CONCLUSIONS

On the basis of morphological species concept there are twenty eight species of *Calamus* occur in Sulawesi. All those species belong to several groups of Beccari’s and most of the species belongs to group XV where leaves cirrate, leaflets elongate, leaf sheath eflagellate, primary bracts tubular - tattering in age, rachilla pedicellate, involucrophorum sessile, endosperm homogenous or ruminate. Four of these twenty eight species have been discovered recently and recorded as new, *C. perpendiculus*, *C. rosetus*, and *C. lorelinduensis*. Another new species, *Calamus ahlidurii* Fernando, is published here based on the determination note of Fernando on the herbarium specimen. One new species reported as new record, *Calamus robinsonianus*. *Calamus pedicellatus* has been assigned as synonymy of *C. inops* mainly because of better understanding of the range variation in specimens. Three names of uncertain application are discussed.

Beccari recognized 16 groups of *Calamus* based mainly on the present or absent of the cirrus, present or absent of flagella in the leaf sheath and/or in the inflorescence, shape of primary bract, rachillae sessile or pedicellate, involucrophore sessile or pedicellate and endospermae homogenous or ruminate. Kramadibrata and Dransfield added two groups – Groups XVII for species which has vestigial flagellum and Group XVIII for *Calamus inops* groups. In Sulawesi, Group XVII only presented by *Calamus perpendiculus*, the rest of the species occur in Borneo. Furtado had proposed sections within *Calamus* but it seems that his sections did not work very well because most of his section can be referred to Beccari’s group. In total based on the recent study 18 groups has been known for grouping within *Calamus* and 6 groups occurs in Sulawesi.

The phenetic study shows within seven species of *Daemonorops* occur in Sulawesi *D. takanensis* and *D. mogeana* confirmed as new species. These two species recently collected from the slopes of Bukit Takane-kane and G. Malemo respectively. *Daemonorops takanensis* is distinct from other species by leaf sheath having rusty-brown colored indumentum, armed with numerous very brittle, thin laminar, short, solitary brown spines with small bulbous bases. Whereas *D. mogeana* compared to other species has subglobose fruit and slightly ruminate endosperm.

Of all thirty six species of rattans in Sulawesi, thirty one species are endemic to the region and five species are having more wide distribution. From thirty one endemic species; 8 species have relatively wide distribution (*C. inops*, *C. koordersianus*, *C.
leptostachys, C. macrosphaerion, C. minahassae, C. scleracanthus, C. zollingeri, K. celebica – where C. minahassae, C. zollingeri and K. celebica can be found all over Sulawesi) and the rest of the species have limited distribution or restricted to the certain area in Sulawesi. Another reason why such species has narrow distribution related to vicariance event where the splitting or division of taxon through the development of a natural biogeographical barrier. Five species of Calamus reported have wider distribution across Sulawesi (i.e. C. mindorensis, C. ornatus var. ornatus, C. subinermis, C. symphysipus and C. robinsonianus). C. ornatus var. ornatus has wide areas of distribution and are also widely cultivated compared to other species of Calamus from Sulawesi. This species has bimodal distribution because it can be found in West and East of Wallace line. Another species which has bimodal distribution is C. subinermis because this species occurred in North of Borneo and North Sulawesi. C. symphysipus can be found in all over Sulawesi and up to the Phillipine. C. mindorensis is new record in Sulawesi because it was found only in Philippine but based on new herbarium specimens this species also found in Central and South East of Sulawesi. Whereas C. robinsonianus was first reported only occurred in Mollucas but recent study showed that this species also occurred in South East of Sulawesi.

Certain species of Calamus, such as C. kandariensis and C. kjelbergii is likely to go extinct because so far there is no new evidence of herbarium specimens collected from type locality or other areas in Sulawesi. C. ornatus var. ornatus in this region meets criteria of Least Concern as well as C. subinermis. Those two species have wide areas of distribution and the former species is widely cultivated in the Philippine as large diameter rattans for furniture industry. There are 11 species of Calamus and one species of Daemonorops – D. robusta, as commercial rattans in Sulawesi. All those species have not cultivated yet. Local people usually collected the rattans directly from the forest. These activities would threaten of the commercial rattans occurrence and increased levels of exploitation.

The cane of commercial rattans from Sulawesi used for the furniture industry. Their cane ideal for binding purposes and their smooth cane surface highly suitable for weaving, matting and fine basket-ware after splitting. Local people has an astonishing variety or carrying baskets, hats, sleeping mats, tobacco pouches and other woven items made from a variety of species. C. zollingeri, giant rattan of East Indonesia which mostly used and exported as furniture, has very wide distribution all over Sulawesi.