GENERAL INTRODUCTION

Background

*Freycinetia* is one of the four genera within the Palaeotropic monocotyledonous family of *Pandanaceae*. The other genera are *Martellidendron*, *Pandanus*, and *Sararanga*. Unlike the other three genera of *Pandanaceae*, almost all species of the genus are climbers except the Hawaiian endemic, *F. arborea* that possesses a habit of shrub or small tree (Stone 1967; Dahlgren *et al.* 1985), a habit that the species shares with at least some members of *Martellidendron* (Callmander *et al.* 2003) and *Pandanus*. *Sararanga* is so far known to possess a habit of large trees.

The genus was firstly described by the French botanist Gaudichaud in 1824 with only three species proposed namely *F. arborea*, *F. radicans*, and *F. indens*, in which *F. arborea* was selected as the genus type (Gaudichaud 1824). For this study the genus *Freycinetia* is consisted of 200 species or more (one 1983; Dahlgren *et al.* 1985; Cox 1990; and Cox *et al.* 1995; Callmander *et al.* 2003).

The genus occurs from the mainland South East Asia, the great Malay Archipelago (including the Philippines and New Guinea with its adjacent islands), Taiwan, Micronesia, northern Australia, and Pacific (including New Zealand). The centre of distribution is New Guinea, where approximately 60 species were believed to be existed (Stone 1976). In New Zealand the genus is the only member of *Pandanaceae* found. Evolutionary the genus has been regarded as the most advanced member of the family based on the climber habit and the structure of inflorescences (Stone 1972a).

Species of *Freycinetia* have been recognised to possess many uses. The tuberous roots are used for strings and other domestic uses. In several countries of South Pacific, the inflorescences of some species are eaten or employed as emergency food sources (Brink & Escobin 2003). Several species with optional colourful bracts are cultivated as ornamental plants. The best example
is the New Zealander endemic *F. banksii*, which is praised as a favourite house plant (Dahlgren *et al.* 1985). The colourful bracts of *F. funicularis* are applied as a source of natural colouring in Chinese traditional soft drink (Heyne 1987).

Malesia is a floristic region that comprises political entities of Indonesia, Malaysia, Singapore, Brunei Darussalam, the Philippines, Timor Leste (formerly East Timor), and Papua New Guinea. The area is extending to the southern part of Thailand. Malesia is regarded as the important floristic region for *Pandanaceae* only in this region that the three traditionally known genera (*Freycinetia, undarius*, and *Sararanga*) are found (Stone 1983). In some areas the three genera are found cohabitant as can be found in the Philippines and New Guinea including its adjacent islands (Keim 2009). Furthermore, it is in Malesia, particularly New Guinea that the family reaches its outstanding diversity. This is so true for *Freycinetia* (Stone 1970a).

The species of *Freycinetia* inhabits various types of habitats such as swampy forests, mangroves, primary and secondary to montane forest from sea level up to 3000 m above sea level (Stone 1974).

With an area of 476,000 square km Sumatra is the second largest island in Republic of Indonesia. This is approximately 25% of the total land area of the country (BAPPENAS 2003). In term of the Malay Archipelago Sumatra is undisputedly one of the essential islands that build the great archipelago. The island is located in the most western corner of the archipelago. The Malay Archipelago is the backbone of Malesia.

Concerning the biodiversity, Sumatra is the third most diverse island in Malesia after New Guinea and Borneo (Whitten 1992; Johns 1995; Roos *et al.* 2004). The flora of Sumatra comprises of about 10,000 species of which 12% are ferns (Davis *et al.* 1995; Roos *et al.* 2004). Despite this richness, botanically matra is still considered as an under collecting area compared to other areas in Malesia such as the Malay Peninsula, Java, Borneo, Sulawesi, and New Guinea. Khan (1995) mentioned that Sumatra is probably the least explored of all Malesia, especially for the genus *Freycinetia*.

Prior to this study, the species of *Freycinetia* in Sumatra was represented 10 species (Stone 1972b). Although this number seems to be inferior compare
to the other areas within Malesia, such as Borneo, the Philippines, Malay Peninsula, and New Guinea; however, there are some areas in Sumatra, which have not been explored thoroughly for their pandan flora.

The first taxonomical study of the Sumatran species of Freycinetia was done by Warburg (1900), in which he reported two species: Freycinetia sumatrana and F. tenius. Prior to this present study the latest work on the genus in Sumatra was done by Stone (1972b). Stone carried out his study mainly based on herbarium specimens kept in Herbarium Bogoriense (BO) at Bogor, Indonesia and National Herbarium of the Netherlands at Leiden (L, then Rijksherbarium Leiden). He recognized ten species with several new species but had never been rigidly published.

Recently the biodiversity of Sumatra has been under severe of threats caused by deforestation, industrialization, habitat alternation, expansion of oil palm plantations, and other kinds of threats (Holmes 2000; FWI/GFW 2002; Irwan 2004). The rate of deforestation in Sumatra is approximately 268,000 hectares/year or 22.8% of total deforestation rate for Indonesia, which is about 70,000 hectares/year (Departemen Kehutanan 2008). This terrifying fact has biological impact to the flora of Sumatra in the form of imminent massive biodiversity loss. This is indeed true for Freycinetia as almost all members of this genus are climbers that need trees to sustain their existence.

In order to minimize the threat to the existence of the Sumatran species of Freycinetia, better study on the biology of the genus (incorporating modern approaches in morphology, anatomy, and ecology) are needed. Besides, accurate documentation (including field study and collecting new herbarium specimens), and unambiguous species delimitation are essential to be studied as species diversity is continuously under threats and decreased.

The objectives of the study

The aims of this current study include having a better understanding in the morphology of Freycinetia particularly in Sumatra in order to have a better grip of species delimitation, supportive anatomical data, and the distribution and ecology of the species found in Sumatra.