

# Studies on the Bryophyte Flora of Vanuatu. 1. Introduction and Mniaceae (Musci)

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In 1996 and 1997 Tsukuba Botanical Garden, National Science Museum, Tokyo organized botanical expeditions for studying the montane flora of Vanuatu in collaboration with the Environment Unit and the Department of Forestry of Vanuatu (cf. Iwashina *et al.* 1998). In October - December 1996, I collected bryophyte specimens as a member of the expedition, and Mr. K. Sugimura did in September - October 1997.

The mosses of Vanuatu have been reported by Mitten (1868), Brotherus and Watts (1915), Thériot (1938), Dixon (1948), and Tixier (1972, 1973, 1974). Schultze-Motel (1973) compiled a catalog of mosses of Melanesia. Based on the collections made by Higuchi in 1992, recent reports were published by Matsui and Iwatsuki (1993), Inoue and Higuchi (1994), and Iwatsuki and Suzuki (1995). Higuchi (1996) lists 33 families, 84 genera, and 236 species and infraspecific taxa from Vanuatu. Recently Streimann and Reese (2001) reported Vanuatu mosses including ten new moss records based on the collections made by Streimann in 1998.

The liverworts of Vanuatu have never been listed, but about 140 species were recorded (cf. Furuki 2002). The hornworts have never been reported from Vanuatu (cf. Hasegawa 2002).

## Study area

Vanuatu, previously known as New Hebrides, is situated in the southwest region of the Pacific Ocean. Its neighbours are New Caledonia, ca. 400 km to the southwest, Fiji, ca. 800 km to the east, and the Solomon Islands, ca. 800 km to the northwest. The irregular Y-shaped archipelago in a northwest/southeast orientation consists of about 80 islands, and stretches 900 km between 13°S and 22°S latitude, and between 166°E and 175°E longitude (Fig. 1). The highest peak of 1879 m is Mt. Tabwemasana on Espiritu Santo which is the largest island in the archipelago. Geologically the islands of Vanuatu originated from volcanic activity and coral formation, and date from the Tertiary (Vitt 1991). The total land mass is approximately 12,930 square kilometres (Whyte 1990). From November to April the weather is warm and humid. Usually the areas above 1000 m are occupied by cloud forests with mosses and ferns.

Higuchi and Sugimura visited the islands of Espiritu Santo and Efate. Collecting sites are shown in Fig. 2, and locations are described below. The collections were sorted and distributed to specialists. Some papers are published here, and many more are in preparation. The collections are preserved in the herbarium of the National Science Museum (TNS) and the duplicates are in the herbarium of the Department of Forestry (PVNH), Vanuatu.

### Espiritu Santo

1. Mt. Vutimele (15°01'S, 166°41'E)
2. Mt. Vutimena (15°07'S, 166°41'E)

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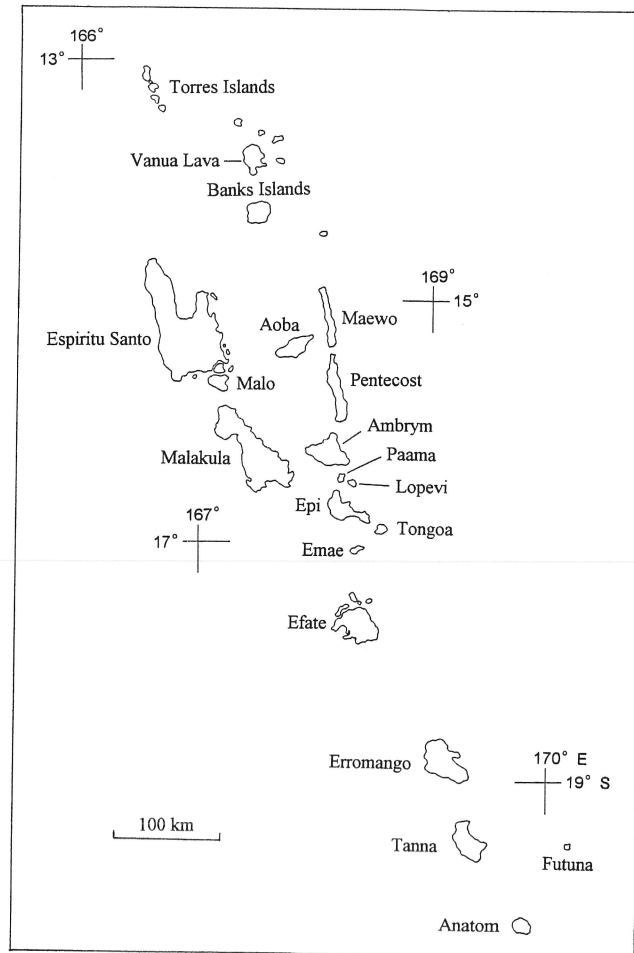


Fig. 1. Outline map of Vanuatu.

3. Mt. Tabwemasana ( $15^{\circ}22'S$ ,  $166^{\circ}47'E$ )
  4. Kerepua ( $15^{\circ}17'S$ ,  $166^{\circ}38'E$ )
  5. Peavot ( $14^{\circ}58'S$ ,  $166^{\circ}46'E$ )
  6. Tsureviu ( $15^{\circ}04'S$ ,  $166^{\circ}47'E$ )
  7. Matantas ( $15^{\circ}09'S$ ,  $166^{\circ}56'E$ )
  8. Butmas ( $15^{\circ}22'S$ ,  $167^{\circ}00'E$ )
  9. Tangoa ( $15^{\circ}34'S$ ,  $166^{\circ}59'E$ )
- Efate
1. Port Vila ( $17^{\circ}44'S$ ,  $168^{\circ}19'E$ )
  2. Erakor ( $17^{\circ}46'S$ ,  $168^{\circ}18'E$ )
  3. Pang Pang ( $17^{\circ}40'S$ ,  $168^{\circ}32'E$ )
  4. Nagar Resort ( $17^{\circ}31'S$ ,  $168^{\circ}23'E$ )

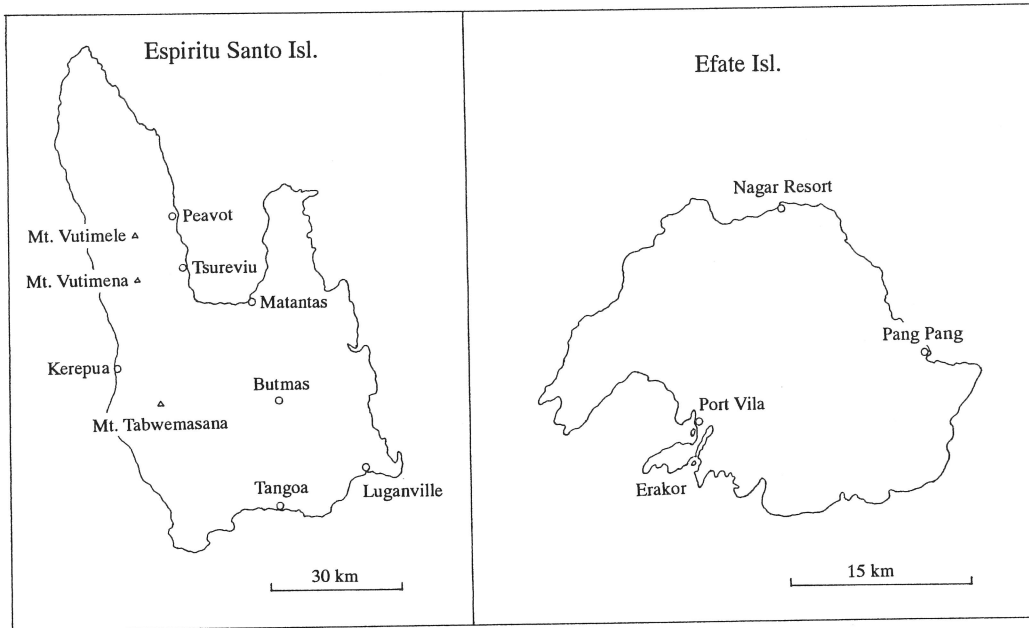


Fig. 2. Collecting sites in Espiritu Santo and Efate Islands in 1996 and 1997.

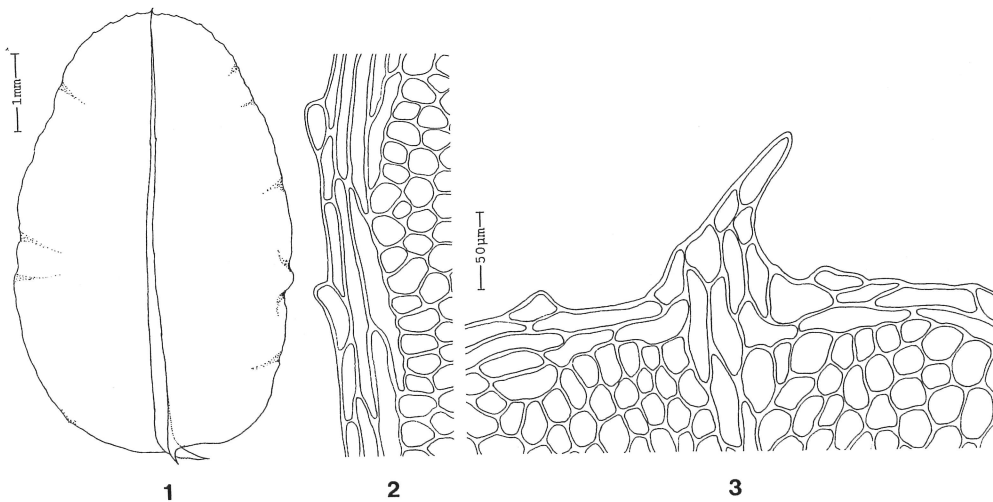


Fig. 3. *Plagiomnium integrum* var. *integrum*. 1. Leaf. 2. Leaf border at middle portion. 3. Leaf apex. All drawn from Higuchi 31616.

#### MNIACEAE

Tixier (1974) reported *Mnium* 'esculentum' Mitt. from Espiritu Santo Isl. Higuchi (1996) suggested that it might be the orthographic error of *Mnium succulentum* Mitt. (= *Plagiomnium succulentum* (Mitt.) T.J.Kop.). Koponen and Norris (1983) discussed on *Plagiomnium integrum* (Bosch & Sande Lac.)

T.J.Kop. based on New Guinean collections, and provided the total range of the species including Vanuatu. *Plagiomnium succulentum* and *P. integrum* var. *integrum* are the species in the family Mniaceae as occurring in Vanuatu.

**Plagiomnium integrum** (Bosch & Sande Lac.) T.J.Kop. var. **integrum**, *Hikobia* 6: 57 (1972).

Specimens examined. Espiritu Santo Isl., Mt. Tabwemasana, 1170 m alt., Nov. 7, 1996 (Higuchi 31597), 1300 m alt. (Higuchi 31601), 1400 m alt. (Higuchi 31616).

Distribution. China, Bhutan, Burma, India, Indonesia, Malaysia, Philippines, New Guinea, Vanuatu, Fiji (cf. Koponen 1983).

Notes. *Plagiomnium integrum* is characterized by elliptic leaves with decurrent bases, strong leaf border and elongate hexagonal laminal cells usually with thickened walls. *P. integrum* var. *integrum* is distinguished from *P. integrum* var. *subelimbatum* (Dixon) T.J.Kop. & Norris, endemic to New Guinea, by having leaves bordered at apex (Fig. 3: 3. cf. Koponen and Norris 1983).

The specimens cited above occurred at high altitude above 1000 m on soil and boulders along stream or in wet montane forest.

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### Summary

Botanical expeditions to Vanuatu arranged by Tsukuba Botanical Garden, National Science Museum, Tokyo were outlined with special reference to the collections of bryophytes. The Mniaceae was studied based on the collections made by Higuchi in 1996. *Plagiomnium integrum* var. *integrum* was recognized from Espiritu Santo, Vanuatu.

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