

Materials for a revision of *Erycibe* (Convolvulaceae) in Peninsular Malaysia

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ABSTRACT. Information from the literature, new observations based on field study, and new distribution data gathered from herbarium specimens and new collections are assembled in preparation for a revision of the genus *Erycibe* in Peninsular Malaysia. Significant new data are discussed and a conservation status is assigned to each of the 19 taxa recognised in Peninsular Malaysia. Problems still to be resolved are highlighted.

Keywords. Convolvulaceae, *Erycibe*, Peninsular Malaysia

Introduction

Erycibe includes about 75 species distributed mainly in tropical Asia and Malesia with outlying species in Australia, Japan and Taiwan (Staples 2010). The genus *Erycibe* was first described by Roxburgh (1798), based on *E. paniculata* Roxb. from India. The taxonomic framework for understanding the genus was established by Hoogland (1953a) who provided a nomenclatural review of all taxa described at that time (70 accepted species). Detailed descriptions, keys for identification, selected illustrations, ecological information and biogeographical distribution summaries were provided for the 53 Malesian species (Hoogland 1953b). Later, an index of all *Erycibe* specimens examined was prepared (Hoogland 1961) that remains useful for naming older herbarium specimens and is invaluable for understanding the taxonomic concepts Hoogland employed. Subsequent to Hoogland's work another five Asian species have been described although not all are accepted.

Hoogland made a thorough revision based solely on herbarium material and his keys and descriptions rely heavily on reproductive (floral) characters. He was the first to use trichome characters, particularly the hairs from the calyx and the midpetaline bands, to distinguish the species in certain groups. Yet, while the keys and descriptions work well enough in the herbarium, they are not practical for field identification. Using the hair characters requires a compound microscope with an optical micrometer for measuring accurately; many botanists and collectors have lamented the lack of good field characters for recognising *Erycibe*. This is problematic especially when trying to key out sterile or fruiting materials.

In the account of *Erycibe* in Peninsular Malaysia, Ridley (1923) recognised 15 species, documented in the *Flora of the Malay Peninsula*; some of these were later reduced to synonymy by Hoogland (1953a, 1953b). Hoogland accepted 16 species and 2 varieties in Peninsular Malaysia. Of these, four taxa were considered endemic (*E. magnifica*, *E. praecipua* ssp. *praecipua*, *E. sapotacea* and *E. strigosa*). Later, Ng (1989) recognised two more species that he named 'species A' and 'species B' based on leaf characters. Until now, the two latter species have not been described due to incomplete material. In total, Peninsular Malaysia has 19 recognised taxa.

Almost six decades after Hoogland's revision for *Flora Malesiana*, there is no updated taxonomic revision for the genus *Erycibe* in Peninsular Malaysia. The Flora of Peninsular Malaysia Project now provides an impetus to re-examine the genus and synthesise new information. Today, there are more collections of *Erycibe* available, which makes it possible to review taxonomic concepts for the recognised species and the two new taxa recognised by Ng. The full revision of the genus in Peninsular Malaysia, with a new key, detailed descriptions, distribution maps for each species and colour photographs will be published in the Flora of Peninsular Malaysia account. The purpose of the present paper is to bring together new information gathered from the literature, from field observations of living plants, and from study of the herbarium specimens that have accumulated since the 1950s. Furthermore, the conservation status for each species has been assessed based on the Malaysia Plant Red List Guideline (Chua & Saw 2006).

Materials and methods

Field study and specimen collection

Nine field trips were carried out from January 2009 till April 2010 at known localities as well as in new collection areas, while specialised trips were carried out to relocate rare species to obtain fresh materials. Materials for flowers and fruits were preserved in the spirit collection in addition to voucher specimens. Further information of the habitat and habit characters based on personal observations made in the field was added. In addition, close-up colour photographs were taken, especially of flower and fruit parts, as an aid in distinguishing the species.

Comparative morphology based on herbarium specimens

This study was conducted on herbarium specimens from the following herbaria: BKF, K, KEP, KLU, L, SING and UKMB. A total of 586 specimens of *Erycibe* collected from Borneo, Singapore, Sumatra and Thailand were borrowed and compared with specimens collected from Peninsular Malaysia. Of these, 241 collections of *Erycibe* collected from Peninsular Malaysia were examined.

Scanning Electron Microscope (SEM) studies

The structures of the floral parts, especially trichomes on the mid-petaline bands and calyx, have been observed by Hoogland (1953b) to be of taxonomic value for

distinguishing the species. However, during that time, Hoogland observed this character through light microscopy and no figures or plates were provided in his account to illustrate this character. Today, Scanning Electron Microscope (SEM) offers a powerful technique for observation of trichome characters and making precise measurements. In this study, 15 species were studied using Scanning Electron Microscope (FEI Quantum 200) using herbarium specimens or fresh materials.

Conservation status of Erycibe

The distribution of the Peninsular Malaysian *Erycibe* species has not been mapped, so their conservation status is unknown, particularly for the endemic species. The conservation status assessment of each taxon is being carried out based on the guidelines and criteria of the Malaysia Plant Red List (Chua & Saw 2006). The final result for all 19 taxa is currently in preparation.

Results and discussion

Distribution of Erycibe

Based on the data from recently collected material together with that on herbarium specimen labels, all *Erycibe* species are found and distributed in lowland to hill forest, ranging from 20 m to 1200 m a.s.l. From the field work conducted, only four of the 19 taxa, namely, *E. albida*, *E. sapotacea*, *E. stapfiana* and *E. rheedii* were found and studied in the forest at the base of Gua Wang Buluh and Temurun Waterfall (Kedah state), Penang Hill (Penang), base of Gunung Korbu and Bubu Forest Reserve (Perak), Forest Research Institute Malaysia (Selangor), Pasoh Forest Reserve (Negeri Sembilan), Gunung Belumut (Johor) and Tembat Forest Reserve (Terengganu) (Fig. 1).

Erycibe albida was found flowering at Temurun Waterfall (Kedah), Pasoh Forest Reserve (Negeri Sembilan) and Tembat Forest Reserve (Terengganu). All collections were made in lowland areas. However, no fruits were obtained.

Erycibe sapotacea was again found on Penang Hill (type locality). It has been recorded as endemic to Peninsular Malaysia in the past. Unfortunately, no flowers were obtained (December 2009). However, specimen *W.J.J.O. de Wilde & B.E.E. de Wilde-Duyffes 21199*, 29 July 1981, from Sumatra (deposited in the Leiden herbarium) looks similar to *E. sapotacea* in fruit and leaf characters. For the time being, *E. sapotacea* is considered as an endemic to Peninsular Malaysia. However, further study is needed and perhaps this species has a wider distribution extending to Sumatra.

Erycibe stapfiana was observed flowering in April at the lower trail to Gunung Korbu (Perak). The flowering season is about 2–3 weeks only. It is a climber, reaching 30–35 m tall in the forest canopy. We found this climber on a hillside near a Saraca stream, which is relatively undisturbed with quite an open forest canopy.

Erycibe rheedii was found to be quite common in Pulau Tuba (Kedah) near Gua Wang Buluh (a limestone cave). It occurs along the trail to the cave's base. Similar to other species, *E. rheedii* also favours gaps where sunlight is available. From

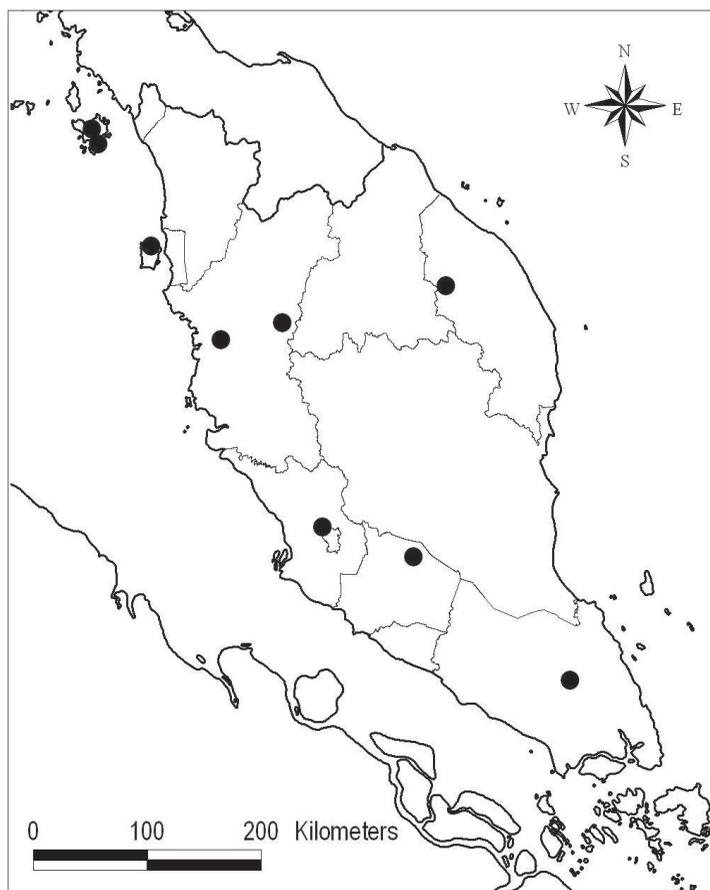


Fig. 1. Location of field collecting trips for *Erycibe* spp.

our observations, it only flowers once a year (early March) and the fruiting season is towards the end of the month.

Based on the data gathered, the distribution of the two undescribed species is now known. *Erycibe* sp. A is believed to be endemic to Gunung Belumat, Johor, and *Erycibe* sp. B is endemic to lowland forest of Pahang, Selangor and Negeri Sembilan.

Morphological observations

Generally, *Erycibe* species are small shrubs, woody climbers or lianas, climbing by twining high in the forest canopy. Plants are always found on forest margins, in forest gaps and sometimes near roadsides. In Peninsular Malaysia, only *E. albida* has been recorded consistently as a shrub. From the observations made in the field, the outer bark is normally light or pale grey, sometimes with lenticels or low longitudinal ridges and sometimes very smooth when the climbers become huge. However, characters such as plant height, bark texture and bark colours are not good taxonomic characters for identification because they are related to age of the climbers. Nevertheless, these characters are able to provide supplementary evidence for field identification.

As for the leaves, there are a few characters that are quite useful for the identification of Peninsular Malaysia species. The size and shape of the lamina in *E. leucoxyloides* is very distinct, oval-elliptic to lanceolate, 1.1–3.9 cm long and 0.5–1.3 cm wide. In the examination of herbarium specimens, some of the species such as *E. magnifica* have very clear venation underneath with thick pubescence. These characters are very consistent and can be useful to distinguish the species.

Erycibe has two types of inflorescence: racemose/paniculate or glomerulate at either a terminal or axillary position. Many *Erycibe* species have very light sweet-scented flowers like jasmine, although there is a species recorded with a strong odour: *E. rheedii*. The flower of *Erycibe* is either white or creamy in colour. *Erycibe* has a deeply 5-lobed corolla, with each lobe having a bilobed apex and very dense hairy outside on the mid-petaline bands. The filament is either triangular or laterally concave. A few species have truncate anther and many have acute anther apices.

The fruit is a berry, with a little flesh surrounding the single seed, seated on the persistent calyx. Generally, the shape of the fruits is ovoid or ellipsoid or sometimes obpyriform. In Hoogland's revision for *Flora Malesiana*, important characters such as colour of the fruits was unknown for some species. For example, a recent collection made from Penang Hill added another important character for *E. sapotacea*: this species has pale grey fruits, which was not mentioned in Hoogland's account.

Micromorphological observations

For first time SEM technique is used for the micromorphological study on trichome structure of the midpetaline bands and calyx. In this study, two main hair types were found on the midpetaline bands: two-branched hairs and three- to many-branched hairs (stellate hairs). Two-branched hairs are found in *E. festiva* and *E. maingayi*. Three- to many-branched hairs are found in other species and also in *E. maingayi*. For the calyx, a glabrous calyx surface is found only in *E. albida*, while two-branched hairs are found in *E. festiva*, *E. griffithii* and *E. maingayi* and three- to many-branched hairs (stellate hairs) are found in other species. Thus, the results from the SEM images support Hoogland's findings in 1953.

An examination of the mid-petaline and calyx hairs of the specimen *Sidek bin Kiah SK513*, 19 February 1976, from Kuala Dipang Forest Reserve, Perak (with very typical *Erycibe* leaf shape) shows it belongs to *E. festiva*, which has two-branched hairs. Initially this specimen had been wrongly identified as *E. griffithii* by the collector and later identified by an unknown person (in 2008) as *E. maingayi*.

However, from the analysis made, not all species can be distinguished by the trichome type. Trichome type is an additional character useful to distinguish a few species only.

Ecology and life history

In the study of plant dispersal by Ridley (1930), birds are reported as seed dispersers of *Erycibe tomentosa* var. *tomentosa* (synonym *E. princei*) and *E. malaccensis*. *Erycibe tomentosa* var. *tomentosa* produces large panicles of drupes; the fruits do not all ripen at once. The contrast of bright-orange unripe fruits (very conspicuous) with dark

red or almost black ripe fruits is attractive to frugivorous birds. Besides that, there are anecdotal records by some biologists observing hornbills eating *Erycibe* fruits. However, recent books on hornbill biology such as Kinnaird & O'Brien (2007) and Poonswad (1998) do not list *Erycibe* (or any Convolvulaceae) among the food plants eaten by hornbills. Besides birds, the fruits of *Erycibe* are also eaten by mammals and McConkey & Galetti (1999) reported the sun bear (*Helarctos malayanus*) eating *E. maingayi* fruits and dispersing the seeds in Central Kalimantan, Indonesia. The bear's droppings contained establishing *E. maingayi* seedlings found around 150 m from the adult liana.

Presently unresolved problems

After almost 60 years, the number of new herbarium collections for *Erycibe* in Peninsular Malaysia has not greatly increased. There were less than 100 collections of *Erycibe* collected after Hoogland's time. Several species, for example *E. strigosa*, has very little information known; the only collection is still only the type specimen collected in 1886 from Taiping, Perak, with very limited locality information. Therefore, further collecting would be important. Until now, incomplete material in herbarium specimens (fruits and flowers) prevents the description and formal naming of the two taxa recognised by Ng (1989). Besides, the locality data as stated on the specimen label are insufficient, thus it is hard to relocate the plant.

Even with new collections available, there are still major gaps to be filled, especially in life history data. The study of ecology, phenology, pollination, seed predation, herbivory, or seedling establishment is still lacking. Pollen grains have also still to be studied.

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