

## Flowering plant diversity of the Satun Geopark

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### Abstract

The flowering plant diversity of the Satun Geopark was a part of a survey project collecting resources of the biodiversity in the Satun Geopark. The objective of the project was to record plant species in the area. The project began in October 2019 and ended in 2024. After four years (2019–2023) of work, 74 plants families and 342 species were recorded, 312 species were native, and 30 species were exotic. Family Moraceae had highest number of species at 32 species. The habit of trees had the highest number of species at 235 species. On the conservation status, three species were near threatened (NT), 12 species were vulnerable (VU), five species were endangered (EN), and two species were critically endangered (CR).

### Keywords

flowering plant, plant diversity, conservation status, Satun Geopark

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## Introduction

Satun Global Geopark has been certified as a UNESCO Global Geopark since April 17, 2018. It covers four districts Thung Wa, Manang, La-nгу, and Mueang in Satun Province. It consists of two National Parks (Mu Ko Phetra and Tarutao National Parks) and a part of Khao Banthad Wildlife Sanctuary, with an overall area of 2,597 km<sup>2</sup>. The geographical character of the geopark was variable, mountainous, island, coastal, coastal plain, and karst topography which builds the abundance of living organisms. After the geopark was certified, a research program was part of criteria for the geopark, and biodiversity is a treasure for all people in their livelihood. The project of studying the species diversity of plants, animals, and fossils in Satun Geopark was carried out. Five years were set for the program, and the search consisted of nine organism groups: flowering plant, macro algae, insects, mollusks, crabs, amphibians, reptiles, birds, and mammals. The study and observation of the diversity of flowering plants was part of this project.

Flowering plants are plants that produce flowers, fruit, and seeds (Collins dictionary, 2024), with the seed enclosed ovaries called angiosperms (Cantino, 2007; Merriam-webster, 2024). They include herbaceous, grasses and grass-like plants, broad-leaved trees, shrubs, vines, and aquatic plants. An accepted number of plant species as ca 374,000, of which approximately 308,312 are vascular plants, with 295,383 flowering plants (angiosperms; monocots: 74,273; eudicots: 210,008) (Christenhusz and Byng, 2016). Flowering plants estimated that approximately 79 percent of all the known plants now. Williams (1944) reported the important of plants that plants are the basis upon with all other life depend, it is still true until now. Flowering plants are an important source of food and serving as a source of pharmaceuticals, fiber products, timber, ornamentals, and other commercial products.

Species extinction is a big problem now. WWF (2024) declared that the rapid loss of species we are seeing today is estimated by experts to be between 1,000 and 10,000 times higher than the natural extinction rate. The plant species also lost every day. The State of the World's Plants and Fungi report from Royal Botanic Gardens (RBG) Kew estimated that 39.4% of plants are now threatened with extinction (Natural History Museum, 2024).

The flowering plant diversity research of the Satun Geopark aimed to study the existing plants in the park. Plant information will be disseminated to the public to raise awareness of the conservation of plants. The final outcome is hoped to restrain the diversity loss of flowering plants in the geopark.

## Materials and Methods

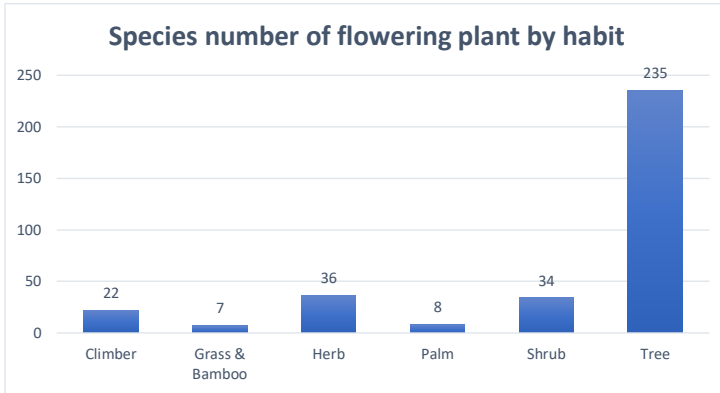
1. Survey and field work to collected plant material, took place in Satun Geopark, comprised of private and public areas, and three conservation areas: Tarutao National Park, Mu Ko Phetra National Park, and Khao Banthad Wildlife Sanctuary.

2. Collected samples were processed according to traditional methods (Victor *et al.*, 2004). Morphological characters were studied and species identification was based on the flora of Thailand, scientific names were checked with POWO (Plants of The World Online) (The Royal Botanic Gardens, Kew, 2024) and Thai names followed Thai Plants Names Tem Smitinand (Revised Edition) 2014 Forest Herbarium, Royal Forest Department, and checked online with Thai Plant Name (online : <https://botany.dnp.go.th/mplant/search.html?group=localname>)

3. Plant status was given by following IUCN (2024).

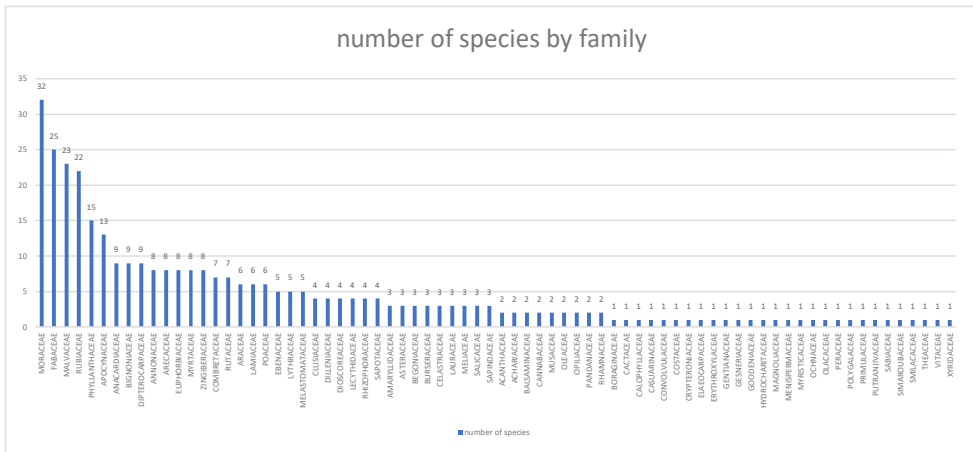
## Results

After four years of works (2019–2023), Plant samples were collected, and species identification was determined. The results showed 74 plants families and 342 species being recorded. They were comprised of 235 species of trees (T), 34 species of shrub, 36 species of herb (H), 22 species of climber(C), eight species of palms (P), seven species of grass and Bamboo (G). Of 342 species, 30 species is exotic (Figure 1, Table 1).



**Figure 1.** A chart shows species number of flowering plant by habit was recorded in the geopark.

By the family of plants, family Moraceae had the highest member, 32 species. Family Fabaceae was the second, 25 species. Family Malvaceae was the third, 23 species, Rubiaceae was the fourth, 22 species, and Phyllanthaceae was the fifth, 15 species (Figure 2, Table 1).



**Figure 2.** A chart shows species number of flowering plants by family was recorded in Satun Geopark.

By status, most species were native to Thailand while 30 species were exotic. Some species became invasive species in the Geopark, such as *Pennisetum pedicellatum* Trin. While many species of exotic are economic plants, such as *Hevea brasiliensis* (Kunth) Müll. Arg., *Cocos nucifera* L., and *Elaeis guineensis* Jacq (Figure 3). The conservation status of 161 species have not been assessed yet. Four species were data deficient (DD), 154 were least concern (LC), three species were near threatened (NT), 12 species were vulnerable (VU), five species were endangered (EN), and two species were critically endangered (CR) (Table 1).



**Figure 3.** Exotic plants in Satun Geopark. A. *Chromolaena odorata* (L.) R. M. King & H. Rob.; B. *Pennisetum pedicellatum* Trin.; C. *Mimosa pudica* L.; D. *Jacaranda mimosifolia* D. Don; E. *Senna alata* (L.) Roxb.; F. *Tecoma stans* (L.) Juss. ex Kunth ; G. *Terminalia ivorensis* A. Chev.; H. *Hippeastrum striatum* (Lam.) H. E. Moore

**Table 1.** List of the flowering plant in Satun Geopark

Family	Scientific Name	Habit	IUCN- Red list status	Note
ACANTHACEAE	<i>Avicennia marina</i> (Forssk.) Vierh.	T	LC	
ACANTHACEAE	<i>Pseuderanthemum crenulatum</i> (Lindl.) Radlk.	S		
ACHARIACEAE	<i>Hydnocarpus castanea</i> Hook. f. & Thomson	T		
ACHARIACEAE	<i>Hydnocarpus ilicifolia</i> King	ST		
AMARYLLIDACEAE	<i>Crinum asiaticum</i> L. var. <i>asiaticum</i>	H		
AMARYLLIDACEAE	<i>Hippeastrum striatum</i> (Lam.) H. E. Moore	ExH		Introduce to Geopark for Ornamental plant
AMARYLLIDACEAE	<i>Scadoxus multiflorus</i> (Martyn) Raf.	ExH		Introduce to Geopark for Ornamental plant
ANACARDIACEAE	<i>Anacardium occidentale</i> L.	ExST	LC	Introduce to Geopark for Economic purpose
ANACARDIACEAE	<i>Gluta elegans</i> (Wall.) Hook. f.	T		
ANACARDIACEAE	<i>Lannea coromandelica</i> (Houtt.) Merr.	T	LC	
ANACARDIACEAE	<i>Mangifera foetida</i> Lour.	T	LC	
ANACARDIACEAE	<i>Mangifera indica</i> L.	T	DD	
ANACARDIACEAE	<i>Pentaspadon curtisii</i> (King) Corner	T		
ANACARDIACEAE	<i>Semecarpus cochinchinensis</i> Engl.	T		
ANACARDIACEAE	<i>Spondias bipinnata</i> Airy Shaw & Forman	T		
ANACARDIACEAE	<i>Spondias pinnata</i> (L. f.) Kurz	T		
ANNONACEAE	<i>Cananga brandisiana</i> (Pierre) I. M. Turner	T		

**Table 1.** List of the flowering plant in Satun Geopark. Continued

Family	Scientific Name	Habit	IUCN- Red list status	Note
ANNONACEAE	<i>Fissistigma polyanthoides</i> (A. DC.) Merr.	ScanS		
ANNONACEAE	<i>Goniothalamus latestigma</i> C. E. C. Fisch.	T		
ANNONACEAE	<i>Monoon cupulare</i> (King) B. Xue & R. M. K. Saunders	ST	VU	
ANNONACEAE	<i>Monoon membranifolium</i> (J. Sinclair) B. Xue & R. M. K. Saunders	ST	LC	
ANNONACEAE	<i>Monoon viride</i> (Craib) B. Xue & R. M. K. Saunders	T		
ANNONACEAE	<i>Orophea kerrii</i> Kessler	S/ST	VU	
ANNONACEAE	<i>Orophea polycarpa</i> A. DC.	S/ST	LC	
APOCYNACEAE	<i>Alstonia macrophylla</i> Wall. ex G. Don	T	LC	
APOCYNACEAE	<i>Alstonia rostrata</i> C.E.C. Fisch.	T		
APOCYNACEAE	<i>Alstonia scholaris</i> (L.) R. Br.	T	LC	
APOCYNACEAE	<i>Amphineurion marginatum</i> (Roxb.) D. J. Middleton	C		
APOCYNACEAE	<i>Catharanthus roseus</i> (L.) G. Don	ExH		Introduce to Geopark for Ornamental plant
APOCYNACEAE	<i>Cerbera odollam</i> Gaertn.	ST	LC	
APOCYNACEAE	<i>Cynanchum viminale</i> (L.) L. subsp. <i>viminale</i>	C		
APOCYNACEAE	<i>Holarrhena curtisii</i> King & Gamble	S		
APOCYNACEAE	<i>Hoya parasitica</i> (Roxb.) Wall. ex Traill	C		
APOCYNACEAE	<i>Kopsia arborea</i> Blume	S	LC	
APOCYNACEAE	<i>Wrightia arborea</i> (Dennst.) Mabb.	ST	LC	
APOCYNACEAE	<i>Wrightia dubia</i> (Sims) Spreng.	T		



**Table 1.** List of the flowering plant in Satun Geopark. Continued

Family	Scientific Name	Habit	IUCN- Red list status	Note
APOCYNACEAE	<i>Wrightia religiosa</i> (Teijsm. & Binn.) Benth. ex Kurz	S		
ARACEAE	<i>Aglaonema nitidum</i> (Jack) Kunth	H		
ARACEAE	<i>Alocasia macrorrhizos</i> (L.) G. Don	H		
ARACEAE	<i>Amorphophallus paeoniifolius</i> (Dennst.) Nicolson	H	LC	
ARACEAE	<i>Colocasia esculenta</i> (L.) Schott	H	LC	
ARACEAE	<i>Colocasia gigantea</i> (Blume) Hook. f.	H		
ARACEAE	<i>Scindapsus officinalis</i> (Roxb.) Schott	C		
ARECACEAE	<i>Adonidia merrillii</i> (Becc.) Becc.	ExP	VU	Introduce to Geopark for Ornamental plant
ARECACEAE	<i>Borassus flabellifer</i> L.	P		
ARECACEAE	<i>Caryota mitis</i> Lour.	P	LC	
ARECACEAE	<i>Cocos nucifera</i> L.	ExP		Introduce to Geopark for Economic purpose
ARECACEAE	<i>Elaeis guineensis</i> Jacq.	ExP	LC	Introduce to Geopark for Economic purpose
ARECACEAE	<i>Licuala peltata</i> Roxb.	P		
ARECACEAE	<i>Orania sylvicola</i> (Griff.) H. E. Moore	P	NT	
ARECACEAE	<i>Roystonea regia</i> (Kunth) O. F. Cook	ExP	LC	Introduce to Geopark for Ornamental plant
ASTERACEAE	<i>Chromolaena odorata</i> (L.) R. M. King & H. Rob.	ExH		Invasive species

**Table 1.** List of the flowering plant in Satun Geopark. Continued

Family	Scientific Name	Habit	IUCN- Red list status	Note
ASTERACEAE	<i>Elephantopus scaber</i> L. var. <i>scaber</i>	H		
ASTERACEAE	<i>Wedelia biflora</i> (L.) DC.	HC		
BALSAMINACEAE	<i>Hydrocera triflora</i> (L.) Wight & Arn.	H	LC	
BALSAMINACEAE	<i>Impatiens kerriae</i> Craib	H		
BEGONIACEAE	<i>Begonia elisabethae</i> Kiew	H		
BEGONIACEAE	<i>Begonia incerta</i> Craib	H		
BEGONIACEAE	<i>Begonia pteridiformis</i> Phut-thai	H		
BIGNONIACEAE	<i>Dolichandrone columnaris</i> Santisuk	T		
BIGNONIACEAE	<i>Dolichandrone serrulata</i> (Wall. ex DC.) Seem.	T		
BIGNONIACEAE	<i>Dolichandrone spathacea</i> (L. f.) K. Schum.	T	LC	
BIGNONIACEAE	<i>Handroanthus chrysanthus</i> (Jacq.) S. O. Grose	ExT	VU	Introduce to Geopark for Ornamental Plant
BIGNONIACEAE	<i>Jacaranda mimosifolia</i> D. Don	ExT	VU	Introduce to Geopark for Ornamental Plant
BIGNONIACEAE	<i>Millingtonia hortensis</i> L. f.	T		
BIGNONIACEAE	<i>Oroxylum indicum</i> (L.) Benth. ex Kurz	ST		
BIGNONIACEAE	<i>Stereospermum fimbriatum</i> (Wall. ex G. Don) A. DC.	T		
BIGNONIACEAE	<i>Tecoma stans</i> (L.) Juss. ex Kunth	ExS	LC	Introduce to Geopark for Ornamental Plant
BORAGINACEAE	<i>Cordia subcordata</i> Lam.	ST	LC	
BURSERACEAE	<i>Canarium littorale</i> Blume	T	LC	



**Table 1.** List of the flowering plant in Satun Geopark. Continued

Family	Scientific Name	Habit	IUCN- Red list status	Note
BURSERACEAE	<i>Canarium subulatum</i> Guillaumin	T	LC	
BURSERACEAE	<i>Garuga pinnata</i> Roxb.	T		
CACTACEAE	<i>Opuntia elatior</i> Mill.	ExS	LC	Invasive species
CALOPHYLLACEAE	<i>Calophyllum calaba</i> L. var. <i>calaba</i>	T		
CANNABACEAE	<i>Celtis philippensis</i> Blanco	T	LC	
CANNABACEAE	<i>Gironniera nervosa</i> Planch.	T	LC	
CASUARINACEAE	<i>Casuarina equisetifolia</i> L.	T	LC	
CELASTRACEAE	<i>Euonymus echinatus</i> Wall.	S/ScanS	LC	
CELASTRACEAE	<i>Euonymus indicus</i> B. Heyne ex Wall.	T	LC	
CELASTRACEAE	<i>Reissantia indica</i> (Willd.) N. Hallé	C		
CLUSIACEAE	<i>Garcinia atroviridis</i> Griff. ex T. Anderson	T		
CLUSIACEAE	<i>Garcinia cowa</i> Roxb. ex Choisy	T	LC	
CLUSIACEAE	<i>Garcinia merquensis</i> Wight	T		
CLUSIACEAE	<i>Garcinia speciosa</i> Wall.	T		
COMBRETACEAE	<i>Combretum punctatum</i> Blume	C		
COMBRETACEAE	<i>Lumnitzera racemosa</i> Willd.	ST	LC	
COMBRETACEAE	<i>Terminalia calamansanai</i> (Blanco) Rolfe	T	LC	
COMBRETACEAE	<i>Terminalia catappa</i> L.	T	LC	
COMBRETACEAE	<i>Terminalia foetidissima</i> Griff.	T	LC	
COMBRETACEAE	<i>Terminalia ivorensis</i> A. Chev.	ExT	VU	Introduce to Geopark for Ornamental Plant
COMBRETACEAE	<i>Terminalia nigrovenulosa</i> Pierre	T		
CONVOLVULACEAE	<i>Ipomoea pes-caprae</i> (L.) R. Br.	C	LC	

**Table 1.** List of the flowering plant in Satun Geopark. Continued

Family	Scientific Name	Habit	IUCN- Red list status	Note
COSTACEAE	<i>Cheilocostus speciosus</i> (J. Koenig) C. D. Specht	H	LC	
CRYPTERONIACEAE	<i>Crypteronia paniculata</i> Blume	T		
DILLENIAACEAE	<i>Dillenia hookeri</i> Pierre	S	LC	
DILLENIAACEAE	<i>Dillenia indica</i> L.	T	LC	
DILLENIAACEAE	<i>Dillenia obovata</i> (Blume) Hoogland	T	LC	
DILLENIAACEAE	<i>Tetracera indica</i> (Christm. & Panz.) Merr.	C		
DIOSCOREACEAE	<i>Dioscorea hispida</i> Dennst.	HC		
DIOSCOREACEAE	<i>Tacca integrifolia</i> Ker Gawl.	H		
DIOSCOREACEAE	<i>Tacca leontopetaloides</i> (L.) Kuntze	H	LC	
DIOSCOREACEAE	<i>Tacca palmata</i> Blume	H		
DIPTEROCARPACEAE	<i>Dipterocarpus alatus</i> Roxb. ex G. Don	T	VU	
DIPTEROCARPACEAE	<i>Dipterocarpus costatus</i> C.F. Gaertn	T	VU	
DIPTEROCARPACEAE	<i>Dipterocarpus grandiflorus</i> (Blanco) Blanco	T	EN	
DIPTEROCARPACEAE	<i>Dipterocarpus obtusifolius</i> Teijsm. ex Miq.	T	NT	
DIPTEROCARPACEAE	<i>Hopea ferrea</i> Laness.	T	EN	
DIPTEROCARPACEAE	<i>Hopea odorata</i> Roxb.	T	VU	
DIPTEROCARPACEAE	<i>Pentacme siamensis</i> (Miq.) Kurz	T	LC	
DIPTEROCARPACEAE	<i>Shorea roxburghii</i> G. Don	T	VU	
DIPTEROCARPACEAE	<i>Vatica harmandiana</i> Pierre	T	DD	
EBENACEAE	<i>Diospyros bejaudii</i> Lecomte	T		
EBENACEAE	<i>Diospyros buxifolia</i> (Blume) Hiern	T	LC	
EBENACEAE	<i>Diospyros dictyoneura</i> Hiern	T		
EBENACEAE	<i>Diospyros montana</i> Roxb.	T		
EBENACEAE	<i>Diospyros undulata</i> Wall. ex G. Don	S/ST	LC	

**Table 1.** List of the flowering plant in Satun Geopark. Continued

Family	Scientific Name	Habit	IUCN- Red list status	Note
ELAEocarpaceae	<i>Elaeocarpus grandiflorus</i> Sm.	T		
ERYthroXYLACEAE	<i>Erythroxylum cuneatum</i> (Miq.) Kurz	ST		
EUPHORBIACEAE	<i>Cleidion javanicum</i> Blume	S/ST	LC	
EUPHORBIACEAE	<i>Euphorbia antiquorum</i> L.	S/ST	LC	
EUPHORBIACEAE	<i>Euphorbia tirucalli</i> L.	ExS	LC	Invasive species
EUPHORBIACEAE	<i>Excoecari agallocha</i> L.	S/T		
EUPHORBIACEAE	<i>Falconeria insignis</i> Royle	T		
EUPHORBIACEAE	<i>Hevea brasiliensis</i> (Kunth) Müll. Arg.	ExT	LC	Introduce to Geopark for Economic purpose
EUPHORBIACEAE	<i>Macaranga gigantea</i> (Rchb. f. & Zoll.) Müll. Arg.	S/ST	LC	
EUPHORBIACEAE	<i>Suregada multiflora</i> (A. Juss.) Baill.	S/T		
FABACEAE	<i>Adenanthera pavonina</i> L.	T	LC	
FABACEAE	<i>Bauhinia purpurea</i> L.	ExST	LC	Introduce to Geopark for Ornamental Plant
FABACEAE	<i>Caesalpinia bonduc</i> (L.) Roxb.	C	LC	
FABACEAE	<i>Callerya dasyphylla</i> (Miq.) Schot	C		
FABACEAE	<i>Canavalia rosea</i> (Sw.) DC.	HC	LC	
FABACEAE	<i>Cassia fistula</i> L.	T	LC	
FABACEAE	<i>Dalbergia cochinchinensis</i> Pierre	T	CR	
FABACEAE	<i>Delonix regia</i> (Bojer ex Hook.) Raf.	ExT	LC	Introduce to Geopark for Ornamental Plant
FABACEAE	<i>Derris amoena</i> Benth.	C	LC	

**Table 1.** List of the flowering plant in Satun Geopark. Continued

Family	Scientific Name	Habit	IUCN- Red list status	Note
FABACEAE	<i>Derris trifoliata</i> Lour.	C		
FABACEAE	<i>Erythrina subumbrans</i> (Hassk.) Merr.	T		
FABACEAE	<i>Intsia palembanica</i> Miq.	T	NT	
FABACEAE	<i>Millettia pinnata</i> (L.) Panigrahi	T	LC	
FABACEAE	<i>Mimosa pudica</i> L.	ExS	LC	Invasive species
FABACEAE	<i>Paraderris elliptica</i> (Wall.) Adema	C		
FABACEAE	<i>Parkia speciosa</i> Hassk.	T	LC	
FABACEAE	<i>Parkia timoriana</i> (DC.) Merr.	T	LC	
FABACEAE	<i>Peltophorum dasyrrhachis</i> (Miq.) Kurz	T		
FABACEAE	<i>Pterocarpus indicus</i> Willd.	T	EN	
FABACEAE	<i>Saraca indica</i> L.	T	LC	
FABACEAE	<i>Senna alata</i> (L.) Roxb.	ExS	LC	Invasive species
FABACEAE	<i>Senna occidentalis</i> (L.) Link	ExUS	LC	Invasive species
FABACEAE	<i>Senna siamea</i> (Lam.) H. S. Irwin & Barneby	T	LC	
FABACEAE	<i>Senna timoriensis</i> (DC.) H. S. Irwin & Barneby	ST	LC	
FABACEAE	<i>Tamarindus indica</i> L.	ExT	LC	Introduced to Geopark for Economic purpose
GENTIANACEAE	<i>Fagraea fragrans</i> Roxb.	T	LC	
GESNERIACEAE	<i>Microchirita involucrata</i> (Craib) Y. Z. Wang	H		
GOODENIACEAE	<i>Scaevola taccada</i> (Gaertn.) Roxb.	S		
HYDROCHARITACEAE	<i>Ottelia alismoides</i> (L.) Pers.	AqH	LC	
LAMIACEAE	<i>Clerodendrum indicum</i> (L.) Kuntze	S		

**Table 1.** List of the flowering plant in Satun Geopark. Continued

Family	Scientific Name	Habit	IUCN- Red list status	Note
LAMIACEAE	<i>Clerodendrum paniculatum</i> L.	S		
LAMIACEAE	<i>Sphenodesme mollis</i> Craib	C		
LAMIACEAE	<i>Tectona grandis</i> L. f.	T	EN	A species was not locally, It was introduced to Geopark for Economic purpose
LAMIACEAE	<i>Vitex peduncularis</i> Wall. ex Schauer	T	LC	
LAMIACEAE	<i>Vitex pinnata</i> L.	T	LC	
LAURACEAE	<i>Cinnamomum camphora</i> (L.) J. Presl	ExT	LC	Introduce to Geopark for Economic purpose
LAURACEAE	<i>Cinnamomum iners</i> Reinw. ex Blume	T	LC	
LAURACEAE	<i>Litsea grandis</i> (Nees) Hook. f.	T	LC	
LECYTHIDACEAE	<i>Barringtonia acutangula</i> (L.) Gaertn.	ST/T	LC	
LECYTHIDACEAE	<i>Barringtonia asiatica</i> (L.) Kurz	ST/T	LC	
LECYTHIDACEAE	<i>Barringtonia racemosa</i> (L.) Spreng.	S/ST	LC	
LECYTHIDACEAE	<i>Careya arborea</i> Roxb.	T		
LYTHRACEAE	<i>Lagerstroemia calyculata</i> Kurz	T		
LYTHRACEAE	<i>Lagerstroemia floribunda</i> Jack var. <i>cuspidata</i> C. B. Clarke	T		
LYTHRACEAE	<i>Lagerstroemia loudonii</i> Teijsm. & Binn.	T		
LYTHRACEAE	<i>Lagerstroemia speciosa</i> (L.) Pers.	T	LC	
LYTHRACEAE	<i>Sonneratia griffithii</i> Kurz	T	CR	

**Table 1.** List of the flowering plant in Satun Geopark. Continued

Family	Scientific Name	Habit	IUCN- Red list status	Note
MAGNOLIACEAE	<i>Magnolia baillonii</i> Pierre	T	LC	
MALVACEAE	<i>Berrya cordifolia</i> (Willd.) Burret	T		
MALVACEAE	<i>Bombax anceps</i> Pierre	T		
MALVACEAE	<i>Ceiba pentandra</i> (L.) Gaertn.	ExT	LC	
MALVACEAE	<i>Colona auriculata</i> (Desf.) Craib	S		
MALVACEAE	<i>Colona flagrocarpa</i> (C. B. Clarke) Craib	T		
MALVACEAE	<i>Colona merguensis</i> (Planch. ex Mast.) Burret	T		
MALVACEAE	<i>Firmiana colorata</i> (Roxb.) R. Br.	T	LC	
MALVACEAE	<i>Grewia eriocarpa</i> Juss.	T	LC	
MALVACEAE	<i>Hibiscus tiliaceus</i> L.	S/ST	LC	
MALVACEAE	<i>Microcos paniculata</i> L.	T	LC	
MALVACEAE	<i>Microcos tomentosa</i> Sm.	T	LC	
MALVACEAE	<i>Pterocymbium tinctorium</i> (Blanco) Merr.	T	LC	
MALVACEAE	<i>Pterospermum acerifolium</i> (L.) Willd.	T	LC	
MALVACEAE	<i>Pterospermum diversifolium</i> Blume	T	LC	
MALVACEAE	<i>Pterospermum grandiflorum</i> Craib	T		
MALVACEAE	<i>Pterospermum littorale</i> Craib	T		
MALVACEAE	<i>Scaphium scaphigerum</i> (Wall. ex G. Don) G. Planch.	T		
MALVACEAE	<i>Sterculia balanghas</i> L.	T		
MALVACEAE	<i>Sterculia foetida</i> L.	T		
MALVACEAE	<i>Sterculia hypochra</i> Pierre	T		
MALVACEAE	<i>Sterculia lancaviensis</i> Ridl.	S/ST		
MALVACEAE	<i>Sterculia parviflora</i> Roxb. ex G. Don	T	LC	
MALVACEAE	<i>Thespesia populnea</i> (L.) Sol. ex Corrêa	ST	LC	

**Table 1.** List of the flowering plant in Satun Geopark. Continued

Family	Scientific Name	Habit	IUCN- Red list status	Note
MELASTOMATACEAE	<i>Melastoma malabathricum</i> L. subsp. <i>malabathricum</i>	S		
MELASTOMATACEAE	<i>Melastoma saigonense</i> (Kun- tze) Merr.	S		
MELASTOMATACEAE	<i>Memecylon edule</i> Roxb.	S/ST	LC	
MELASTOMATACEAE	<i>Memecylon garcinioides</i> Blume	ST		
MELASTOMATACEAE	<i>Memecylon ovatum</i> Sm.	S/T	LC	
MELIACEAE	<i>Chukrasia tabularis</i> A. Juss.	T	LC	
MELIACEAE	<i>Swietenia macrophylla</i> King	ExT	EN	Introduced to Geopark for Economic purpose
MELIACEAE	<i>Toona sureni</i> (Bl.) Merr.	T	LC	
MENISPERMACEAE	<i>Tiliacora triandra</i> (Colebr.) Diels	C		
MORACEAE	<i>Artocarpus heterophyllus</i> Lam.	ExT		Introduced to Geopark for Economic purpose
MORACEAE	<i>Artocarpus integer</i> (Thunb.) Merr.	T	LC	
MORACEAE	<i>Artocarpus rigidus</i> Blume	T	LC	
MORACEAE	<i>Ficus altissima</i> Blume	T	LC	
MORACEAE	<i>Ficus annulata</i> Blume	T		
MORACEAE	<i>Ficus benjamina</i> L.	T	LC	
MORACEAE	<i>Ficus callophylla</i> Blume	T	LC	
MORACEAE	<i>Ficus callosa</i> Willd.	T		
MORACEAE	<i>Ficus chartacea</i> (Wall. ex Kurz) Wall. ex King	S		
MORACEAE	<i>Ficus concinna</i> (Miq.) Miq.	T	LC	
MORACEAE	<i>Ficus curtipes</i> Corner	T		
MORACEAE	<i>Ficus drupacea</i> Thunb.	T	LC	
MORACEAE	<i>Ficus fistulosa</i> Reinw. ex Blume	T	LC	



**Table 1.** List of the flowering plant in Satun Geopark. Continued

Family	Scientific Name	Habit	IUCN- Red list status	Note
MORACEAE	<i>Ficus hirta</i> Vahl	S/ST	LC	
MORACEAE	<i>Ficus hispida</i> L. f.	ST	LC	
MORACEAE	<i>Ficus maclellandii</i> King	T		
MORACEAE	<i>Ficus microcarpa</i> L. f.	T	LC	
MORACEAE	<i>Ficus montana</i> Burm. f.	CrUS	LC	
MORACEAE	<i>Ficus punctata</i> Thunb.	C	LC	
MORACEAE	<i>Ficus racemosa</i> L.	T	LC	
MORACEAE	<i>Ficus religiosa</i> L.	T	LC	
MORACEAE	<i>Ficus rumphii</i> Blume	T		
MORACEAE	<i>Ficus sagittata</i> J. Koenig ex Vahl	C	LC	
MORACEAE	<i>Ficus saxophila</i> Blume subsp. <i>cardiophylla</i> (Merr.) C. C. Berg	S/T	LC	
MORACEAE	<i>Ficus superba</i> (Miq.) Miq.	T	LC	
MORACEAE	<i>Ficus talbotii</i> King	T		
MORACEAE	<i>Ficus variegata</i> Blume	T	LC	
MORACEAE	<i>Ficus virens</i> Aiton	T	LC	
MORACEAE	<i>Streblus asper</i> Lour.	T	LC	
MORACEAE	<i>Streblus ilicifolius</i> (S. Vidal) Corner	S/T	LC	
MORACEAE	<i>Streblus taxoides</i> (B. Heyne ex Roth) Kurz	S/T		
MORACEAE	<i>Trophis scandens</i> (Lour.) Hook. & Arn.	C		
MUSACEAE	<i>Musa ×paradisiaca</i> L.	H		
MUSACEAE	<i>Musa balbisiana</i> Colla	ExH	LC	Introduced to Geopark for Economic purpose
MYRISTICACEAE	<i>Knema globularia</i> (Lam.) Warb.	T	LC	
MYRTACEAE	<i>Melaleuca cajuputi</i> Powell	T	LC	
MYRTACEAE	<i>Rhodomyrtus tomentosa</i> (Aiton) Hassk.	S	LC	

**Table 1.** List of the flowering plant in Satun Geopark. Continued

Family	Scientific Name	Habit	IUCN- Red list status	Note
MYRTACEAE	<i>Syzygium cinereum</i> (Kurz) Chantar. & J. Parn.	T		
MYRTACEAE	<i>Syzygium claviflorum</i> (Roxb.) Wall. ex A. M. Cowan & Cowan	T	LC	
MYRTACEAE	<i>Syzygium cumini</i> (L.) Skeels	T	LC	
MYRTACEAE	<i>Syzygium grande</i> (Wight) Walp.	T		
MYRTACEAE	<i>Syzygium lineatum</i> (DC.) Merr. & L. M. Perry	ST/T		
MYRTACEAE	<i>Syzygium siamense</i> (Craib) Chantar. & J. Parn.	T		
OCHNACEAE	<i>Ochna integerrima</i> (Lour.) Merr.	S/ST	LC	
OLACACEAE	<i>Olax imbricata</i> Roxb.	C	LC	
OLEACEAE	<i>Chionanthus eriorachis</i> (Kerr) P. S. Green	T		
OLEACEAE	<i>Jasminum elongatum</i> (P. J. Bergius) Willd.	ScanS		
OPILIACEAE	<i>Melientha suavis</i> Pierre	S/ST		
OPILIACEAE	<i>Urobotrya siamensis</i> Hiepko	S/ST		
PANDANACEAE	<i>Pandanus obovatus</i> H. St. John	S/T		
PANDANACEAE	<i>Pandanus odorifer</i> (Forssk.) Kuntze	T	LC	
PERACEAE	<i>Chaetocarpus castanocarpus</i> (Roxb.) Thwaites	S/T	LC	
PHYLLANTHACEAE	<i>Antidesma ghaesembilla</i> Gaertn.	S/T	LC	
PHYLLANTHACEAE	<i>Antidesma leucopodium</i> Miq.	T	LC	
PHYLLANTHACEAE	<i>Antidesma sootepense</i> Craib	S/T		
PHYLLANTHACEAE	<i>Aporosa aurea</i> Hook. f.	S/T	LC	
PHYLLANTHACEAE	<i>Aporosa microstachya</i> (Tul.) Müll. Arg.	ST	LC	
PHYLLANTHACEAE	<i>Baccaurea parviflora</i> (Müll. Arg.) Müll. Arg.	T		
PHYLLANTHACEAE	<i>Baccaurea ramiflora</i> Lour.	T	LC	

**Table 1.** List of the flowering plant in Satun Geopark. Continued

Family	Scientific Name	Habit	IUCN- Red list status	Note
PHYLLANTHACEAE	<i>Breynia villosa</i> (Blanco) Welzen & Pruesapan	S		
PHYLLANTHACEAE	<i>Breynia vitis-idaea</i> (Burm. f.) C. E. C. Fisch.	S/ST	LC	
PHYLLANTHACEAE	<i>Cleistanthus gracilis</i> Hook.f.	S/ST		
PHYLLANTHACEAE	<i>Cleistanthus helferi</i> Hook.f.	S/ST		
PHYLLANTHACEAE	<i>Glochidion coccineum</i> (Buch.-Ham.) Müll. Arg.	S/ST		
PHYLLANTHACEAE	<i>Glochidion zeylanicum</i> (Gaertn.) A. Juss. var. <i>zeylanicum</i>	S/ST	LC	
PHYLLANTHACEAE	<i>Hymenocardia punctata</i> Wall. ex Lindl.	S/T		
PHYLLANTHACEAE	<i>Phyllanthus columnaris</i> Müll. Arg.	ST		
POACEAE	<i>Chrysopogon aciculatus</i> (Retz.) Trin.	G		
POACEAE	<i>Dendrocalamus elegans</i> (Ridl.) Holtt.	B		
POACEAE	<i>Imperata cylindrica</i> (L.) Raeusch.	G	LC	
POACEAE	<i>Oryza sativa</i> L.	G	LC	
POACEAE	<i>Pennisetum pedicellatum</i> Trin.	ExG	LC	Invasive species
POACEAE	<i>Saccharum officinarum</i> L.	G		
POLYGALACEAE	<i>Xanthophyllum eurhynchum</i> Miq.	T		
PRIMULACEAE	<i>Ardisia crenata</i> Sims var. <i>angusta</i> C. B. Clarke	S		
PUTRANJIVACEAE	<i>Drypetes hoaensis</i> Gagnep.	ST/T	LC	
RHAMNACEAE	<i>Colubrina asiatica</i> (L.) Brongn. var. <i>asiatica</i>	C	LC	
RHAMNACEAE	<i>Ziziphus oenoplia</i> (L.) Mill. var. <i>oenoplia</i>	C		
RHIZOPHORACEAE	<i>Carallia brachiata</i> (Lour.) Merr.	T	LC	
RHIZOPHORACEAE	<i>Gynotroches axillaris</i> Blume	T		

**Table 1.** List of the flowering plant in Satun Geopark. Continued

Family	Scientific Name	Habit	IUCN- Red list status	Note
RHIZOPHORACEAE	<i>Rhizophora apiculata</i> Blume	T	LC	
RHIZOPHORACEAE	<i>Rhizophora mucronata</i> Lam.	T	LC	
RUBIACEAE	<i>Benkara sinensis</i> (Lour.) Ridsdale	S	LC	
RUBIACEAE	<i>Canthium parvifolium</i> Roxb.	S		
RUBIACEAE	<i>Catunaregam tomentosa</i> (Blume ex DC.) Tirveng.	S/ST		
RUBIACEAE	<i>Chassalia curviflora</i> (Wall.) Thwaites var. <i>curviflora</i>	S		
RUBIACEAE	<i>Gardenia coronaria</i> Buch.-Ham.	S/ST		
RUBIACEAE	<i>Gardenia philastrei</i> Pierre ex Pit.	T		
RUBIACEAE	<i>Haldina cordifolia</i> (Roxb.) Ridsdale	T		
RUBIACEAE	<i>Hymenodictyon orixense</i> (Roxb.) Mabb.	T		
RUBIACEAE	<i>Ixora cibdela</i> Craib	ST		
RUBIACEAE	<i>Ixora finlaysoniana</i> Wall. ex G. Don	ST		
RUBIACEAE	<i>Mitragyna diversifolia</i> (Wall. ex G. Don) Havil.	T	LC	
RUBIACEAE	<i>Mitragyna rotundifolia</i> (Roxb.) Kuntze	T		
RUBIACEAE	<i>Morinda citrifolia</i> L.	ST		
RUBIACEAE	<i>Morinda coreia</i> Buch.-Ham.	ST		
RUBIACEAE	<i>Mussaenda sanderiana</i> Ridl.	ScanS		
RUBIACEAE	<i>Nauclea orientalis</i> (L.) L.	T	LC	
RUBIACEAE	<i>Pavetta indica</i> L. var. <i>tomen-</i> <i>tosa</i> (Roxb. ex Sm.) Hook. f.	S		
RUBIACEAE	<i>Prismatomeris griffithii</i> Ridl.	S		
RUBIACEAE	<i>Psyrdrax dicoccos</i> Gaertn. var. <i>dicoccos</i>	ST	VU	
RUBIACEAE	<i>Psyrdrax nitida</i> (Craib) K. M. Wong	T		
RUBIACEAE	<i>Tarenna collinsiae</i> Craib	T		

**Table 1.** List of the flowering plant in Satun Geopark. Continued

Family	Scientific Name	Habit	IUCN- Red list status	Note
RUBIACEAE	<i>Vidalasia murina</i> (Craib) Tirveng.	T		
RUTACEAE	<i>Acromychia pedunculata</i> (L.) Miq.	S/ST	LC	
RUTACEAE	<i>Atalantia monophylla</i> (L.) DC.	ST	LC	
RUTACEAE	<i>Citrus ×aurantifolia</i> (Christm.) Swingle	ExST		Introduce to Geopark for Economic purpose
RUTACEAE	<i>Clausena harmandiana</i> (Pierre) Pierre ex Guillaumin	S	LC	
RUTACEAE	<i>Glycosmis pentaphylla</i> (Retz.) DC.	S/ST	LC	
RUTACEAE	<i>Murraya paniculata</i> (L.) Jack	S/ST		
RUTACEAE	<i>Zanthoxylum rhetsa</i> (Roxb.) DC.	T	LC	
SABIACEAE	<i>Meliosma simplicifolia</i> (Roxb.) Walp.	ST		
SALICACEAE	<i>Flacourtia indica</i> (Burm. f.) Merr.	T	LC	
SALICACEAE	<i>Flacourtia ramontchi</i> L'Hér.	T		
SALICACEAE	<i>Homalium undulatum</i> King	T	VU	
SAPINDACEAE	<i>Allophylus cobbe</i> (L.) Raeusch.	S		
SAPINDACEAE	<i>Lepisanthes rubiginosa</i> (Roxb.) Leenh.	S/ST	LC	
SAPINDACEAE	<i>Lepisanthes tetraphylla</i> (Vahl) Radlk.	ST/T	LC	
SAPOTACEAE	<i>Madhuca smitinandii</i> Chantar.	T		
SAPOTACEAE	<i>Mimusops elengi</i> L.	T	LC	
SAPOTACEAE	<i>Palaquium garrettii</i> H. R. Fletcher	T		
SAPOTACEAE	<i>Planchonella obovata</i> (R. Br.) Pierre	T		
SIMAROUBACEAE	<i>Eurycoma longifolia</i> Jack	S		
SMILACACEAE	<i>Smilax perfoliata</i> Lour.	C		

**Table 1.** List of the flowering plant in Satun Geopark. Continued

Family	Scientific Name	Habit	IUCN- Red list status	Note
THEACEAE	<i>Schima wallichii</i> (DC.) Korth.	T	LC	
VITACEAE	<i>Leea indica</i> (Burm. f.) Merr.	S/ST	LC	
XYRIDACEAE	<i>Xyris indica</i> L.	H	LC	
ZINGIBERACEAE	<i>Alpinia conchigera</i> Griff.	H	LC	
ZINGIBERACEAE	<i>Alpinia galanga</i> (L.) Willd.	ExH		Introduced to Geopark for Economic purpose
ZINGIBERACEAE	<i>Boesenbergia curtisii</i> (Bak.) Schltr.	H		
ZINGIBERACEAE	<i>Curcuma longa</i> L.	H	DD	
ZINGIBERACEAE	<i>Curcuma papilionacea</i> Soonthornk., Ongsakul & Škorničk.	H		
ZINGIBERACEAE	<i>Curcuma petiolata</i> Roxb.	H	DD	
ZINGIBERACEAE	<i>Curcuma sessilis</i> Gage	H		
ZINGIBERACEAE	<i>Kaempferia pulchra</i> Ridl.	H		

## Discussion

The total species of flowering plants in the Satun Geopark was 342 species of with 311 was locally ant native species (*Tectona grandis* was excluded because not locally) compared to plant species of Thailand (10,000 – 12,000 species), which was around 2.5–3.1 %. However, the project still has one more year of work. It is possible that number of plant species will be higher than 400 species.

Thirty species of exotic plant were record, which was around 8.8 % of all species. It is slightly lower than expected. However, part of the four years was focused on three conservation areas (Mukoa Petra National Park, Tarutao National Park, and Khao Bantad Wildlife Sanctuary) and two local administrative areas (Le Stegodon and Urai Thong Caves). The survey areas were mostly in natural areas. When this is considered, finding a low number of exotic species would be the common results. If more village and farmland areas were added, it is possible that the number of exotic species would be higher. However, some native species were not

indigenous such as *Tectona grandis* L. f. Even if a species was introduced to the Geopark for a plantation, it is still native in status.

Family Moraceae had highest species number (32 species) compared to species of Moraceae in Thailand (151 species), which was around 21.2 %. However, many plant collected are still waiting for species identification. After all species are identified within the next year, it possible that the members of other families (such as. Fabaceae, Poaceae) will higher in number and percentage than Moraceae.

Some species which normally inhabit Dry Dipterocarp Forest, such as *Pentacme siamensis* (Miq.) Kurz and *Dipterocarpus obtusifolius* Teijsm. ex Miq., were abundant in the Geopark. *Pentacme siamensis* (Miq.) Kurz was common in karst ecosystems while *Dipterocarpus obtusifolius* Teijsm. ex Miq. was abundant in lowland habitats. It implies that *Pentacme siamensis* (Miq.) Kurz and *Dipterocarpus obtusifolius* Teijsm. ex Miq. do not only occur in dry dipterocarp forest.

The conservation status of most plants has not been assessed yet. Within the family Dipterocarpaceae, *Dipterocarpus obtusifolius* Teijsm. ex Miq. was near threatened (NT), four species were vulnerable (VU) (*Dipterocarpus alatus* Roxb. ex G. Don, *Dipterocarpus costatus* C.F. Gaertn, *Hopea odorata* Roxb., *Shorea roxburghii* G. Don) and two species were endangered (EN) (*Dipterocarpus grandiflorus* (Blanco) Blanco and *Hopea ferrea* Laness.). Because the wood of this family is famous for uses in construction or other various purposes, many of them were logged every year, and it has affected their populations.

Exotic species were introduced to the geopark such as *Adonidia merrillii* (Becc.) Becc., *Terminalia ivorensis* A. Chev., *Jacaranda mimosifolia* D. Don, and *Handroanthus chrysanthus* (Jacq.) S. O. Grose were vulnerable (VU), while *Swietenia macrophylla* King was endangered (EN). In this case the species still maintains a conservation status that will cause confusion because we follow the status of IUCN red list, while they were cultivated plants in Thailand, and their population also abundance. Then the conservation status of the exotic species could be evaluated for only the Geopark.

Next year, species identification will be done, and a program to raise awareness on the conservation of biodiversity resources will arise.



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