

## Gregarious Flowering and Regeneration Process of Tropical Bamboo under The Influence of Forest Fire

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### Abstract

Knowledge about life history and reproductive characteristics are recently accumulated in Japan. Little is known about tropical bamboos. We investigated the demography data of culm for the four bamboo species coexist in mixed deciduous forest in Thailand on the period from flowering stage to early regeneration process, and have identified the genet from a clump structure. We have investigated the mortality factors in the reduction curve of genet of bamboo to start the regeneration all at once. Gregarious flowering event of GA and CP was detected by demography data in 1998 and 2001, respectively. GA flowered almost of all genets in 8 of the nine plots. A huge number of genets participated in the flowering event, and died after that. Then, survived genets were observed in all plots. There is a possibility that flowering genets were reproductive or no flowering genets were extant. When the parent genet of them were died, lack of bamboo canopy was occurred, because the next generation start from seed germination. Genet of BT with a large culm began to increase immediately while flowering event have occurred. BT in 6 of nine sub-quadrats was to become the primary dominant species. For the forest fire occurred in 2010, genets with culm >1m high would not be affected by the fire. However, genets with culm only <1m high are affected by the fire.

**Key Word:** tropical bamboo, demography of genet, regeneration process, mixed deciduous forest (MDF)

### Introduction

The bamboos originating from tropical regions, have many species and high diversity in tropical regions. In the mixed deciduous forests (MDF) of Thailand, some bamboo species coexist, and each species are high dominance. Bamboos in the temperate regions in East Asia are well known to have a peculiar flowering habit. They are long-lived monocarpic and flower simultaneously in a wide range after vigorous rhizomatous clonal growth over 100 years. Simultaneous death of Bamboos often forms exclusive and dense population, promote the establishment of woody seedlings, and provide a great opportunity to regenerate the forest. There are striking differences between the temperate bamboos and tropical bamboos. It is life form, community structure, flowering habit, and so on. Knowledge about life history and reproductive characteristics are recently accumulated in Japan (Makita 1992, 1996). Little is known about tropical bamboos. We investigated the demography data of culm for the four bamboo species coexist in mixed deciduous forest in Thailand on the period from flowering stage to early regeneration process, and have identified the genet from a clump structure. We have investigated the mortality factors in the reduction curve of genet of bamboo to start the regeneration all at once.

### Study site and methods

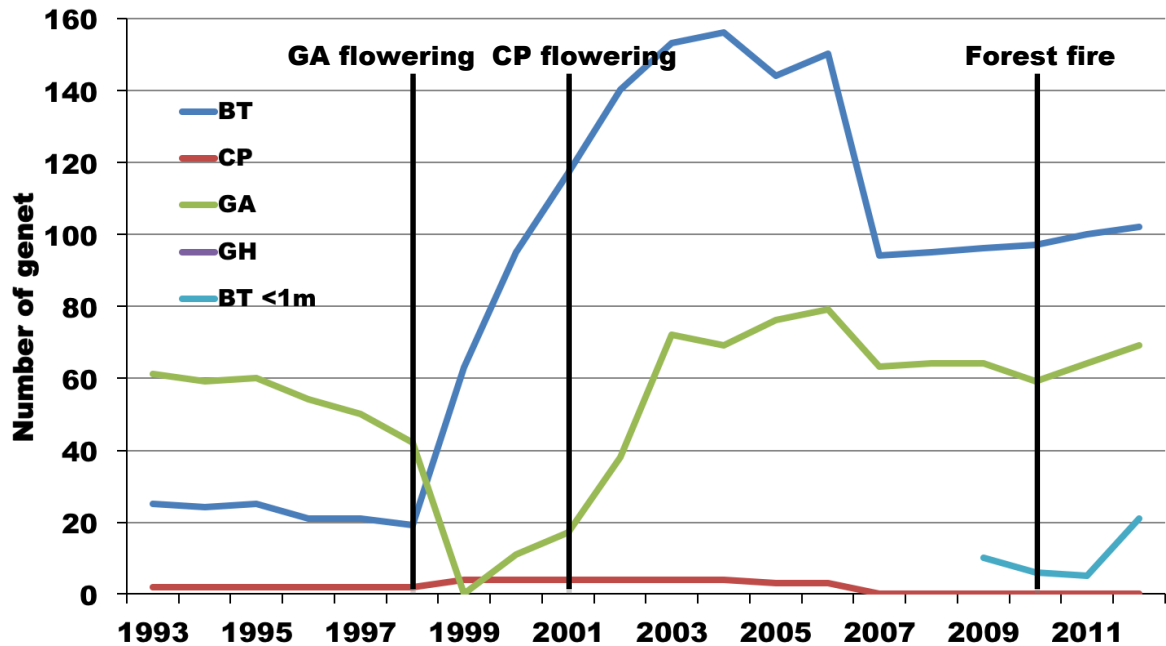
The study was conducted in a mixed deciduous forest in Mae Klong Watershed Research Station, Kanchanaburi Province, Thailand. Four dominant bamboo species (*Gigantochloa albociliata*, *G. hasskarliana*, *Bambusa tulda*, and *Cephalostachyum pergracile*) coexist on the understory. Their bamboos are the clump forming type with pachymorph rhizome system (McClure 1966). To clarify the dynamics of genets (clumps) and culms of 4 bamboo species, nine 20 x 20 m sub-quadrats were uniformly arranged in a 4ha permanent plot. All the culms > 1 m high of the clumps were tagged, and the diameter at 1 m high was measured at the end of the growing season (late October or November) once a year from 1993 to 2012. At the first census, current year culms and older culms were specified. From the second census, newly emerged current year culms were tagged and other culms were checked survival. For the culms <1m high of the clumps, another nine 5 x 5 m sub-quadrats were set up in 2010, and investigate in the same way. To clarify whether culm <1m high of the clumps affected by forest fire, the occurrence of forest fire were recorded. The forest fire occurred in 2010 after census, and not occurred before census in the 2012.

### Results and Discussion

*Gigantochloa hasskarliana* (GH) flowered in 1990, *Gigantochloa albociliata* (GA) flowered in 1998, and *Cephalostachyum pergracile* (CP) flowered in 2001 in the 4ha permanent plot, but no flowering event in other bamboo appeared in other years. *Bambusa tulda* (BT) did not flower throughout the study period. This result that is shown in four tropical bamboo species was different from the well known phenomenon of temperate bamboos. More than 2 bamboos species distributed in the mixed deciduous forest coexisted, and shared the bamboo canopy layer in all sub-quadrats. Gregarious flowering event of GA and CP was detected by demography data in 1998 and 2001, respectively. GA flowered almost of all genets in 8 of the nine plots. A huge number of genets participated in the flowering event, and died after that. Then, survived genets were observed in all plots. There is a possibility that flowering genets were reproductive or no flowering genets were extant. GA was distributed before flowering, but the number of genet was few in the remaining 1 plot. GA of this sub-quadrat showed no significant decrease in the number of genet before and after flowering. CP was distributed in 5 sub-quadrats before flowering, but the number of genet was few, showed no significant decrease before and after flowering. In any bamboo species, the number of genet was few before flowering in a sub-quadrat, suggesting that all genets may not flowered.

While two species of bamboos have occurred the flowering event in 1998 and 2001, when the parent genet of them were died, lack of bamboo canopy was occurred, because the next generation start from seed germination. Genet of BT with a large culm began to increase immediately while flowering event have occurred. BT in 6 of nine sub-quadrats was to become the primary dominant species. The 3 remaining sub-quadrats, flowered GH, GA, and CP is regenerated, and became primary dominant species. In case of the regeneration pattern that GA and CP have flowered and BT was grow up to canopy, sapling clumps of bamboo flowered survived under the canopy as sapling bank. In another case of the regeneration pattern that flowered bamboo regenerate in situ, sapling clumps may not remain. Other species survived understory as sapling bank. For the forest fire occurred in 2010, genets with culm

>1m high would not be affected by the fire. However, genets with culm only <1m high are affected by the fire. All of culm of the many genets burnt to death. It is unclear which cause to death of genet. After that, the number of genet has increased in the year of no forest fire. We consider some genets will die. Forest fire is one of inhibiting factor of regeneration of bamboo. We need continuation of census longer to determine whether culms were dead or whole genets were dead.



**Figure 1** Change in the number of genets in sub-quadrat.

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