hatt.	+					Hattori, 1980
52.	*F. riojaneirensis* (Raddi) Spruce			+			Srivastava & Alam, 2004
53.	*F. serrata* Gottsche f. *serrata*	+		+			Verdoorn, 1930; Hattori, 1973; Nath & Asthana, 1998; Singh & Nath, 2007
54.	*F. schensiana* Massal.	+					Hattori, 1966, 1971
55.	*F. sphaerantha* S. Hatt.						Hattori, 1980
56.	*F. sharpantha* Udar & Kumar	+					Udar & Kumar, 1983
57.	*F. shanensis* Svihla	+					Hattori & Thaithong, 1978b
58.	*F. sinensis* Steph.	+	+				Hattori, 1980; Mitten, 1861; Chopra, 1943; Bapna & Kachroo, 2000
59.	*F. subclavata* Steph.	+	+				Hattori, 1975, 1980; Hattori & Thaithong, 1978, 1978a
60.	*F. subpedicellata* S. Hatt.	+					Hattori, 1980
61.	*F. tamarisci* (L.) Dumort.	+		+			Nath & Asthana, 1998; Srivastava & Alam, 2002; Singh & Nath, 2007; Dey et al., 2009 [Mitten, 1861 *as F. moniliata* Nees]
62.	*F. tamarisci* (L.) Dumort. subsp. *obscura* (Verd.) S. Hatt.	+					Hattori & Thaithong, 1978
63.	*F. tagawana* (S. Hatt. & Thaith.) S. Hatt.	+					Hattori & Lin, 1985 [Hattori & Thaithong, 1978 as *F. evoluta* Mitt. var. *tagawana* S.Hatt. & Thaith.]
64.	*F. tuyamae* S. Hatt. & Thaith.	+					Lal, 1979
65.	*F. udarii* Nath & A. P. Singh	+					Nath & Singh, 2006
66.	*F. yunnanensis* Steph.	+	+				Hattori, 1966, 1971; Hattori & Thaithong, 1978; Nath & Udar, 1984

EH: Eastern Himalaya; WH: Western Himalaya; WG: Western Ghats, CI: Central India; A & N: Andaman and Nicobar Islands.

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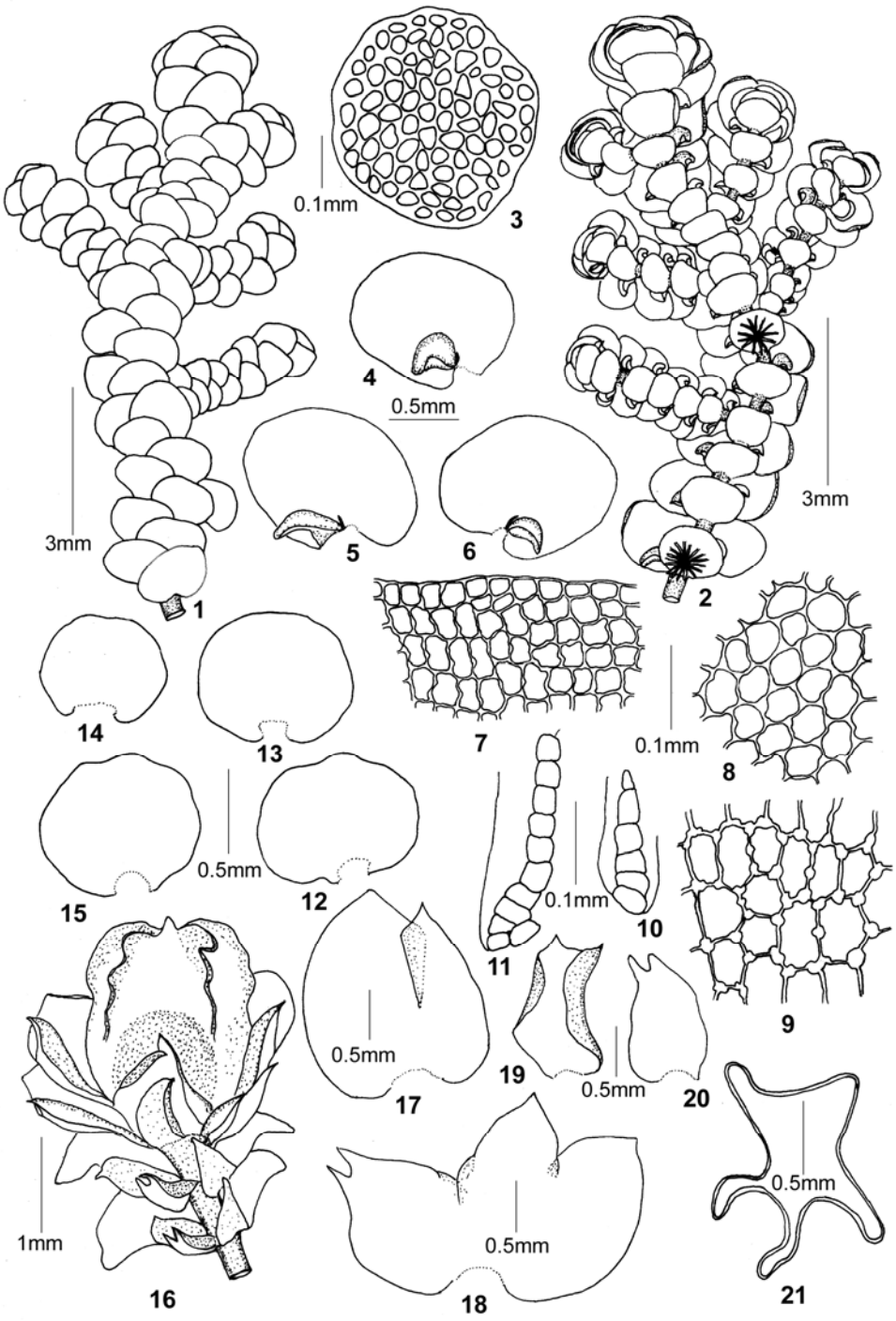


Fig. 1. *Frullania evelynae* S. Hatt. & Thaith. 1: A portion of the plant in dorsal view. 2: The same in ventral view. 3: C.S. of stem. 4-6: Leaves with lobule. 7: Marginal leaf cells towards apex. 8: Median leaf cells. 9: Basal leaf cells. 10-11: Styli. 12-15: Underleaves. 16: Female inflorescence showing arrangement of bract bracteole and perianth. 17: Female bract. 18: Female bract with connate bracteole. 19-20: Female bracteoles. 21: C.S. perianth.

0.15-0.5 mm wide; styli minute, usually 6-11celled, cells arranged in a row, sometimes at base up to 2 cells wide, 87.5-142.5 μm long, 7.5-37.5 μm. Underleaves approximate to imbricate towards apex, suborbicular to reniform, entire, 0.6-0.9 mm long, 0.8-1.2 mm wide, 2-2.5 times the width of stem, nearly flat, margin slightly undulated and incurved. Male inflorescence not seen. Female inflorescence terminal on main stem or

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branches. Perianth semi-exerted, pyriform, 1.7-2.0 mm long, 1.0-1.2 mm wide, 5-keeled, keels high and narrow, undulated, surface smooth, apex obtuse with short apical beak; female bracts in 3 pairs, bract lobe of inner whorl ovate-orbicular with subacute apex, 1.4-2.0 mm long, 1.0-1.2 mm wide; inner bract lobule 1/2 –connate, ovate, with acute apex, 0.7-1.8 mm long, 0.5-0.9 mm wide, outermost bract lobule sometimes lanceolate-canaliculate ca. 0.7 mm long, 0.5 mm wide; bracteoles broadly ovate or rectangular, margin strongly incurved 0.8-1.7 mm long, 0.4-1.2 mm wide, 1/6-1/5th bifid, lobes triangular with subacute apex.

Specimen examined: Mizoram, Lungtlai, Towads S. Vataphaphai, growing on tree trunk in association with *Cheilolejeunea sp.*, 29.06.2008. *S. K. Singh* 119888 (ASSAM).

Distribution: INDIA: Meghalaya (Khasi & Jaintia Hills); West Bengal (Darjeeling); Mizoram (-present study). CHINA.

Frullania evelynae is characterized by entire suborbicular to reniform underleaves and semi-exerted, pyriform with 5 high, narrow, undulated keeled perianth. This species is closely allied with *F. physntha* Mitt. However, the latter is clearly distinct from the former by having large exerted perianth which are almost spherical, somewhat prominulate at apex with 5 short, more or less angular-crispate keels and the innermost female bract with an acute lobe and acuminate-acute lobule bearing 1 large tooth or lacina on the ventral margin and the innermost female bracteole with 2 apical teeth and often with minute basal teeth (Thaithong and Hattori, 1977).

Note on diversity and distribution of *Frullania* in India

So far about 66 taxa of *Frullania* recorded from different Bryogeographical regions of India. Among them, with 50 taxa Eastern Himalaya is richest followed by Western Himalaya with 21 taxa and Western Ghats with 19 taxa. Andaman & Nicobar Islands is represented with 6 taxa and Central India with 3 taxa. Whereas the other bryological territories has no representation. Out of 66 taxa, 14 taxa viz., *F. debilis* Steph. ex S. Hatt., *F. gracilis* (Reinw. et al.) Dumort. subsp. *zennoskei* S. Hatt. & Thaith., *F. hattoriantha* Udar & Nath, *F. inftata* Gottsche var. *dioica* S. Hatt. & Thaith., *F. larjiana* Sushil K. Singh & D. K. Singh, *F. pariharii* S. Hatt. & Thaith. f. *intermedia* Thaith. *F. pran-nathii* M. Dey & D. K. Singh, *F. pseudo-schensiana* S. Hatt., *F. retusa* Mitt. var. *hirsuta* S.Hatt. & Thaith. *F. retusa* Mitt. var. *gymnantha* S.Hatt. & Thaith., *F. rhytidanta* S. Hatt., *F. sphaerantha* S. Hatt., *F. subpedicellata* S. Hatt. *F. udarii* Nath & A. P. Singh are endemic to Indian regions (Table 1).

Doubtful species

F. glomerata (Lehm. & Lindenb.) Mont. – listed from the Nilgiri Mts. by Montagne (1842) and Mitten (1861), but the species is confined to tropical C. and S. America (Gradstein& Costa 2003). It is not known to which taxon the Indian specimens should be assigned.

F. riparia Hampe ex Lehm. (syn. *F. aelotis*) – confined to Europe eastwards to Iran, and North America, Mexico (Schuster, 1992).

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伊氏耳葉蘚（*Frullania evelynae*, 耳葉蘚科, 地錢門） – 印度米佐蘭姆的一個稀有種

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摘要：在印度米佐蘭姆（Mizoram）首次記錄到伊氏耳葉蘚（*Frullania evelynae*）這個非常罕見的耳葉蘚科（Frullaniacae）物種。本文提供了詳細分類說明及手繪圖以利辨識；並提供印度地區耳葉蘚屬（*Frullania*）物種的清單及分佈。

關鍵詞：伊氏耳葉蘚、苔綱、印度、米佐蘭姆。

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