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臺灣省林業試驗所報告

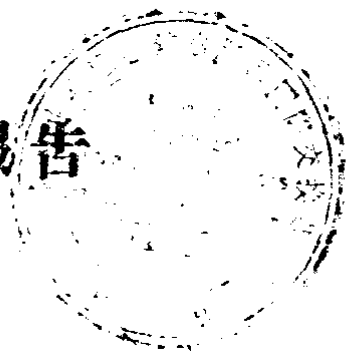
第六號

BULLETIN

of

TAIWAN FOREST RESEARCH INSTITUTE

No. 6



颱風與臺灣植物分佈之關係

斯 煒

THE RELATION OF TYPHOONS TO PLANT DISTRIBUTION IN TAIWAN

by

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中華民國三十六年六月

臺灣省林業試驗所印行

臺 海 臺 北

Published by

TAIWAN FOREST RESEARCH INSTITUTE

Taipeh, Taiwan, China

June, 1947

## THE RELATION OF TYPHOONS TO PLANT DISTRIBUTION IN TAIWAN

Sze wei

In the Far East tropical cyclones are called typhoons. They are great whirls intermediate in size and local destructiveness between tornadoes and the low of cyclonic storms which cause the frequent changes of weather in middle latitudes. (Visser, 1925)

Typhoons when travel across Taiwan produce many of the extremes of wind, temperature and rainfall, and are of interest to the ecologist as well as the meteorologist and the navigator.

Typhoons in general originate from the place in sea between 137° and 160° East longitude and 5° and 17° North latitude. Their directions are abnormal. They travel eastward or north west, and pass through the Philippines and the coast parts of China to Taiwan or pass through Taiwan to the mainland of China.

According to the records from 1393 to 1918, there occurred on the average about twenty-five times of typhoons yearly in Taiwan. Most of them happened in July, August, September and October, and less in February, March and April.

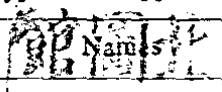
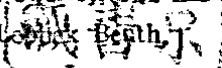
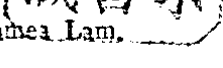
### Destructiveness of Typhoons

Typhoons are ecologically significant in several ways. Typhoons with strong velocity strip off the leaves, break off many branches, and frequently uproot trees or break trunks. The effectiveness of the wind is increased by sudden changes in velocity and directness.

A brief study was made of the trees injured and killed by typhoons in Botanic Garden at Quizechao (龜子角), in forest plantations at Kongkow (港口) and Kaosze fu (高士佛) in Hanzhun (恒春), and in natural forest and the plantation at Lianhwacheh (蓮花池) in Taichung (臺中), and in Botanic Garden in Taipei (臺北).

In table I, II and III, the number of trees of different species injured are given.

Table I. Number of trees injured and killed by typhoons  
in Botanic Garden at Quizechao (龜子角)

Typhoons happened:	September and October, 1945			September, 1946		
	Trunk broken	Half uprooted	Uprooted	Trunk broken	Half uprooted	Uprooted
 <i>Casuarina equisetifolia</i> Linn.	30	17	203			2
 <i>Albizzia lebbek</i> Benth.	5	11	154			20
 <i>Cassia siamea</i> Lam.	11	28	85			10

<i>Caryota urens</i> Linn.	17	4	51		5
<i>Caesalpinia Sappan</i> Linn.		6	41		
<i>Casuarina glauca</i> Sieb.	3	5	30		
<i>Casuarina Cunninghamiana</i> Miq.	4	6	24		
<i>Leucaena glauca</i> Benth.	11	8	22		
<i>Pterocarpus indicus</i> Willd.	20	6	20		
<i>Dalbergia latifolia</i> Roxb.		2	20		
<i>Ficus retusa</i> Linn.			19		3
<i>Adenanthera pavonina</i> Linn.	1	2	18		
<i>Peltophorum ferrugineum</i> Benth.	8	2	17		
<i>Cedrela toona</i> F. Vill.	1	3	17		3
<i>Cinnamomum zeylanicum</i> Bl.	4		17		
<i>Delonix regia</i> Raf.			14		5
<i>Swietenia Mahagoni</i> Jacq.	3	2	11		5
<i>Areca Catechu</i> Linn.	2		11		
<i>Oreodoxa regia</i> H. B. K.	2		9	2	
<i>Haematoxylon campechianum</i> Linn.	12	15	8		
<i>Euphoria Longana</i> Lam.		2	8		
<i>Pithecolobium lucidum</i> Benth.	1		7		
<i>Acacia Richii</i> A. Gray.			7		
<i>Heritiera littoralis</i> Dryand.			7		
<i>Ficus elastica</i> Roxb.			7		
<i>Bauhinia</i> spp.	12		6		3
<i>Bixa orellana</i> Linn.			6		
<i>Cinnamomum Camphora</i> Nees, et Eberm.			5		
<i>Eugenia Jambos</i> Linn.			5		
<i>Terminalia Chebula</i> Tetz.			5		
<i>Albizzia falcata</i> Back.			5		2
<i>Acacia Senegal</i> Willd.			5		
<i>Ravenala madagascariensis</i> J. F. Gmel.			4		
<i>Araucaria Bidwillii</i> Hook.			4		
<i>Swietenia macrophylla</i> King.		2	4		3
<i>Quercus variabilis</i> Linn.			4		3
<i>Semscarpus vernicifera</i> Hay, et Kawak.	3	1	4		
<i>Aleurites moluccana</i> Willd.	1		4		
<i>Machilus Thunbergii</i> Sieb. et Zucc.			4		
<i>Casuarina Deplancheana</i> Miq.	2		4		1
<i>Grevillea robusta</i> A. Cunn.	2		3		
<i>Bombax Ceiba</i> Linn.			3		
<i>Manihot Glaziovii</i> Muell. Arg.			3		
<i>Santalum album</i> Linn.			3		2

						3
<i>Tectona grandis</i> Linn.			3			
<i>Pinus luchuensis</i> Mayer.			3			1
<i>Cassia Fistula</i> Linn.	1	1	3			
<i>Maba buxifolia</i> Pers.			2			
<i>Anona</i> spp.			2			
<i>Livistona altissima</i> Zoll.			2			
<i>Garcinia spicata</i> Hook. f.			2			
<i>Spondias pinnata</i> Kurtz.			2			
<i>Arenga pinnata</i> Merr.	1		2			2
<i>Canarium odoratum</i> Baill.			2			1
<i>Terminalia angustifolia</i> Jacq.	1		2			
<i>Lagerstroemia speciosa</i> Pers.			2			
<i>Jatropha curcos</i> L.			2			
<i>Albizzia procera</i> Benth.			2			
<i>Terminalia Catappa</i> Linn.			2			
<i>Quassia amara</i> Linn.			2			
<i>Trachycarpus excelsus</i> var. <i>Fortunei</i> Mak.			2			
<i>Melia Azedarach</i> Linn.			2			
<i>Actinophloeus Macarthurii</i> Becc.	2		1			
<i>Hevea brasiliensis</i> Muell.-Arg.			1			
<i>Archontopoenix Alexandrae</i> Wendl. et Drud.			1			
<i>Crescentia Cujete</i> Linn.			1			
<i>Raphia Ruffa</i> Mart.			1			
<i>Bischofia javanica</i> Bl.			1			
<i>Agathis alba</i> Foxw.	2		1			
<i>Samanea Saman</i> Merr.			1			1
<i>Goniothalamus Amuyon</i> Merr.			1			
<i>Cocos nucifera</i> Linn.			1	3	3	5
<i>Pandanus boninensis</i> Warb.			1			
<i>Eucalyptus Globulus</i> Labill.			1			
<i>Hymenaea Courbaril</i> Linn.			1			
<i>Olea europea</i> Linn.			1			
<i>Mallotus philippinensis</i> Muell.-Arg.			1			
<i>Calophyllum Inophyllum</i> Linn.			1			
<i>Araucaria Cunninghamii</i> Sweet.			1			
<i>Artocarpus communis</i> Forst.			1			
<i>Tamarindus indica</i> Linn.			1			3
Total	161	123	966	5	3	80

Table II. Number of trees injured and killed by typhoons  
in forest plantation at Kongkow (港口)

Typhoons happened:	September and October, 1945			September, 1946.		
	Trunk broken	Half uprooted	Uprooted	Trunk broken	Half uprooted	Uprooted
Names						
<i>Delonix regia</i> Raf.						4
<i>Tamarindus indica</i> Linn.						3
<i>Acacia Richii</i> A. Gray.						2
<i>Cassia siamea</i> Lam.						1
<i>Terminalia Catappa</i> Linn.						1
<i>Casuarina equisetifolia</i> Linn.						1
<i>Quercus variabilis</i> Bl.						1
<i>Albizia falcata</i> Back						1
Total						14

Table III. Number of trees injured and killed by typhoons  
in forest plantation at Kaosze-fu (高士佛)

Typhoons happened:	September and October, 1945			September, 1946		
	Trunk broken	Half uprooted	Uprooted	Trunk broken	Half uprooted	Uprooted
Names						
<i>Cryptomeria japonica</i> D. Don.						35
<i>Albizia Lebbek</i> Benth.						1
<i>Pinus luchuensis</i> Mayer.				1		
Total				1		36

Eighty-one different plant species at three sites in Hangchun had been injured or killed by typhoons happening in last two years. Among the total of 1388 trees injured by typhoons, 1096 had been uprooted, 123 half-uprooted and 164 had trunks broken. All of them died away afterwards. Only a portion of the half-uprooted trees might recover their growth after treatment. Loss were most heavy in trees of *Casuarina* species, *Albizia Lebbek*, *Cassia-siamea*, *Caryota urens*, *Caesalpinia Sappan*, *Pterocarpus indicus* and *Leucaena glauca*. All of the trees of eighty-one species, except *Semecarpus vernicifera*, *Cinnamomum Camphora*, *Acacia Richii*, *Albizia procera*, *Euphoria Longana* which are indigenous to Taiwan, are exotic species cultivated thirty years ago by Japanese Silviculturists. No serious or particular damage to trees was noticeable

anywhere on the natural forest.

Trees damaged by typhoons on September, 1946, in Botanic Garden in Taipei were as follows:

*Pinus* spp., *Taiwania cryptomerioides* Hay., *Salix glandulosa* Seem. var. *Warburgi* Koidz., *Celtis sinensis* Pers., *Trema orientalis* Bl., *Ficus retusa* Linn., *Ficus* spp., *Cinnamomum Camphora* Nees, et Ebern., *Liquidambar formosana* Hance., *Acacia Richii* Merr., *Pterocarpus vidalianus* Rolfe., *Pterocarpus indicus* Willd., *Pterocarpus santalinus* Linn. f., *Pterocarpus Marsupium* Roxb., *Acacia mollissima* Willd., *Cassia auriculata* Linn., *Acacia Catechu* Willd., *Dalbergia Sisso* Roxb., *Dalbergia latifolia* Roxb., *Pongamia pinnata* Merr., *Cassia siamea* Lam., *Erythrina* spp., *Cassia Fistula* Linn., *Delonix regia* Raf., *Hæmatoxylon compechianum* L., *Bauhinia* spp., *Bischofia javanica* Bl., *Tectona grandis* Linn., *Eugenia* spp., *Eucalyptus citriodora* Hook., *Schefflera* spp., *Carissa Carandas* Linn., *Elaeocarpus elliptica* Nakai., *Lagerstroemia speciosa* Pers., *Artarbotrys uncinatus* Miq., *Archontophoenix Alexandrae* Wendl et Drude., *Oreodoxa regia*, H. B. K., *Areca Catechu* Linn., *Livistona subglobosa* Martius., *Actinophloeus Macarthurii* Becc., *Trachycarpus excelsus* Wendl. var. *typicus* Nak., *Pandanus odoratissimus* L. f., *Ravenala madagascariensis* Gmel. and *Bambusa* spp.,

Among the total of 45 species over two-thirds of them are exotic species.

In natural forest at Lianhwacheh no damage to trees was noticeable. Only trees of *Cunninghamia lanceolata* in the plantation were uprooted by typhoon happening in October, 1946.

An examination of the table reveals the fact that artificial forests in Hangchun and Taipei were easily to be attacked by typhoons. The exotic trees were injured heavier than indigenous ones, because these trees do not become adjusted to withstand great wind pressure and as a consequence the occasional severe storms often cause great damage. Losses of trees of some species such as *Casuarina* species, *Albizzia* Lebbek and *Cassia siamea* etc. were greater than might have been expected since these trees of species are generally considered as resistant ones to wind although the percentage of these trees injured as compared with other species was low. According to W. C. Wu's (吳慰中) suggestions it can be explained as follows:

(1) The deep root systems of trees such as *Casuarina* species had been modified after the practice of transplanting.

(2) With widespreading and spherical crowns, the trees of these related species present a large surface to wind.

Natural forests were less attacked by typhoons. In woodlands at Hangchun and Lianhwacheh no greater damage was to be noticed. Trees had become adjusted to wind action and were able to resist damage.

### Effects of Typhoons on Plant Distribution in Taiwan.

According to Wilson's investigation (1922) the flora of Taiwan is closely allied to China, especially the conifers have closer relationship with those of central western China. Genkei Masamune (1932) concluded that the flora of Taiwan firstly had relation to that of China and secondly to that of Philippines. The ligneous flora of Botel Tobago (紅頭嶼) is more closely allied with that of the Philippine than with Taiwan. This fact was interpreted by Ryozo Kanehira (1935) as follows: "When Continental China, Formosa, Botel Tobago and the Philippines were connected in the Tertiary, the Asiatic elements invaded Botel Tobago more strongly than the Philippine elements, Formosa acting as a bridge. While Botel Tobago was apparently separated from Formosa before Formosa became separated from Continental China there still remained a connection with the Philippines through an isthmus, or a row of continuous island, thus providing the opportunity of certain intermigrations between Botel Tobago and the Philippines, but not at this time permitting Formosan-philippine intergrations." Even though the continent of Asia had separated as suggested by Ryozo Kanehira and other's (Merrill 1923, 1926), it seems doubtful that it has any direct relation to the flora of Taiwan. It seems more possible that typhoons transporting seeds and fruits of plants from the mainland of China and the Philippines to Taiwan and vice versa, and the climatic conditions in Taiwan are the factors controlling the distribution of plants in Taiwan.

Taiwan is near by the coast of China and not away from the Philippines. The distance from Botel Tobago which lies on the south east of Taiwan to ~~Baton~~ (one island of the Philippines) is about 49 miles, and the distance to the coast of mainland of China is about 240 Km. Taiwan is very mountainous, with a central axis stretching from south with an average height of 2500-3000m, which is comparable to that of in central and western China. Typhoons with a velocity of 15 to 70 Km. per hour could travel all over these regions within a short time. The climatic conditions of those mountain regions are thought be similar.

Not only the seeds or fruits of wind-distributed species but also the heavy fruits or seeds are easily brought and distributed by typhoons from the Philippines and China to Taiwan,

and vice versa.

The island of Krakatoa, whose vegetation was entirely destroyed by a volcanic eruption in 1833, is about 12 miles to the nearest island and about 25 miles to the coast of Java. The first plants found in island were thallophytes and bryophytes from wind blown spores. The first vascular plants to appear in abundance were ferns, whose spores are readily scattered by the wind. Fifteen years after the eruption, 53 species of seedbearing plants had reached the island. Of these it was estimated that 60 per cent, chiefly shore forms, was brought by ocean current, 32 per cent by wind and 8 per cent by animals (Erast, 1903). This example explains that island such as Taiwan, if entirely without any vegetation would be easily covered by plants migrating from China, the Philippines and other neighboring places, by typhoons as a seed distributing agent, within a period of one hundred years.

Strong winds cause huge waves and strong ocean currents which are agents of dispersal of seeds and fruits of hydrophytes or water-borne plants. Paleotropic trees of wide distribution often grown in tidal or mangrove forests in Taiwan are the examples of plants that have been dispersed by the sea current.

The island with distinctly high altitudes and abundant rainfall and high humidity support a very rich flora as compared with that of some neighboring regions. With great variation and sharp local contrast in climate, a great number of plants endemic in these regions could have been crossed from hybridization among organisms belonging to different species in the course of time (Shull 1933). The pollens used for pollination may be transported by wind from remote lands. On the other hand by the action of typhoons in dispersing seeds and fruits, endemic plants have migrated and are still migrating to other places and other exotic plants are being brought to the island continuously. This explains why Taiwan is comparatively rich in number of genera but poor in endemism. The facts that the flora of Taiwan has relation to that of China and secondly to that of Philippines can be explained as follows:

(1) Most of plants have the opportunity to migrate from the Philippines and the mainland of China to Taiwan and vice versa, when typhoons travel across these regions.

(2) The mountains in Taiwan with average of 2500 to 3000 m. are comparable to that of mountains in central and western China. With similar climatic conditions in mountains the same trees may grow luxuriously in Taiwan, as well as China.

### Summary

In the Far East tropical cyclones are called typhoons. The ways they travel are various



and the directions are abnormal. Frequently they travel eastward or northwest and pass through the Philippines and the coast parts of Taiwan or from Taiwan to the mainland of China. In Taiwan most of them happened in July, August, September and October.

Typhoons with strong velocity frequently uproot trees or break trunks. A brief study was made of the trees injured and killed by typhoons in three sites in Hungchun, in Botanic Garden in Taipeh and in natural forest and the plantation at Lianhwacheh.

Artificial forest were easily to be attacked by typhoons. The exotic trees were injured or killed more heavier than indigenous ones. Trees in natural conditions were less injured and rarely killed, because they had become adjusted to wind action and were able to resist damage.

Typhoons with a velocity of 15 to 70 Km. per hour are very easily to reach Taiwan from the Philippines and China and other countries in a short time. Not only the seeds or fruits of wind-distributed species but also the heavy seeds or fruits are easily brought and distributed to and fro between these regions. The transportation of plants by typhoons from the mainland of China and the Philippines to Taiwan and vice versa are the primary cause in developing the flora of Taiwan. By helping of typhoons much endemic plants have migrated and are still migrating to other places and other exotic plants are being brought to the island. This is why Taiwan is comparatively rich in number of genera but poor in endemism.

The flora of Taiwan firstly has relation to that of China and secondly to that of Philippines. It is partly due to the action of typhoons in transporting plants between these regions and partly due to the similar climatic conditions in high mountains in Taiwan to these of central and western China.

### Acknowledgments

The writer wishes to express his indebtedness to the Hungchun Branch station of Forest Research Institute, Lianhwacheh Branch station of Forest Research Institute and the Department of Forest Biology for supplying data of the trees injured by typhoons. Thanks are also to J. Y. Wang (王仁禮) Head of Department of Observation, Taiwan Weather Bureau, for his assistance in explaining the character of typhoons. For suggestions during this study and for criticism of manuscript the author is indebted to W. F. Lin, (林渭訪) Director of Taiwan Forest Research Institute.

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## 颱風與臺灣植物分佈之關係

臺灣終年受颱風的襲擾，其來也，風力極大，溫度雨量亦生極大變化。故颱風在本省對於生物的影響，其重要不下於溫度，雨量二因子。

颱風大部發源於東經 $130^{\circ}$ 至 $160^{\circ}$ ，北緯 $5^{\circ}$ 至 $7^{\circ}$ 海面，其進行路線極不一致。惟多數為最初西向或西北向，迨至本島附近海面，折向東北，直赴日本方面。常經過菲列賓，臺灣至我國西南部，或從菲列賓經過我國沿海至臺灣。

據統計，從1893年至1918年，平均每年有25次，多發生於六月以迄九月，而以八月中旬為最

### 颱風對於林木的破壞力

由於颱風的強大風力，本省各分所的造林地及植物園內林木，被吹倒者甚多，或幹折，或連根拔起而死亡，僅一部份半根倒木經處理後，可供復其生活力。恒春分所在龜子角植物園，及港口與高士佛之造林地曾於1945，1946二年受颱風影響的風倒木，作一較詳細的調查。臺北植物園及蓮花池分所之天然林與造林地於1945年之風倒木亦在調查。前者由本所森林生物科負責調查，後者由該分所調查。風倒木的種類甚多，在臺北植物園內共有45種不同林木被風吹倒。在恒春三處共有81種不同林木被風吹倒。蓮花池僅一種樹種杉木 (*Cunninghamia lanceolata*) 為人造林，約幾十株被風吹倒，因在蓮花池造林地之樹種不多。在恒春的風倒木中，共有1388株，其中1096株，是全根拔起，123株半根拔起，154株是主幹折斷，風倒木的名稱及被害情形，見下列各表。

從調查可知天然林不論在恒春附近或蓮花池受颱風之害者甚少。但人造林則受害大，外來樹

種受害更為顯著。如在恒春的81種風倒木中，除其中5種為本地產者外，其他76種皆為外來樹種。臺北植物園內的45種風倒木中，有三分之二亦為外來種。

天然林因時時受颱風的脅迫，其中林木自幼即養成適應颱風的能力。整個森林及其中各種層次的構成，亦必能適應颱風。因此受害少。但人造林，幼時多少受人為保護，適應颱風的能力弱，故遭遇颱風時受害大。外來樹種亦因此原因而受害大。尚有少許外來樹種僅因無抵抗颱風能力，而被摒諸本省的天然林之外。

在恒春的風倒木中，以木麻黃類及銀合歡等之株數為最多，但若與其造林面積比較，則風倒木的比例並不比其他樹種為高。據前恒春分所主任吳慰中氏之意見，此種風倒木多之原因，不外下列二點：

- (1) 因樹冠大，幹高，故遭遇風的面積大，因此受害烈。
- (2) 經過移植後，主根及支根多被切斷，其深根性之根系受影響，側根數目增加但入土深度較淺，當風能力因此減低，

### 颱風對於臺灣植物的貢獻

臺灣植物的種類，分佈，據學者的研究，與中國本部，菲列濱相似。威爾遜氏1922年謂臺灣的植物與中國極相似，尤其是松柏類，與中國的中西部有密切的關係。正宗嚴敬氏謂臺灣植物與中國本部關係最密切，其次是菲列濱。金平亮三氏等以地質時代亞洲大陸各處分離之遲早來解釋此種現象，此說似難置信。據作者意思：賴颱風傳播種子於中國本部，臺灣，菲列濱間，實為使此三處植物相似之唯一原因<sup>5</sup>。風為傳播植物種子最重要的媒介。臺灣雖孤立海外，與其他區域隔離，但臺灣至中國福建間僅隔240公里 (Km) 左右，至菲列濱亦近。颱風以每小時15到70公里的速率，在很短時間內，可從臺灣吹入中國遼遠之處。故植物種子因颱風的媒介而從菲列濱，臺灣吹入中國中西部或從中國中西部高山吹入臺灣等處是極可能之事。如此植物即交相遷徙。同時中國中西部的山在2500—3000公尺處，其氣候與臺省之高山相似，而使相似植物，亦能在臺省高山生存。

據金平亮三氏的研究，臺省植物較菲列濱各處為多。其特點是屬 (Genera) 多，但少種土種 (Endemism)，次種為臺灣屬熱帶及亞熱帶區域；雨量多，溫度高。又有高達3950公尺之高山主脈發其自化，寒溫愛熱四帶之植物皆可生存。故植物種類從此繁多。同時賴強大風力從世界遼遠之處，將不同種類植物的花粉吹入臺省，與其他不同種類植物雜交，發生雜種，在悠長歲月，亦為可能。然因有強風的媒介，使臺省大多數林木的果實，種子可吹至中國本部，及菲列濱等各處；而他處植物果實種子亦可因強風而吹入或挾海流而漂至臺灣，因此由於臺灣與附近各處

植物有交相遷徙的可能，而造成臺灣植物種類繁多却少地土種的現象。

故臺灣植物與中國本部及菲列濱植物相似原因，由於下列一點以解釋之：

- (1) 賴颶風的媒介，使三處植物得交相遷徙，而使各處發生相同的植物。
- (2) 臺灣三千公尺的高山，其氣候與中國中西部三千公尺的高山之山地氣候相似，使相同植物賴以生存。

表 1 在恒春龜子角植物園內風倒木之種類及株數

樹 種	1945年9月及10月			1946年9月		
	幹折	半根倒	根倒	幹折	半根倒	根倒
木 麻 黃 ( <i>Casuarina equisetifolia</i> Linn.)	30	17	203			2
大 葉 合 歡 ( <i>Albizia Lebbek</i> Benth.)	5	11	154			20
鐵 刀 木 ( <i>Cassia siamea</i> Lam.)	11	28	85			10
酒 椰 子 ( <i>Caryota urens</i> Linn.)	17	4	51			5
蘇 木 ( <i>Caesalpinia Sappan</i> Linn.)		6	41			
銀 木 麻 黃 ( <i>Casuarina glauca</i> Sieb.)	3	5	30			
克 膏 漢 木 麻 黃 ( <i>Casuarina Cuninghiana</i> Miq.)	4	6	24			
銀 · 合 歡 ( <i>Leucaena glauca</i> Benth.)	11	8	22			
薔 薇 木，印 度 紫 禮 ( <i>Pterocarpus indicus</i> Willd.)	20	6	20			
廣 葉 檀 樹 ( <i>Dalbergia latifolia</i> Roxb.)		2	20			
榕 樹 ( <i>Ficus retusa</i> Linn.)			19			3
孔 雀 豆，相 思 格 ( <i>Adenanthera pavonina</i> Linn.)	1	2	18			
馬 來 降 雨 木 一 種 ( <i>Peltophorum ferrugineum</i> Batai)	8	2	17			
紅 棟 子 ( <i>Cedrela toona</i> F. Vill.)	1	3	17			3
錫 蘭 肉 桂 ( <i>Cinnamomum zeyganicum</i> Bl.)	4		17			
金 鳳 樹，鳳 凰 木 ( <i>Delonix regia</i> Raf.)			14			5
栲 花 心 木 ( <i>Swientenia Mahagoni</i> Jacq.)	3	2	11			5
檳 榔 ( <i>Areca Catecha</i> Linn.)	2		11			
大 王 椰 子 ( <i>Oreodoxa regia</i> H. B. K.)	2		9	2		
豎 星 水 樹 ( <i>Haematoxylon campechianum</i> Linn.)	12	15	8			
龍 眼 ( <i>Euphoria Longana</i> Lam.)		2	8			

雞 眉 (Pithecellobium lucidum Benth.)	1		7	
相 思 樹 (Acacia Richii A. Gray.)			7	
大 白 葉 仔 (Heritiera littoralis Dryand.)			7	
印 度 橡 皮 樹 (Ficus elastica Roxb.)			7	
羊 蹄 甲 (Bauhinia spp.)	12		6	3
紅 木 (Bixa orelliana Linn.)			6	
樟 樹 (Cinnamomum Camphora Nees. et Eberm.)			5	
浦 桃, 蓮 霧 (Eugenia Jambos Linn.)			5	
攪 仁 (Terminalia Chebula Tetz.)			5	
合 歡 (Albizzia falcata Back.)			5	2
豆 拉 伯 膠 樹 (Acacia Senegal Willd.)			5	
旅 人 木, 扇 芭 蕉 (Ravenala madagascariensis J. F. Gmel.)			4	
兩 洋 杉 (Araucaria Bidwillii Hook.)			4	
桃 花 心 木 (Swietenia macrophylla King.)		2	4	3
栓 皮 櫟 (Quercus variabilis Linn.)			4	3
莖 東 漆 (Semecarpus vernicifera Hay. et Kawak.)	3	1	4	
石 梁 (Aleurites moluccana Willd.)	1		4	
楨 楠, 猪 脚 楠 (Machilus Thunbergii Sieb. et zucc.)			4	
臺灣响木麻黃 (Casuarina Deplancheana Miq.)	2		4	
銀 樺 樹 (Grevillea robusta A. Cunn.)	2		3	
木 棉 樹, 斑 芝 樹 (Bombax Ceiba Linn.)			3	
木 薯 膠 樹 (Manihot Glaziovii Muell. Arg.)			3	
檀 香 (Santalum album Linn.)			3	2
柚 木 (Tectona grandis Linn.)			3	
琉 球 松 (Pinus luchuensis Mayer.)			3	1
波斯皂莢, 阿勃勒 (Cassia Fistula Linn.)	1	1	3	
象 牙 樹 (Maba buxifolia Linu. Pers.)			2	
番 荔枝 (Anona spp.)			2	
蒲 葵 一 種 (Livistona altissima Zull.)			2	
福 樹 (Garcinia spicata Hook. f.)			2	

酸	棗 ( <i>Spondias pinnata</i> Kurtz.)			2			
桫	欏 ( <i>Arenga pinnata</i> Merr.)	1		2			2
香	水 樹 ( <i>Canarium odoratum</i> Baill.)			2			1
狹	葉 欏 仁 ( <i>Terminalia angustifolia</i> Jacq.)	1		2			
紫	葳 一 種 ( <i>Lagerstroemia speciosa</i> Pers.)			2			
麻	風 樹, 木 花 生 ( <i>Jatropha curcas</i> L.)			2			
黃	豆 樹, 白 其 春 ( <i>Albizzia Procera</i> Benth.)			2			
欏	仁 ( <i>Terminalia Catappa</i> Linn.)			2			
赤	楠 木 ( <i>Quassia amara</i> Linn.)			2			
棕	櫚 ( <i>Trachycarpus excelsus</i> var. <i>Fortunei</i> Mak.)			2			
棟	樹 ( <i>Melia Azedarach</i> Linn.)			2			
亞	哈 法 亞 斯 樹 ( <i>Actinophloeus Macarthurii</i> Bucc.)	2		1			
巴	西 橡 皮 樹 ( <i>Hevea brasiliensis</i> Muell.-Arg.)			1			
亞	力 山 大 椰 子 ( <i>Archontophoenix Alexandrae</i> Wendl. et Drud.)			1			
格	拉 白 書 樹 ( <i>Crescentia Cujete</i> Linn.)			1			
羅	幡 椰 子 ( <i>Raphia Ruffa</i> Mart.)			1			
重	陽 木, 茹 零 ( <i>Bischoffia javanica</i> Bl.)	2		1			
貝	殼 杉 ( <i>Agathis alba</i> Foxw.)			1			
兩	木 ( <i>Samanea Saman</i> Merr.)			1			1
哥	納 香 ( <i>Goniolthalmus Amuyon</i> Merr.)			1			
椰	子 ( <i>Cocos nucifera</i> Linn.)			1	3	3	5
露	兜 樹 ( <i>Pandanus boninensis</i> Warb.)			1			
藍	桉 樹 ( <i>Eucalyptus Globulus</i> Labill.)			1			
考	白 拉 爾 樹 ( <i>Hymenaea Courbaril</i> Linn.)			1			
阿	力 布 ( <i>Olea europea</i> Linn.)			1			
粗	糠 柴 ( <i>Mallotus philippinensis</i> Muell.-Arg.)			1			
瓊	崖 海 棠 樹 ( <i>Calophyllum inophyllum</i> Linn.)			1			
杉	葉 南 洋 杉 ( <i>Araucaria Cunninghamii</i> Sweet.)			1			
麵	包 樹 ( <i>Artocarpus communis</i> Forst.)			1			
糕	望 子, 酸 果 ( <i>Tamarindus indica</i> Linn.)			1			3
總	數	161	123	966	5	3	80

表 2 恒春港口造林地風倒木之種類及株數

樹 風 時 間 樹 種	1945年9月及10月			1946年9月		
	幹折	半根倒	根倒	幹折	半根倒	根倒
鳳 凰 木 ( <i>Delonix regia</i> Raf.)						4
羅望子, 酸果 ( <i>Tamarindus indica</i> Linn.)						3
相 思 樹 ( <i>Acacia Richii</i> A. Gray.)						2
鐵 刀 木 ( <i>Cassia siamea</i> Lam.)						1
欖 仁 ( <i>Terminalia Catappa</i> Linn.)						1
木 麻 黃 ( <i>Casuarina equisetifolia</i> Linn.)						1
栓 皮 櫟 ( <i>Quercus variabilis</i> Bl.)						1
合 歡 一 種 ( <i>Albizia falcata</i> Back.)						1
總 數						14

表 3 恒春高士佛造林地風倒木之種類及株數

樹 風 時 間 樹 種	1945年9月及10月			1946年9月		
	幹折	半根倒	根倒	幹折	半根倒	根倒
柳 杉 ( <i>Cryptomeria japonica</i> D. Don.)						35
大 葉 合 歡 ( <i>Albizia Lebbek</i> Benth.)						1
琉 球 松 ( <i>Pinus Iuchuensis</i> Mayer.)				1		
總 數				1		36

