

The Botany of Christmas Island.

The first collection of plants made in Christmas Island was that of the expedition of the Flying Fish under Captain Maclear, in 1886, but a few plants only were then obtained. In 1887, H. M. S. Egeria visited the island and remained ten days during which time Mr. J. J. Lister, naturalist to the expedition, collected plants, animals, and rocks but was unable to penetrate into the centre of the island. The account of the plants obtained on these two expeditions was published by Mr. Hemsley in the Journal of the Linnean Society vol. XXV p.351. They amounted to about 52 specimens of flowering plants, 17 Ferns and Lycopodiaceae, and 8 cellular cryptogams. As previous to this time no settlement had ever been made on the island nor any ships except a few whalers, and other vessels touched there, the flora was in its unaltered primitive state and no weeds of cultivation had made their appearance. The collection however was by no means complete even for the area visited, but many of the endemic plants were collected.

In 1888 (November) Mr. Clunies Ross settled there, and from this period dates the introduction of the weeds and plants generally introduced by human agency.

In 1890 I visited the island in the gunboat "Redpole" landing at Flying Fish Cove, and spent about 10 hours there, during which time I collected as many plants as I could, in the Cove and up as high as the Plateau. As I was chiefly interested in the indigenous plants at that time I paid less attention to the introduced species, but noted *Hibiscus abelmoschus*, and *Spilanthes acmella* neither seen since; *Paspalum sanguinale* and *Eleusine-indica*. An account of this trip was published in the Journal of the Straits Branch of the Asiatic Society, vol. 22, p.123.

During their residence the Ross family introduced a number of useful and ornamental plants many of which are still to be found in the Settlement and with these a number of weeds must have been introduced.

In July 1897 Mr. C. Andrews, visited the island and remained for upwards of a year, during which he made extensive collections, and explored a good portion of the island. The account of his expedition appeared in 1900 as "a Monograph of Christmas Island" published by the trustees of the British Museum. He added a large number of species to the known flora; many indigenous ones, and about a dozen introduced plants or weeds which had more or less established themselves.

At that time clearings were being made and roads cut, and since the opening up and development of the Phosphate quarries, there has been an influx of Chinese, who have brought in their train a number of cultivated plants and weeds. Practically however the greater part of the island is quite unaffected by these arrivals, which have only spread in Flying Fish Cove, along the Cemetery road, and round the Phosphate hill quarries, and also on the cleared ground at the waterfall. At the time of Mr. Andrew's visit no herbivorous animals except one goat had been introduced, but since then a few cattle and some horses have been brought, and these perhaps are responsible for the appearance of some weeds, such as *Amaranthus viridis*, and *Panicum colonum* which not rarely spring up where the dung of these animals is dropped: In the collections made by myself in 1904 there are a number of introduced weeds not obtained by Mr. Andrews, as well as some indigenous plants which were either overlooked by him or not in flower at the time of his visit.

The collection although made at a very dry time of the year, as not a drop of rain fell till quite the close of our visit, contained nearly all the flowering plants and ferns previously collected, as well as the novelties alluded to.

The plants not seen by me on this occasion were *Spilanthus acmella* and *Hibiscus abelmoschus*, introduced and fugacious weeds; *Cerbera odollam* found by Andrews at Rocky Point, which has since been much cleared for coolie lines, and the tree perhaps destroyed; *Remusatia vivipara* in the old path to Phosphate hill, which has perhaps been destroyed by the formation of the tip for the Phosphate, at the end of the

tram lines, or the plant may still be there and simply dried up at the time of our visit for I sought carefully for it in vain. *Lastraea intermedia* collected by Lister, and apparently not by Andrews I did not see, nor *Sagenia polymorpha* found by him, not common at North West point, a locality I could not get to. Some other plants mentioned in previous lists are obvious and others doubtful misidentifications. Lister's collections are preserved at the Royal Gardens Kew and Andrews' at the British Museum and I have not had the opportunity of seeing them.

The collections made in 1904 included as can be seen a good many additions to what was previously known and contained the first collection of marine Algae from the island. It is only possible to get to the sea in a very few places, on account of the height of the cliffs, and the impossibility of using a boat with any degree of safety. In many places from the top of the cliffs one can see the rocks beneath the surface clothed with masses of *Turbinaria*, *Sargassum* and many other Algae, far out of reach, and doubtless there are many yet to be collected. I have to thank Mr. and Mrs. Gepp of the British Museum for identifying the Mosses and Algae, and some other plants. The fungi and some of the Lichens were identified by Mr. Masee of Kew Gardens and other plants by Mr. Hemsley of Kew. A few plants were met with without any trace of flowers or fruit, one a shrub closely resembling *Clerodendron neriofolium* near the waterfall; a big liane common in the forest; and a small tree with lanceolate leaves common on the plateau, and of *Tristiriopsis Nativitatis* very common in Flying Fish Cove and which was first collected in fruit by Lister and again in fruit by me, the flowers are as yet unknown.

I do not think it at all probable that the whole of the flora even of the flowering plants and ferns is yet known. Many of the indigenous plants were very local, and considering the large area of the island which is practically inaccessible as yet, especially the south coast, and the fine cliffs of Egeria point, one may expect that a number more plants will be found whenever it is possible to explore these parts, and even in the more accessible parts it is probable that many

small plants will be met with which were dried up at the time of our visit.

Native Names. Mr. Andrews in his account of the flora gave a number of native names which he had obtained apparently from the Javanese temporarily employed on the island, but these are of little importance, as nearly all are either blunders by ignorant natives or expressions made up on the spur of the moment. Thus *Pongamia*, well known as Malapari is called Kayu Kwat, simply "strong wood." *Ochrosia* is given as "Gundra Roussa" presumably a blunder for *Gendarusa*, (*Justicia Gendarusa*) from some fancied resemblance of the leaves to those of the *Justicia*; *Berria Ammonilla* is given as Boognor, but it is really known in the island as Bungoh i.e. *Lazerstræmia*, no doubt on account of its hard wood; *Pisonia excelsa* is called Jamboe (i.e. Jambu), that is an *Eugenia* (*Jambosa* section). No Malay who knew anything about the plants would make such a mistake as this if he saw the tree, nor would he call *Kleinhovia* Laban i.e. *Vitex pubescens*. A few of the names of very common and well known plants are correct Javanese names, such as Ketapan, Waroo, Dadup.

Distribution of the species. In giving the distribution of any given species of plant, writers are apt to be very casual in their localities, Malaya for instance is by some authors made to cover anywhere from Tenasserim to the Philippines, including three or four quite distinct floras, and plants are described as "widely spread in tropics" when in fact their area is circumscribed to a small portion. The importance of distributional notes depends entirely on their accuracy and their value consists in the light that they throw on the origin of the flora. Comparatively little literature and herbarium material is at my disposal as I write this, but I have given as many distributional notes as I can get, and tried to distinguish indigenous plants (i.e. plants which have arrived at the locality without the direct or indirect

aid of man) from those which have been so introduced which I class as *weeds*. In order to make the distinction clear, I have given in all important cases the date of the first collecting of these plants. The earliest list, that of Lister published in 1888 in the journal of the Linnean Society, though only a small collection, contains only two plants which one would suspect to be weeds, viz: *Datura*, and *Fleurya*. There is absolutely no evidence of any one's having settled on the island previously to the visit of the *Egeria*. There may have been wrecks, and doubtless there were and whalers had touched at Flying Fish Cove. Dampier sent a boat on shore on the south west point. But these visits would not be likely to bring introduced weeds, like *Datura* and *Fleurya*, which seem only to occur round Flying Fish Cove, and not in the further side of the island where most of the earlier landings seem to have been made. We may take it then that all the plants collected by the Flying Fish and *Egeria* parties are indigenous, and Christmas Island may be considered the only Oceanic Island of which the flora has been collected when in its original state and before the appearance of man and his concomitant weeds.

The settling of the Ross family not long after dates, the first invasion of weeds. Mr. Ross brought many plants to cultivate both useful and economic. Whether in pots of soil or packing or in other such ways, a number of weeds arrived, most if not all these came from Cocos Island and Java. A number of these were seen or collected by myself in 1890, but the few hours at my disposal on that occasion were more devoted to the indigenous flora. More weeds had appeared by the time Andrews made his visit, and about then commenced the influx of Chinese, who often carry pot plants about with them, as well as vegetable seeds, etc. Then cattle and horses were imported, and these added yet more weeds, both in fodder brought with them and in that which they had eaten on the way. Thus I found in 1904, more weeds than Andrews had collected.

These weeds though in many cases very abundant now in the Settlement and the clearings on Phosphate hill and by the waterfall have not spread to any distance beyond, not even along the fishermen's regular routes.

The following is a list of weeds of the island, (excluding plants merely planted intentionally which have spread of themselves such as Papaya, Capsicum and Melia) arranged according of the date of their first record.

1890.

Hibiscus abelmoschus.
Spilanthes acmella.
Panicum sanguinale.
Eleusine indica.

1897.

Gynandropsis pentaphylla.
Ageratum conyzoides.
Synedrella nodiflora.
Ipomea digitata ?
Solanum ferox.
Stachytarpheta indica.
Euphorbia pilulifera.
Phyllanthus Niruri.
Trema amboinensis.

1904.

Cleome viscosa.
Cardiospermum Halicacabum.
Ludwigia prostrata.
Turnera ulmifolia.
Ipomea chryseides.
Amaranthus viridis.
A. paniculatus.
Peperomia exigua.
Euphorbia thymifolia.
Cyperus Iria
Paspalum conjugatum.
Panicum colonum.

Setaria glauca.
Pteris quadriaurita.
Solanum involucreatum.

Melia azederach, *Carica Papaya* and *Capsicum minimum* introduced doubtless by the Ross family have also spread freely over cleared and partly cleared ground in the neighbourhood of the settlements being dispersed by birds, but are absent from the further parts of the island.

The indigenous flowering plants number about 125 of which 29 are distinct enough to constitute endemic species, with 26 Vascular Cryptogams including 3 endemic species, and 85 terrestrial cellular cryptogams.

ENDEMIC SPECIES.

These are the following.

Limacia nativitatis.
Pittosporum nativitatis.
Abutilon Listeri.
Grewia osmorylon.
Grewia insularis.
Acronychia andrewsi.
Tristiriopsis nativitatis.
Colubrina pedunculata.
Eugenia gigantea.
Zehneria alba.
Heptapleurum natale.
Saprosma nativitatis.
Hoya aldrichii.
Ardisia pulchra.
Asystasia alba.
Dicliptera Maclearii.
Peperomia Rossii.
Claoxylon caeruleascens.
Laportea Murrayana.
Cryptocarya nativitatis.
Dendrobium pectinatum.
Phreatia Listeri.
Ph. congesta.

Saccolabium Archydas.

Corymbis angusta.

Zeuxine exilis.

Arenga Listeri.

Pandanus nativitatis.

P. elatus.

Panicum andrewsi.

P. clivale.

Asplenium centrifugale.

Gymnopteris Listeri.

Selaginella rupicola.

Moss.

Ectoprotecium micronesiense

Fungi.

Favolus albidus.

Geaster andrewsi.

Peria chlorina.

Alga.

Halymenia polyclada.

The affinities of these plants may be said to be with Javanese species except *Cryptocarya* and *Pandanus Nativitatis*, which are allied to Australian and New Caledonian species.

As Oliver (Journ. Linn. Soc. l. c. 352) remarks "most of the plants could not be exactly matched with their congeners from Java but yet do not sufficiently differ to be specifically distinguished, an indication of considerable age of the flora," and indeed this is so, for besides these distinguished as distinct species several others are very unlike the plants as we know them from surrounding countries, eg., *Randia densiflora*, *Callicarpa longifolia*, *Ochrosia Acheringae* and *Leea sambucina*. Still it must be taken into consideration that the locality where these plants grow is very unlike their habitats in Java and the Malay Peninsula. The soil is very rich in phosphates and lime, and extremely porous, so that in the dry season it becomes extremely dry, the water soak-

ing through the ground till it reaches the basalt. Many of the plants grow on bare rocks of coral reef, others in masses of coral detritus. What wonder that plants growing on such soils and with such a climate should differ from those growing in permanently wet woods with rich humus and little lime and phosphate. Compare the damp dark forests rich in humus with little lime which *Carymbis veratrifolia* inhabits with the dry powdery dust of phosphate of iron and alumina and broken coral reef in which *C. angusta* grows; the damp clay banks where *Asystasia intrusa* lives, with the coral talus which *A. alba* frequents; the low lying damp open country inhabited by *Callicarpa longifolia* with the plateau woods where the variety *glabrescens* grows and one can not wonder these forms are very distinct.

It must be remembered that we have as yet no complete knowledge of the floras of the adjacent islands, and it is probable that some of these endemic species will be found again in other Malayan islands. Some of the plants indigenous to Christmas Island and not classed as endemic are as yet only known to occur in one other spot, e.g. *Balanophora insularis* and *Dendrocolla carinatifolia* in Pulau Aur, an island lying off the eastern coast of Pahang, and *Sideroxylon sundaicum*, on Pulau Sangian.

The greater number of the indigenous species however differ little or not at all from the forms known elsewhere, though there seems among the trees to be a tendency to greater size, probably due to some extent to the absence of competition, of the plants found elsewhere than in Christmas Island, nearly all have been recorded from Java. The exceptions are.

<i>Ochrocarpus ovalifolius</i>	Admiralty Islands and Timor Laut
<i>Strongylodon ruber</i>	Andamans, Ceylon and Polynesia.
<i>Inocarpus edulis</i>	Polynesia.
<i>Quisqualis indica</i>	Burma, Malay Peninsula.
<i>Blumea spectabilis</i>	India, Ceylon, Malay Peninsula.
<i>Sideroxylon sundaicum</i>	Pulau Sangian.

<i>Ochrosia ackeringæ</i>	Sumatra and Banka.
<i>Convolvulus parviflorus</i>	Africa, India, Ceylon and Australia.
<i>Ruellia ringens</i>	E. Africa, India, Malay Peninsula.
<i>Balanophora insularis</i>	Pulau Aur.
<i>Acalypha wightiana</i>	Malay Peninsula.
<i>Dendrocalla carinatifoliu</i>	Pulau Aur.
<i>Ischæmum foliosum</i>	New Caledonia.
<i>Fimbristylis cymosa</i>	Australia.

It is probable however that several of these will be found to occur in Java.

CULTIVATED PLANTS ON CHRISTMAS ISLAND.

I made a note of all the plants I saw cultivated on Christmas Island, especially those useful as fruit or vegetables. The importance of these to the coolies working on the Island as well as to the Europeans need not be dilated on.

The fruit trees included :

Pomegranate (more valuable perhaps for its anthelmintic roots). Custard-apple, Bullock's Heart, Sapodilla, Pumelo, Orange and Limes, Papaya, Pineapple (Mauritius pines only), Tamarind, Coconut, Lime-berry and Bananas. All fruit well here, and there was a good supply of most of them. The limes and orange trees were however much attacked by scale insects. Directions for cleaning them were given to the Manager. Mangosteens had been planted and I heard also that Durians had been introduced. A few dying mangosteen seedlings were all I saw. Soil and climate is not suitable for these. Of other fruit trees were single specimens of Jambu Bol, Jack and Mango, none of which had fruited. Coconuts grow and fruit well in the Cove and appear sufficient in number to supply all local needs.

Vegetables. The Chinese have one or two gardens for vegetable cultivation in which grow Dolichos Lablab (Karas bean) Kachang Prut Ayam, Luffas, Waxgourd, Bottlegourd, Peria, Chives, Chinese lettuce, Kangkong, Bayam, Sweet.

potato, Brinjals and Indian Corn ; Chilies have run wild everywhere. Dal and Haricot beans, mentioned by Andrews as cultivated I did not see and of other plants in cultivation mentioned by him Sugar-cane, Bamboos, Nutmeg, and Cocoa, have also disappeared. The dry calcareous soil is not suited for these plants. A few ornamental plants are cultivated but more might be done in this way. There are a few good trees of Kapok, a candle-nut tree, Liberian Coffee, doing well but the trees are getting old. Lemongrass, and a good supply of Tapioca. The attention of the Magistrate was called to a number of thriving plants of the very undesirable Indian Hemp (Ganja) close to his house carefully planted and protected by his gardener.

Fodder plants for the horses and cattle are practically restricted to *Oplismenus undulatifolius* which is abundant in many of the woods and is collected and brought in by the grass cutters. There is also *Digitaria sanguinalis* and I also found recently introduced *Panicum Colonum* and *Paspalum conjugatum* both in very small quantity. The latter when it gets to the cooler and shadier parts of the island will probably spread, and is a good fodder grass. The rest of the grasses in the island are unsuited for fodder. The horses however eat greedily many of the weedy herbaceous plants such as *Synedrella* and *Ageratum* when young. More might be done in introducing fodder plants as there seems rarely to be sufficient. The soil in a good part of the island is hardly deep enough for much cultivation, but behind the Settlement is a good area tolerably flat in parts of rich brown earth, in which beans, pines, bananas, etc., grow well. A good deal of this is still covered with secondary scrub which could be cleared and used as a fruit and vegetable garden. The difficulty of cultivation in the dry island lies in two factors, the excessive drought in the dry season, accentuated by the porous nature of the soil which does not retain water, and the great mist of sea spray which covers the Cove, and the cultivated area at the Waterfall during the rough seasons. At the latter place where sweet-potatoes were being cultivated the natives told me that the plants were destroyed every year

in the stormy season by the heavy masses of sea spray thrown up by the waves.

The peculiarity of the soil very rich in phosphate, and lime also must be unsuitable for many plants. The area at present available for cultivation of any trade products is too small for more than experimental work, but a good many more vegetable and fruits might be successfully grown. I brought and gave to Mr. Macpherson who took a good deal of interest in plant cultivation, suckers of pine-apples, and seeds of the cherry tomato. This plant had run wild in Fernando de Noronha, an island very similar in many respects to Christmas Island, just as the Chili has there, and its small sweet fruits were found to be very refreshing, and could be gathered in basketsful from the rocks among which it grew. The birds in Christmas Island would soon disperse the seed and it would probably soon become abundant. The only wild eatable fruits on the island are those of *Sideroxylon* which somewhat resemble cherries and the kernels of the Ketapang and *Inocarpus edulis*, the Otaheite chestnut, which I was somewhat surprised to find no one on the island seemed to know was eatable. When boiled it has quite the taste of a Spanish Chestnut but it is very much larger.

The following is a list of all the plants cultivated at present or previously recorded in Christmas Island. The amount of cultivated land is very small. A number of the plants in this list were introduced by Mr. Ross and others later by the employés of the Phosphate Company, of the trees I saw frequently but one specimen.

1. Fruit trees.

<i>Punica granatum</i>	Pomegranate, grows well.
<i>Anona squamosa</i>	Custard apple ,,
,, <i>muricata</i>	Bullóck's Heart ,,
<i>Mangifera indica</i>	Mango. One tree not fruiting.
<i>Artocarpus integrifolia</i>	Jack. ,,
<i>Achras sapota</i>	Chicko, several fruiting.
<i>Citrus decumana</i>	Pumelo ,,

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| <i>Citrus aurantium</i> | Orange several fruiting. |
| <i>Citrus medica</i> | Limes " |
- The Limes of which there are plenty were at the time of our visit much affected by scale.
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| <i>Garcinia Mangostana</i> | Mangosteen, all dead the dry season and poor soil does not suit them. |
| <i>Carica papaya</i> | Papaw, abundant, good seed dispersed by birds. |
| <i>Tamarindus indicus</i> | Tamarind, several and young seedlings noticed along the waterfall trunk. |
| <i>Cocos nucifera</i> | In Flying Fish bay, two varieties fruiting well. |
| <i>Ananassa sativa</i> | Pineapple grows well. The Mauritius pine is the only variety there. |
| <i>Triphasia trifoliolata</i> , | Limeberry plentiful. |
| <i>Musa sapientum</i> | Bananas do well. |
| <i>Eugenia Malaccensis</i> | One tree. |
2. Vegetables.
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| <i>Dolichos Lablab</i> | |
| <i>Cajanus indicus</i> | Dal. seen by Andrews. |
| <i>Phaseolus lunatus</i> | " |
| <i>Vigna Catiyang</i> | Cultivated by Chinese. |
| <i>Luffa</i> sp. | |
| <i>Benincasa cerifera</i> | Waxgourd. |
| <i>Momordica charantia</i> | Peria. |
| <i>Ipomeca aquatia</i> | Kankong. |
| <i>I digitata</i> | Sweet potato. |
| <i>Lactuca</i> sp. | Chinese lettuce. |
| <i>Allium scorodoprasum</i> | Climes. |
| <i>Lagenaria</i> sp. | Gourd. |
| <i>Solanum Melongena</i> | Brinjal, yellow variety. |
| <i>Capsicum minimum</i> | Chilies established in various places. |
| <i>Zea Mais</i> | Indian corn grows well. |
| <i>Andropogon nardus</i> | Lemon grass. |
3. Ornamental and other plants.
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| <i>Aleurites moluccana</i> | Candlenut. One tree Ross' old house. |
| <i>Oreodoxa regia</i> | |

<i>Elaeis guineensis</i>	oil palm.
<i>Livistona australis</i>	
<i>Cycas revoluta</i>	
<i>Phoenix</i> sp.	Young plants.
<i>Fourcroya gigantea</i>	Two young plants.
<i>Poinciana regia</i> .	
<i>Caesalpinia pulcherrima</i>	
<i>Plumiera acutifolia</i>	
<i>Hibiscus rosa-sinensis</i>	
<i>Cassia siamensis</i>	
<i>Canna indica</i>	
<i>Jatropha curcas</i>	
<i>Jasminum Sambac</i>	
<i>Renanthera arachnites</i>	
<i>Vanda Hookeriana</i>	
<i>Melia azederach</i>	has spread all over the Cove, and as far as Phosphate hill, giving a great part of the secondary scrub.
<i>Codiaeum variegatum</i>	Croton, a few bushes.
<i>Eriodendron anfractuosum</i>	Two or three trees.
<i>Cannabis indica</i>	
<i>Coffea liberica</i>	does well.
<i>Manihot Utilissima</i>	Tapioca.

The Nutmeg and Cocoa and the Sugar Cane and Bamboos formerly cultivated have quite died out.

NOTE ON THE TIMBERS OF CHRISTMAS ISLAND.

The Bastard Teak (*Berria* sp.) is of course the most valuable timber of the island, but though a good deal still exists, the supply is not inexhaustible, as it appears only to occur on the lower terraces on the North Coast. It hardly occurs on the plateau and I saw it not on the other coasts. The timber of the *Eugenia*, the biggest tree on the island is fairly good but is not what would be classed as a first class wood. *Sideroxylon* has a white wood, good for planking, etc., but not as good as the wood of most trees of the order, *Sapotaceae*. *Cordia*, the iron wood of Cocos Island, is a first class wood but

the trees are scanty and small here. *Ochrosia*, *Pongamia* and *Cryptocarya* also give useful woods. The Katapang is larger here and with harder wood than I have seen elsewhere. In fact it appears to be too hard for practical purposes. The so called wild coffee, *Randia densiflora* var. supplies excellent walking sticks and umbrella handles, and as there is often a considerable demand for these they might at some time be an article of export.

THE COLLECTION MADE:

Considering the time at our disposal and the difficulty of getting to further parts of the island a very complete collection of the flora was made which not only added a very large proportion to the plants previously known, but has enabled me to correct a number of misidentifications in previously published works, of previously unrecorded species; a certain number, not very large, were plants introduced accidentally after Andrews' visit; the others were plants obviously overlooked by him. I do not think that even yet we have got a full list of all indigenous species as it is probable that in the at present inaccessible parts of the South and West other plants will be found. I met with three trees and shrubs not previously noticed by other collectors on which no trace of flowers or fruits could be found. They were quite common but I failed to identify them, and doubtless there are others in further parts of the island. A large number of fungi too were collected which had not previously been recorded and others of this group will probably be met with in more suitable time of year.

The greater part of the flora is however known now.

THE FLORA DICOTYLEDONS.

MENISPERMACEÆ.

Limacia nativitatis, n. sp.

A tall woody climber with slender branches. Leaves (young) elliptic orbicular, (older) lanceolate subacute mucronate 2-3 inches long $1\frac{1}{2}$ - $2\frac{1}{2}$ inches wide above glabrous dark green beneath pubescent with yellowish

hairs especially dense on the midrib, nerves ascending 2 pairs petiole 1 inch long geniculate densely pubescent. Racemes 3 inches long not branched slender, rachis pubescent. Flowers yellow in distant tufts of 5 or 6, shortly pedicelled. Bracts linear pubescent. Sepals 6, 3 outer ones linear spathulate pubescent, 3 inner ones broader obovate obtuse, pubescent on the back. Petals smaller sub-spathulate glabrous. Stamens 6 glabrous, 6 filaments broadly linear, anthers introrse 2 celled, grooved. Fruit not seen.

Common near Flying Fish Cove and towards Rocky point and on the Plateau.

The plant which climbs on the smaller trees covering them with a thick mat of foliage, only came into flower shortly before we left, and I only obtained male flowers.

It seems most nearly allied to *L. borneensis* Miq. and is remarkable for its simple racemes of flowers.

The genus *Limacia* extends from Tenasserim and Cochin China to the Malay peninsula and archipelago. The fruits are drupaceous.

Tiliacora racemosa forma, is given without special locality in the Monograph of Christmas Island. It is an Indian plant. I have not seen it here and would suggest the plant referred to this species may perhaps be the preceding.

CAPPARIDEE.

Gynandropis pentaphylla, Dec.

Pedicellaria pentaphylla Schrank.

Was collected in the settlement by Andrews.

Cleome viscosa, L.

A few plants were met with on the coral beach in the Flying Fish Cove.

Both of these tropical weeds occur occasionally in cultivated ground, and often disappear again as quickly as they come.

CRUCIFERÆ:

Sinapis nigra, L.

I found a single stunted plant of what appeared to be this in waste ground near the quarries on Phosphate hill evidently an escape from cultivation.

PORTULACACEÆ.

Portulaca oleracea, L.

The common Purslane is abundant in Flying Fish Cove and also at the Waterfall.

This plant was not obtained by any of the previous collectors and is probably a recent introduction. It is a widely distributed weed occurring in all warm countries on sea shores and sandy or open places. It is described by Hemsley (Voyage of the Challenger, Botany vol. I. p. 35) as certainly sea-dispersed, and so it seems to be as it occurs on almost all oceanic islands, but it is also apparently carried about accidentally by man, and then readily spreads, as it is often abundant in estates and waste ground where there seems no other reason for its presence. Hemsley talks of it too as a cultivated plant, and thinks that its wide distribution may be due to that cause. I have never seen it cultivated in the East, nor used by any native race for food, certainly neither Chinese nor Malays eat it here so still less do they cultivate it. Into Christmas Island it certainly seems to have come as an accidental weed, as it did not occur in any place where other weeds had not already come, or where there had not been some cultivation close by. I do not know whether it has ever been recorded that this plant closes up its leaves at night, like *Phyllanthus* and other such plants.

PITTOSPOREÆ.

Pittosporum nativitatis Baker, was described in the Monograph of Christmas Island p. 171, fig. XVII, from plants collected by Andrews on the plateau on the East Coast. It is

abundant on the upper terraces at the cemetery, and Phosphate hill and also on the Plateau. It is a small tree 12 to 14 feet tall, with the foliage much like that *P. ferrugineum*, common, near the sea and in dry places inland. The flowers as described by Baker are in compact heads at first but the panicle opens out later and is nearly as wide as that of *P. ferrugineum*. They are of the same yellowish white colour as those of that species. It appears to be fertilized by wasps.

The fruit is a capsule and appears to resemble that of *P. ferrugineum*, the seeds of which are dispersed by birds.

GUTTIFERÆ.

Ochrocarpus ovalifolius, T. Anders.

A large tree with very coriaceous oblong dark green leaves, and white flowers solitary or in pairs on the bare portion of the branches below the leaves. Fruit oblong conic eventually brown.

Abundant on the first terrace from North East point to steep point, collected on the East Coast also by Andrews. The plant, known as Nyamplon, much suggests *Calophyllum* in habit, but with much larger leaves. The fruits are probably sea drifted. I found a number of them under a rock in the woods at the waterfall which had been carried there and eaten by rats. *Ochrocarpus ovalifolius* is a native of the Admiralty islands, Timor Laut and Pulau Sangian.

Calophyllum Inophyllum, L.

This common sea shore tree is not as plentiful as would be expected in Christmas Island being confined so far as I saw to the vicinity of the waterfall, where there were a number of tall trees of it. It was not in flower at the time of our visit, but weeds and fruit were obtained. The locality was on the basaltic outcrop or very close to it, and it was probably due to the volcanic soil or to the neighbourhood of subterranean water that it grew there. This tree is common in the

Polynesian Islands, Malay Archipelago, and Peninsula, India and Mascarene Islands, and is always to be found near the sea, though it will grow in open country inland. The seeds are often drifted about in the sea, but are dispersed inland often by fruit bats.

MALVACEÆ.

Malvastrum tricuspidatum, A Gray.

A low shrubby plant with buff yellow flowers, occurs in Flying Fish Cove. It was also collected by Andrews. I saw it nowhere else. It is widely distributed but absent from many places, occurring in Africa, India, Australia, Cocos, and South America, probably introduced in some of these localities.

Sida spinosa, L.

An erect shrublet with buff yellow flowers grew also in Flying Fish Cove near the last species and I also found it along the cemetery road. Not previously recorded. A sea shore plant occurring in America, India, Malayan peninsula and islands. Australia and Africa.

Abutilon auritum, Sweet Hort, Brit. 1 p. 58.

A tall shrubby plant 7 or 8 feet high, much branched pubescent leaves ovate cordate obtuse 4 inches long three inches wide edge crenulate light green pubescent, petiole 3-4 inches long. Stipules ovate $\frac{1}{4}$ inch long. Panicles terminal lax with branches 4 or 5 inches or more long pubescent. Pedicels $\frac{1}{2}$ inch long. Sepals ovate subacute $\frac{3}{8}$ inch long green woolly pubescent. Corolla an inch across, petals obovate minutely mucronate bright orange yellow finely striate. Staminal tube much shorter with 6 filaments. Fruit $\frac{1}{2}$ inch long of 9 carpels.

Common all round Flying Fish Cove to Smith point, and to North East point along the Cemetery road. On the lower terrace. Flowers opening in the afternoon.

Collected also by myself in 1890 and by Andrews. This plant is figured (Bot. Mag. t. 2495) with pink buds and stamens, and the *Sidaatropurpurea* Bl. Bijdr. is said to be the same species. There is no pink or purple about the Christmas Island plant and I do not see why Blume gave his name to the plant. He does not describe the colour.

- A. auritum* Sweet, is recorded from Java, Timor, Philippines and Queensland New Caledonia.
- A. Listeri* Baker, fil. Journ. Bot. 1093 p. 269.

A shrubby plant about 6 feet tall, much branched, branches slender scabrid not pubescent. Leaves ovate cordate acuminate minutely stellate hairy on both surfaces but chiefly on the back 4 inches long $2\frac{1}{4}$ inch wide. petiole slender 2 inches long. Panicles few flowered or flowers solitary axillary on slender pedicels $1\frac{1}{2}$ inch long, Calyx $\frac{1}{4}$ inch long lobes ovate acuminate closely pubescent. Petals oblong obtuse $\frac{3}{4}$ inch long orange yellow, stamens yellow, free portion of filaments as long as the tubular portion. Carpels densely covered with irritating hairs.

Common all round Flying Fish Cove, Rocky point, Cemetery road, and lower part of Phosphate hill, and at the Waterfall. Endemic. First collected by Mr. Lister.

The *Abutilons* are among the showiest plants in the island. They open their flowers in the afternoon.

Hibiscus vitifolius, Linn.

A tall slender plant about 6 or 8 feet tall, branched, stems velvety pubescent. Leaves ovate cordate or hastate acuminate or shortly three lobed irregularly crenulate and very variable in size $1\frac{3}{8}$ -4 inches long 1-2 inches wide light green velvety pubescent. Panicles small terminal. Flowers shortly pedicelled, Calyx tube globular lobes triangular lanciolate grey pubescent $\frac{1}{4}$ inch long, Corolla $\frac{1}{2}$ inch long prim rose yellow with a purple

centre. Rare, North East Point on the shore terrace. Collected there also by Andrews.

Rather a small flowered form with the leaves less lobed than usual. This plant seems to be common in Ceylon and India, and occurs in Moa, Java, Timor and Australia but is absent from the Malay peninsula. It is apparently a weed of cultivation in waste ground in Ceylon, but it grows far away from any cultivation in Christmas Island.

H. Vrieseanus, Hassk Pl. Jav. Rar 1048 p. 304.

Stems about 12 feet tall $\frac{3}{4}$ inch through pale green brittle with a large pith inside, densely covered with transparent pungent bristles. Lower leaves cordate suborbicular with 6 acuminate points, edge between waved and serrate, nerves 6 to 8 upper leaves more distinctly lobed 6 inches long seven across, quite glabrous on both surfaces except for some scattered, bristles on the upper nerves, petiole 8 inches long thickly around with pungent bristles. Raceme a foot or nine long bristly. Involucral bracts 1 inch long acuminate lanceolate setose sparingly except the edge which is densely setose. Bracts broadly triangular acuminate $1\frac{1}{2}$ inch long. Calyx spathaceous. Corolla 6 inches across, lobes rounded expanded, pale lemon yellow with a maroon eye. Pistil conic densely setose. Capsule conic on a 2 inches peduncle, over 2 inches long 5 angled densely spiny setose. Seeds sub-globose pubescent.

In the centre of the island on the track to Murray hill in thick scrub. Also obtained by Andrews, in a valley on the West Coast.

This beautiful Mallow, is I think certainly what Hasskarl intended by his *H. Vriesianus*, a very little known and apparently rare plant. It differs from his description slightly, the leaves can hardly be said to be lobed, and are nearly glabrous and the fruit cannot be described as small. *H. Vriesianus*, was obtained originally in Java, and does not seem to occur elsewhere. The

plant is undoubtedly indigenous to Christmas Island. It occurs in the dense woods of the interior. It is very difficult to see how it has got there.

H. Abelmoschus, L. The musk seed was found by myself at my first visit near the settlement. It is common cultivated plant, and no doubt had been introduced. It has since disappeared.

H. tiliaceus, L.

This sea shore tree is abundant in Flying Fish Cove and at North East point and also at the Waterfall, growing as usual close to the sea. It is common on all the sea coasts from Polynesia, to Sandwich Islands, Galapagos, Malay islands, Cocos, Pitcairn Island, to the Malay peninsula. First collected in Christmas Island by Lister, also by Andrews. The seeds are sea borne, and the flowers fertilized by *Megachile* sp.

STERCULIACEÆ.

Kleinhovia Hospita, L.

A large shrub or tree about 20 feet tall with panicles of rose pink flowers very showy. Fruit capsular, with small seeds. Common on the lower terraces Rocky point, Phosphate hill, etc. First collected by Andrews. The plant is quite typical. The distribution is Philippines, New Guinea, Java, Banka, Malay peninsula, India and Ceylon and East Tropical Africa. In the Malay peninsula where it is not common, it occurs on river banks. I suspect this plant is dispersed by sea but am doubtful as to how it comes to be widely spread. It does not seem to be a typical sea shore plant.

Triumfetta suffruticosa, Bl.

A large branched shrub, stems hairy with pale appressed hairs. Leaves alternate ovate orbicular cordate acute crenulate, sprinkled with stellate hairs on both sides

(young leaves densely pilose) 3 inches long and as wide, petiole sub-glabrous $\frac{3}{4}$ to 3 inches long. (Flowers yellow). Fruit spike 3 to 4 inches long densely crowded. Capsule 4 or 5 celled, about 1 inch across including the bristles, on a pedicel $\frac{1}{2}$ inch long, cells densely covered with hooked bristles covered with white hairs, cells one seeded seed $\frac{1}{8}$ inch long ovoid pustular-dotted.

Shore terrace North East point and on Steep Rock. Not previously collected.

I believe this identification is correct, as Blume's description fits the plant, but it was out of flower at the time I collected it. I do not understand however how Dr. Stapf (Flora of Kinabalu) says it is closely allied to the weedy narrow leaved *T. pilosa* Roth, no two plants of the same genus could be more diverse.

The distribution given for the species is Lousiade Archipelago, Solomon Islands, Timor Laut, Java, Borneo (Mt. Kinabalu). The fruit is extremely adhesive, and clings to clothing like burrs. It is doubtless distributed by adhering to birds feathers.

Melochia arborea, Blanco.

A soft wooded tree about 15 feet tall with a simple stem and a large head of foliage. Flowers in corymbs, small pink with an ochre spot in the centre. Fruit capsular with winged seeds.

One tree seen in Flying Fish Cove, one at the waterfall and one on the South Coast. Not previously collected. Distribution: Philippines, New Guinea, Java, Borneo, Indian, Malay Peninsula and Mauritius (doubtfully wild).

I am doubtful as to how this plant is disseminated.

TILIACEÆ.

Berria ammonilla, Roxb.

A tree with light colored bark; leaves ovate acuminate, base broad truncate or cordate glabrous 3-8 inches

long, $1\frac{1}{2}$ to 5 wide, primary nerves 4-5 pairs, petiole slender 1-4 inches long. Panicle 4 inches long, flowers numerous small $\frac{1}{4}$ inch across white. Pedicels $\frac{1}{4}$ inch long covered with stellate pubescence. Calyx capsular four lobed, lobes broadly ovate, covered outside with stellate pubescence. Corolla lobes 4 oblong longer obtuse white. Stamens innumerable short, anthers cordate. Capsule 6 to 8 winged, $1\frac{1}{2}$ inch across the wings, wings in pairs to each cell, papery red brown oblong rounded $\frac{3}{4}$ inch long glabrous; seeds one in each cell obscurely angled nearly $\frac{1}{4}$ inch long, fuscous densely covered with stiff red hair.

Common along the shore terraces from Smith point to North East point, much more scanty on the Plateau. This plant was very early observed though it does not appear in Hemsley's list of plants collected by Lister. Its hard wood was mistaken for teak, and from this error apparently arises the statement first made by Hemsley that *Tectona grandis* occurs in the island. So conspicuous a tree as this latter could not have escaped Andrews nor myself, so that it may be considered that there is no evidence that the true Teak, (*Tectona grandis*) occurs or ever did occur in the island. *Berria* I found in flower and fruit in October, and in fruit also on the occasion of my first visit and also received a fruiting specimen from Mr. Keyser collected in August. It is called Bastard-Teak and Bungor (not Boognor as in Andrews' list) which is the ordinary Malay and Javanese name for *Lagerstroemia*. Probably the Javanese considered its wood to resemble that of the *Lagerstroemia*.

Except for the much smaller flowers, little over a quarter of an inch across, I see very little difference between this plant and the typical Ceylon plant, which has flowers $\frac{3}{4}$ inch across.

The distribution of the *Berrias* and of this species seems very curious. One or two distinct species occur in Tahiti and *Berria amonilla* is found in the Cumber-

land islands, East of Queensland—a distinct variety, Christmas Island and Ceylon and is probably native in Southern India.

The fruit is winged as described, but from what I saw of it does not fly any distance from the tree. When ripe it dehisces letting out its seeds which are covered with appressed hairs. It is not usual to find a winged fruit which dehisces before germination of the seed, and though I would class this among wing-fruited plants, I think it most improbable that the fruit with its seed could have been brought to the island by wind, as it dehisces so soon that the seed would probably be dropped out before it reached the island. It is more likely that the seed is dispersed by sea currents.

Grewia osmoxydon, n. sp.

Tree, about 30 feet tall. Leaves lanceolate acuminate with a broad or rounded base serrate—crenate 4-6 inches long 2-3 inches wide, glabrous, nerves 6-7 pairs petiole hardly $\frac{1}{2}$ inch long sprinkled with a few stellate pairs. Racemes axillary or terminal wider an inch long 4 or 5 flowered, rachis pubescent. Buds globose grey pubescent. Sepals linear oblong $5\frac{1}{5}$ inch long white, rather coriaceous, pubescent outside. Petals $\frac{1}{4}$ length rounded base pubescent. Stamens yellow shorter than the sepals very numerous. Fruiting racemes elongated slightly drupes in pairs, pyriform $\frac{1}{8}$ inch long pulp thin testa bony, one celled one seeded. Rocky point and North East point. "Kayu Wangi." Baker. fil. in the Monograph gives the Kayu Wangi as *Grewia laevigata* Vahl, but this is described very differently by Miquel. In his description, the plant is a shrub with not more than three nerves to the leaf, which is pilose in the nerve axils, and the drupes are puberulous with 4 to 2 pyrenes. I cannot think that this description can possibly apply to the Christmas Island scented wood, nor can I find any description to fit this plant. The fruiting specimens sent me by Mr. Leach, are

probably not ripe but the seeds are hard and the embryo firm in texture. They are remarkably small for a *Grewia*. The tree was commencing to flower shortly before we left the island and seems abundant along the Cemetery road as far as N. E. point, along the shore terrace.

Gr. insularis, n. sp.

Tree about 20 feet tall, shedding its leaves after fruiting, twigs densely stellate hairy. Leaves ovate subacute with a rounded base, crenulate 3 inches long 2-2½ inch wide sprinkled all over but especially on the nerves with stellate hairs, petiole densely stellate pubescent, ¼ inch long. Racemes axillary ½ inch long in pairs or three densely stellate pubescent. Flowers in umbels of 3 on each raceme, pedicels ¼ inch long. Buds oblong pubescent. Sepals linear oblong woolly pubescent ¼ inch long yellow. Petals oblong ⅓ of the length of the sepals pubescent at the base. Stamens ¾ the length of the sepals. Fruit not seen. North East point, fairly common. I cannot identify this with any other described species.

RUTACEÆ.

Acronychia Andrewsii, Baker. fil. Monogr. Christmas Island P. 174.

A small tree attaining a height of about 20 feet and sometimes more, bark pale. Leaves bright green trifoliate flowers in short axillary panicles. Fruit a small pale pink berry.

Common, Smith point, Cemetery road. Endemic. The fruit doubtless eaten by birds.

MELIACEÆ.

Melia azederach, L.

This tree is evidently introduced; the biggest specimens occurring at the police quarters close to *Cassia*

siamea and *Eriodendron*, but it has spread abundantly all over Flying-Fish Cove and up Phosphate hill and round the coolie lines there. It forms with *Trema Boehmeria* etc., a great portion of the secondary jungle which springs up after fallowing. The drupes are certainly eaten by birds and the seeds so disseminated. It is absent from all parts of the forest which have not been cleared, and is certainly not native.

Dysoxylum amooroides, Miq. Ann. Mus. Bot. v. 4, p. 16.

A very big tree, 60 to 90 feet or more, tall leaves 18 inches long, leaflets glabrous membranaceous, 6 pairs, the lowest smallest, oblong lanceolate acuminate inaequilateral, alternate 6 inches long by 2 inches wide "Panicke extra-axillary, the branches spike-like or branched with few branches. Flowers sessile. Calyx 5 sepalled villous outside. Petals yellowish pubescent outside" Capsule 1-1½ inch long pyriform or subglobose coriaceous wrinkled orange, 4-split, seeds ½ inch long ovoid angled indian red with thin testa.

Common in the forests of the plateau and descending to Flying Fish Cove. The tree was fruiting at the time of our visit and the ground in some places was strewn with the seeds. Obtained first by Lister, but too incomplete for identification by Hemsley, who describes the tree as 13 feet through. I never saw any nearly as big as this.

Distribution, New Guinea and Java.

The seeds are certainly eaten by birds ;

BURSERACEÆ.

Tristiriopsis Nativitatis, Hemsley.

Tree 40 to 60 feet tall with grey bark. Leaves bipinnate, in young plants much branched about 2 feet long, adults 6 inches long, leaflets alternate 6 pairs or fewer oblong lanceolate petioled, young serrate, adult

entire coriaceous, 2 to 4 inches long $\frac{3}{4}$ to $1\frac{1}{2}$ inches wide, nerves about 9 pairs, petiole $\frac{1}{4}$ inch long. All glabrous except for tufts of hair in the axils of the nerves on the back. Inflorescence in leaf opposed panicles. Flowers not seen. Peduncles in fruit $\frac{1}{2}$ inch long. Calyx persistent 5 lobed to the base lobes $\frac{1}{8}$ inch ovate obtuse pubescent. Drupe 1 inch long green ovoid beaked, base stalked, 3 celled, pericarp thinly pulpy, cell walls woody, hairy within.

Flying Fish Cove, Phosphate Hill, Plateau No. 67.

This was mentioned by Hemsley in Journ. Linn. Soc. XXV. (1890) p. 353, as "*Burseracea*?" Flowers have not yet been obtained and though it is common in Christmas Island, Andrews does not appear to have collected it. Identified by Mr. Hemsley.

CELASTRINEÆ.

Celastrus paniculatus, Willd.

A small tree, Rocky point (Andrews). I saw what I suppose to be this plant in the same locality but it was flowerless and also without fruit.

Distribution Indo-Malaya.

RHAMNACEÆ.

Colubrina pedunculata, Bakes fil. Monog. Christmas Island 195.

A straggling tree, with ovate leaves and flowers in axillary cymes, on long peduncles. Fruit subglobose capsular dehiscing irregularly $\frac{1}{4}$ to $\frac{1}{3}$ inch long; seeds hemispheric with a rounded back and broad inner faces, bright brown polished and very smooth.

North coast, (Andrews) abundant on the upper cliff above Flying Fish Cove, and at Andrews Lookout on Phosphate hill. In dry places. It was in fruit at the time of our visit, Andrews found it in flower in February, Endemic. This is a plant of very different habit

from *Colubrina asiatica* the common Malayan species, being a much bigger and more tree-like plant, with very different leaves as well as its much longer inflorescence. It appears to shed its leaves almost completely after fruiting. *C. asiatica* is a sea shore and open sandy country plant.

AMPELIDÆ.

Cissus repens Lam.

A common vine over the bushes in Flying Fish Cove Rocky point.

Collected first by Andrews on Phosphate Hill.

Distribution India, Andaman Islands, Malay Peninsula, Java.

Cissus pedata var *glabrescens*.

Stems glabrous more or less flexuous obscurely 4 angled, internodes 3-4 inches long. Tendrils branched opposite the inflorescence. Leaves when young more or less pubescent adult glabrous, petiole 2 inches long pubescent when young, glabrous in old leaves, limb 5 to 7 foliolate lobes unequal, central one ovate with a broad base, on a petiolule $1\frac{1}{2}$ inch long, thin crenulate dentate 4 inches long 3 inches wide, nerves 8 pairs, sparingly pubescent, lateral lobes oblique inaequilateral narrower, and more distinctly crenate. Cymes small, opposite to the leaves $1\frac{1}{2}$ inch or little more long, peduncle 1 inch long (lengthening in fruit). Flowers green glabrous very small. Calyx shortly 4 lobed. Corolla ovoid in bud, 4 petals 4 valvate narrowed upwards from a broad base. Fruit $\frac{1}{4}$ inch through pink, seeds $4\frac{1}{4}$ inch long angled in front, smooth rounded polished on the back.

Smith Point etc., common.

This is no doubt the plant collected by Andrews and so identified in the monograph of Christmas Island, but it differs from the description by Planchon in the Mon. Phau. p. 558. in the form of its leaves, and its

much more glabrous habit. I have a somewhat similar form from New Guinea.

Cissus pedata Lam. is distributed over India, Siam and Java but appears to be quite absent from the Malay Peninsula. Fruit as large as a pea, pink; flowers green fertilized by *Polistes Balder* Kirb.

Leca sambucina var *intermedia*.

A tree or large shrub 20 feet or more tall, young stems smooth glabrous green fluted, internodes one foot long, sprinkled over with scattered thorns, adult stems thornless covered with a red, scaly bark. Leaves 12 inches or more long, leaflets oblong lanceolate acute crenulate 3 inches long $1\frac{1}{2}$ inch wide, glabrous except for a tuft of reddish hair in the axils of the nerves on the back. Cymes 3 inches long with tufts of hair in the axils, and the ultimate branches pubescent. Bracts lanceolate acute or subacute. Flowers green, calyx cupshaped with 5 short teeth, pubescent. Petals 5 lanceolate subacute hooded at the tip glabrous staminal tube very short and toothed. Fruit globose grey green $\frac{1}{4}$ inch through when dry, 4 seeded.

This plant is common all over the island, but especially on Phosphate hill, Flying Fish Cove, etc. It is rarer or absent on the Plateau.

It has been referred to the common Malayan species *L. sambucina* and also to *L. horrida* Teysm. It is however not typically either species, but rather intermediate between the two. In general it resembles *L. sambucina* except for its much greater size, smaller corymbs and leaves with tufts of hair in the nerve axils and the presence of distinct thorns on the young stems. In these points it approaches *L. horrida*, which however is much more thorny the thorns being persistent and occurring on the branches, and which does not possess the axillary hairs of the nerves of the leaf.

Distribution of *Leea sambucina* Willd, India, Andamans, Malay Peninsula.

SAPINDACEAE.

Cardiospermum Halicacabum L. A single plant on the coral beach in Flying Fish Cove. This plant occurs frequently as a weed of cultivation and is often cultivated to a small extent as a pot herb.

Allophyllus Cobbe var *glaber*.

A common small tree, Rocky point. Plateau, Flying Fish Cove, N. E. Point, Steep Point.

This plant was collected first by Andrews. The species as generally described includes a number of forms very different in appearance from low shrubs with small glabrous leaves to small trees with large leaves. The Christmas Island plant is not the common sea shore bush, but a bigger erect little tree, which is usually met with in forests.

ANACARDIACEAE

Spondias dulcis, Forst.

A gigantic tree 100 feet tall and 2 feet through with light grey crackled bark. Leaves pinnate. Flowers in short panicles, small white. Drupe elliptic oblong brownish black crackled 2 inches long, pulp yellow acid.

Woods at Andrew's Look out, local but a fair number of trees together. Leafless when we first arrived later with young reddish leaves and fruit, and just commencing to flower.

The first record of this tree here.

LEGUMINOSAE.

Erythrina indica, Lam.

A smooth barked tree usually of a moderate size, but Andrews met with one 18 feet in circumference.

Distribution Sunderbuns, Andamans, Malay Archipelago, Polynesia. Seeds of apparently this species sea-drifted to Cocos Island.

Canavalia ensiformis, De. C.

Shore. (Andrews).

This plant, the Kachang Parang of the Malays is only known in cultivation and is a well-known native vegetable. It was probably an escape from cultivation when Andrews collected it. I did not observe it.

C. obtusifolia var *insularis*.

A strong but slender climber covering bushes with a dense mat of foliage. Leaves trifoliolate, leaflets ovate obtuse, bases nearly equilateral broad rounded 4-5 inches long, $3\frac{1}{2}$ inches wide, petiole 3 inches long, petiolules of lateral leaflets $\frac{1}{4}$, of terminal 1 inch long. Raceme 4 or 5 inches long. Flowers opening singly. Calyx $\frac{1}{2}$ inch long urnshaped bilobed, upper lobe larger emarginate. Petals dark red rose, standard $1\frac{3}{4}$ inch long $\frac{3}{4}$ inch wide, oblong obovate retuse, claw and centre at base greenish white. Wings $1\frac{1}{4}$ inch long $\frac{1}{4}$ inch wide oblong obtuse, keel petals broader elliptic oblong. Stamens 10 fertile, anthers rounded ovate dull yellow, style shorter. Pod oblong beaked 4 inches long $1\frac{3}{4}$ inch wide, the rib close to the upper suture, seeds 2-4 subglobose, slightly flattened, dark brown.

This abundant bean climbing over bushes on the Cemetery road and Phosphate hill differs much in appearance from *C. obtusifolia*, in the more oblong standard, and in Christmas Island in its red not rose colored petals. In plants cultivated in Singapore the petals were more rose colored.

Strongylodon ruber, Vogel.

A climber with slender stems leaves trifoliolate. Flowers red. Pod oblong turgid with large round seeds,

Common in Flying Fish Cove, and Phosphate hill ; collected also by Andrews. This was not in flower at the time of our visit but in fruit. Distribution, Ceylon, Andamans, Australia and Polynesia. The seed probably sea borne. Seeds sea drifted to Cocos Island.

Galactia tenuiflora, W. & A.

A slender climber with trifoliolate leaves $1\frac{1}{2}$ -2 inches long. Flowers pink on the inner face, green on the back about $\frac{1}{4}$ inch across. Pod sword shaped : 1-2 inches long, narrow.

This pretty little vetch, climbs over the bushes abundantly at Rocky point and on Phosphate hill.

Distribution Africa East and South, India, Siam, Malay Islands, Australia.

Pongamia glabra, Vent.

A tall straight tree in the forest or low bushy straggling one on rocks, with rather thin 5-7 foliate leaves and racemes of pink flowers. Pods one seeded flattened, indehiscent.

Common beyond Rocky point, Flying Fish Cove, North East Point.

Distribution Mascarene Islands, India, Malay Peninsula, and islands, North Australia and Polynesia. A typical sea shore and tidal river bank plant as far as the typical form is concerned some of the trees in the woodlands were remarkably straight and tall and very different in appearance from the common Malay Peninsula plant.

Inocarpus edulis, Forst.

A big tree with a remarkably grooved stem, and light colored bark ; leaves oblong very dark green coriaceous. Flowers in short axillary racemes yellow. Fruit flattened orbicular, one seeded. Common, Flying Fish Cove. Distribution Polynesia.

The wood is poor, light colored fawn, the centre darker, rays very fine numerous with many fine transverse bars; pores in short lines, joined together and separated by transverse partitions. Weight 4lbs per cubic foot.

The red crabs, *Gecarcinus*, seem very fond of the fruit of this tree of which they eat the green husk. As they drag them from some distance to their burrows for this purpose, it is not uncommon to see a dozen or so young plants growing in a circle round the mouth of the burrow. The seed when boiled is eatable, and very good tasting like a chestnut. It is undoubtedly a sea dispersed plant the strong husk protecting the seed from injury, while floating in the sea.

Specimens were first obtained by Lister and from these Professor Oliver (*Icones Plantarum* t. 1837) gave a figure and description of the seed, to correct the misconception of its structure by Gaertner, but as a matter of fact Lister's fruit was very young and Gaertner's that of a fully ripe fruit. The tree has long been cultivated in the Botanic Gardens at Singapore, where it regularly flowers and fruits. The fruits, only 2 or three ripening on one raceme, are flattened pearshaped polished green or yellowish green; when quite ripe 5 inches long, 4 wide and about an inch through. The remains of the style, represented by a very short elevation is more than half way along the upper edge from the stalk. There are often a few small points also in the sides. The stalk is short under $\frac{1}{2}$ inch and stout. The pod which is indehiscent is one seeded. The exocarp is composed of the thin green epicarp, followed by a fibrous almost woody portion $\frac{1}{4}$ to $\frac{3}{8}$ inch thick. Beneath this is a pithy white mass, at first very thick but disappearing as the seed develops, so that when the seed is ripe there is little or none left. The ripe seed is 3 inches long thick orbicular heart shaped, yellow wrinkled, with no albumen.

The fruits of the Christmas Island trees were on the whole smaller than those of the Gardens plants, but I saw few ripe ones and many fallen ones were sterile. The pod with its fibrous coat is well suited for sea dispersal, and is undoubtedly so dispersed. Its later dissemination over the island is effected in part at least by crabs and perhaps also by the fruit bats. For these animals the eatable part is the green outer coat of the pod. In Singapore the seeds are often destroyed before they are ripe by the squirrels which gnaw through the pod to eat the seed.

Caesalpinia (Guilandina) bonducella, Fleming.

A strong thorny climber with pubescent leaflets, and racemes of yellow flowers, with recurved pubescent bracts. Capsule 3 inches long brown spiny containing 1 or 2 round grey seeds.

Common at Smith point, and North East Point - collected also by Andrews. In bud at the close of our visit

Distrib. All tropical countries. A typical sea shore plant, the hard seeds of which are sea borne.

Entada scandens, Benth.

East coast (Andrews) I did not meet with this big climber anywhere.

Distrib. India Malay Peninsula, Africa South America seeds are often found in sea drift and it is one of the best known sea-dispersed plants. Mr. Chapman found a seed in the sea at Christmas Island.

COMBRETACEAE.

Terminalia Catappa, L.

This tree is very abundant over much of the island not only along the lower terraces and on the sea beach but also on the Plateau. Many of the trees are very large with big buttresses. The wood is hard and dark red brown. I have not seen trees as large elsewhere.

It is however otherwise identical with Malayan forms. The fruit is sea borne, and also disseminated over the island by crabs which eat off the outer coat. Occasionally I saw large quantities of seeds collected together but by what animal I do not know, possibly by fruit bats, which in Singapore are very fond of the fruit and carry it far away.

Distribution. Most tropical countries but often planted, wild only on sea shores.

The wood is very hard, dark red with a satiny lustre, rays fine pores few and large, a very superior timber to any samples I have seen from the Malay Peninsula.

Combretum acuminatum, Roxb.

A woody climber common on the shore terraces and on the plateau. I saw neither fruit or flowers of it. The fruit is described as four angled and oblong, like that of *Combretum trifoliatum* which I have found floating in the sea off Singapore.

Distribution India and Malay islands.

Quisqualis indica, L. A woody and thorny climber, with bunches of red flowers. Flying Fish Cove on rocks above the bay towards the Magistrate's House, also on North East Point, collected also by Andrews. Undoubtedly wild.

The fruits are probably sea borne, they are somewhat lanceolate in shape acuminate and angled. Distrib. Burmah, Malay Peninsula, on the East Coast.

Gyrocarpus americanus, Jacq.

A very large thick stemmed tree with grey rather smooth bark, and soft white wood with very distant rings. Leaves clustered on the ends of the branches rounded ovate acuminate long petioled. Flowers unisexual in large cymes, apetalous, calyx 4-7 partite, stamens 4-7 in male flower, calyx 2 partite in female. Nut bony with two long spatulate wings 3 inches long. Common and

very conspicuous along the lower terraces by the sea. Flying Fish Cove, N. E. Point, Waterfall. The tree sheds its leaves after flowering at at the time of our visit only a few bare bunches of hanging green fruits at the ends of the boughs. Many trees were leafless but a few were begining to produce leaves again. The settlers call it cabbage tree on account of its soft pithy wood. like that of a cabbage stalk. It is perfectly useless, of a light fawn color with large rings and wavy fibres with few large pores. Distribution. All tropical countries

MYRTACEAE.

Eugenia gigantea, n. sp.

A gigantic tree over 100 feet tall with immense buttresses. Bark light coloured with large thin flakes. Leaves opposite elliptic oblong or lanceolate or ovate subacute lower ones large 6 inches long by 4 inches wide, upper ones 3 inches by $1\frac{3}{4}$ wide, glabrous subcoriaceous narrowed at the base to the petiole which is $\frac{1}{2}$ an inch long, primary nerves 11-12 pairs, prominent beneath. Cymes below the leaves 3 inches long, branches slender divaricate. Flowers in trees at the ends of the branchlets, white sessile $\frac{1}{4}$ inch long, ovary turbinate strongly wrinkled when dry. Calyx cupshaped entire. Petals forming a round shield shaped cap coriaceous. Stamens very numerous short white. Style longer rather stout. Drupe half an inch long subglobose purple.

The biggest tree on the island and the biggest species of *Eugenia* I have ever seen. It is abundant all over the plateau, occasionally descending a little lower as at Flying Fish Cove. Specimens of this tree have been collected by all botanists who have visited the island but no account of it has been published.

Barringtonia rubra Miq. lc. p. 487 *Butonica terrestris* Rumph. Amb. iii. lib. 5, p. 181, t. 115, *Barringtonia racemosa*, Bl. (non Juss.) Van Houttes Flora vii. p.

23, Miq. Fl. Ned. Ind. 1, p. 486. Baker Flor Christmas Island.

A tree about 30 feet or more tall rather slender and straight. Leaves crowded at the tips of the branches obovate or oblanceolate acuminate narrowed to the winged petiole, 10 inches long by 4 inches wide, edges crenate serrate, nerves about 16 pairs, petiole winged nearly to the base corky $\frac{1}{2}$ inch long. Racemes pendulous $1\frac{1}{2}$ -2 feet long, rachis slender. Flowers rather distant on slender pedicels $\frac{1}{2}$ inch long. Calyx lobes 4 pale green ovate oblong $\frac{1}{2}$ inch long. Petals twice as long oblong. Stamens 1 inch long white or rose pink. Fruit 2 inches long $\frac{3}{4}$ inch through green oblanceolate in outline narrowed to the base and shortly beaked, very obscurely four angled.

Common in the woods on the upper terraces, and plateau, and occasionally lower.

Distribution Banka, Patjetan, South Java and Amboina.

This plant has been erroneously referred to *B. racemosa* but as Miers (Trans. Linn. Soc. Sec. II. vol. i. p. 69 has very properly shown, *B. racemosa* of many authors is a mixture of several distinct species, and the original species is Indian only. From *B. inclyta* Miers the common plant of the Malay Peninsula, this species differs in its much thinner and smaller leaves, and much smaller flowers and fruits. *B. inclyta* is a typical sea shore plant and grows in damp muddy spots near the sea. It is included under *B. racemosa* in the Flora of British India and the Materials of the Flora of the Malay Peninsula. *B. rubra* is a woodland plant Rumaphius describes it as growing in sulphureous and gravelly soil and it grows in Christmas Island among the detritus of coral reefs. The flowers are either white or rose pink. I was unable to find any other distinction between the two forms, I observed that the fruits were untouched though abundant by any

animal, even the crabs which eat the outer coat of the fruits of *Inocarpus* greedily do not appear to relish that of the *Barringtonia*. The plant has doubtless arrived at the island by sea, as seeds of *Barringtonias* are among the commonest sea drift ones.

TURNERACEÆ.

Turnera ulmifolia, L.

This native of South America has established itself on the sea-beach in Flying Fish Cove. It is a shrubby herb with lanceolate toothed leaves and large yellow flowers.

Probably introduced into cultivation in the East as an ornamental plant it is now well established in sandy places beyond Tanjong Katong in Singapore. It never seems to thrive inland.

ONAGRACEÆ.

Ludwigia prostrata, Roxb.

A common yellow flowered herb abundant in wet spots in many parts of the world. It is rarely prostrate as its name implies but usually erect.

Flying Fish Cove a few plants behind the house, among the bananas. This plant appears to be disseminated by its seeds adhering to the feet or feathers of aquatic birds, and also is spread by streams and rivulets. In this case however I should suggest from its habitat that the seeds have been accidentally brought in rice, and got dropped outside the house.

LYTHRACEÆ.

Pemphis acidula, Forst.

A shrub with a rough barked stem often of considerable thickness, narrow obovate elliptic lanceolate dark green leaves, usually rather stiff, small white flowers and a small acid berry.

Common on the sea rocks from South point to Rocky point.

Var *crassifolia*. Leaves very thick and succulent. Between Waterfall and Steep Rock. This form is very strikingly different from the common one when alive on account of the very thick leaves but I could see no other difference. It formed very large erect or sub-erect bushes or almost trees along the shore in one place, and where exposed to the heavy sea-spray and winds it formed a prostrate dense mat of wiry branches lying over the rocks.

Distrib. Africa and Mascarene isles, Cochin China, Hong Kong, Burmah, Ceylon, S. India, Andamans, Malay Peninsula and islands Australia Polynesia.

FICOIDEÆ.

Sesuvium portulacastrum, L.

A succulent creeping herb with fleshy linear terete leaves, and pink star-like flowers. Fruit a capsule with many seeds.

Densely covering rocks on the top of a promontory by the little White Cove between the Waterfall and Steep Rock.

The seeds and probably portions of the plant are dispersed by sea. It is a common seashore-plant in all parts of the Tropics, growing in tidal mud or on sea-rocks. The whole plant when boiled makes an excellent vegetable, and is known to the Javanese as Sesepit. The boobies near the waterfall used branches of it to make their nests.

Distrib. Tropics generally.

CUCURBITACEÆ.

Zehneria alba, n. sp.

Stems slender glabrous. Leaves ovate cordate acute entire dark green glabrous, upper surface dotted over with

glands? 3-4 inches long 4-5 across, petiole 1-2 inches long slender, nerves 7 pairs radiating from the base Tendrils long and slender. Male flowers numerous in umbels on peduncles $\frac{1}{2}$ -1 inch long slender glabrous, pedicels slender $\frac{1}{4}$ inch. Calyx cupshaped glabrous obscurely toothed. Corolla small $\frac{1}{6}$ inch long white glabrous lobes lanceolate subacute. Stamens 3, filaments glabrous, anthers elliptic thick, connective not prolonged.

Female flowers 4 or 5 in an umbel, white, ovary narrowed to a beak. Fruit elliptic pink $\frac{1}{2}$ inch long Seeds rounded flat smooth margined.

Extremely abundant, Flying Fish Cove Waterfall. Phosphate hill, Plateau, etc.

This is the *Melothria mucronata* of the flora of Christmas Island doubtless, which is identified with *Zehneria Baueriana*, Eudl. but it does not appear to me that it can be even a form of this plant.

Melothria, sp. Trailing on rocks east coast (Andrews). - There may be another of these small Cucurbitaceæ here, as I found a plant with a single yellow flower on the waterfall track, but could get no more.

Momordica charantia, L. This common cultivated plant has run wild about cleared spots. It is of course not native but is the common small fruited form to which the cultivated form quickly reverts.

ARALIACEÆ.

Heptapleurum natole, n. sp.

A long climber with grey stems. Leaves 5 foliate, petiole 3 inches long, leaflets elliptic obtuse or subacute rather fleshy light green, the two outer ones smaller and suborbicular 2 inches long $1\frac{1}{2}$ wide, central ones 4 by $2\frac{1}{2}$, petiolules slender $\frac{1}{2}$ to 1 inch long. Cymes 3 or 4 inches long branched from the base, lower branches $\frac{2}{3}$ inches long, flowers copious green 10-13

inches in an umbel, pedicels $\frac{1}{4}$ inch long slender. Buds oblong obtuse, ovary short turbinate. Petals oblong linear, obtuse 5, stamens 5 alternate.

Fruit not seen.

Very abundant on rocks and trees, all over the island, flowering in the end of October.

This plant is certainly not I think the common *H. ellipticum* Seem. A native of the Malay Peninsula.

RUBIACEÆ.

Randia densiflora var *laxior*, Bak. fl.

A large straggling shrub, stems under an inch through, 10 to 12 feet or more tall. Leaves dark green subcoriaceous lanceolate acuminate acute glabrous 4-5 inches long 2 inches wide nerves 8 pairs, petiole $\frac{1}{4}$ inch long. Panicles axillary 3 inches long and often as wide, peduncle $\frac{1}{2}$ inch long. Bracts small lanceolate acute $\frac{1}{16}$ inch long. Pedicels very short calyx $\frac{1}{8}$ inch long dilated upwards from a narrow base with very short ovate teeth. Corolla tube $\frac{1}{3}$ longer thick, lobes linear lanceolate $\frac{1}{4}$ inch long, white turning yellow, hairs in the mouth of the tube few and short. Anthers linear mucronate.

Berry elliptic red $\frac{1}{4}$ inch long crowned with the persistent calyx lobes.

Extremely abundant all over the island especially on the lower terraces, but also on the plateau up to 900 feet all and perhaps the most abundant plant on the island, commonly known as wild coffee from its white sweet scented flowers. The stems form excellent walking sticks.

Collected first by Lister and by all subsequent visitors.

This plant is very different from the common forms of *R. densiflora* in many points, but perhaps hardly sufficiently so to be distinguished specifically. The typical plant is a tree 50 to 60 feet tall, with thicker leaves and fewer nerves, a denser corymb of slightly

smaller flowers with a pubescent calyx, and shorter corolla tube. Shrubby forms do occur in the Malay Peninsula also and forms with a quite glabrous calyx. Distribution Malay Peninsula and Islands, Hongkong and North Australia.

Guettarda speciosa, L.

A big tree with large sweet scented white flowers, and a green drupe.

Common on the sea coast, Smith Point, Cemetery road, Waterfall, and in the plateau on the Murray hill track, but most frequent near the sea, rarely inland.

The flowers seemed to me to be larger than usual. The fruit is commonly seen in sea drift, and I found several in the sea, but all had sunk.

Distribution Tropics generally.

Morinda citrifolia, Liun.

A large shrub with dark green leaves, and white flowers. Fruit a syncarp about an inch long. Baker fil. (Monograph of Christmas Island), says that the Christmas Island form seems somewhat different from the usual form in its narrower leaves and, occasionally, tetramerous flowers. It is however quite the ordinary plant of the Malay islands, the form with well developed whitish bracts and is identical with the common sea coast plant of Singapore.

It is common in Flying Fish Cove and at the Waterfall.

The fruits are sea dispersed and the plant is most commonly met with on rocky places above the sea. The white flowers are visited and fertilized by the wasps. *Odynerus polyphemus* *Polistes balder* Kirb and by the hawk moths *Cepheonodes hylas* and *Macroglossa*, and the bee *Megachile rotundipennis* Kirb.

Distribution India, Malay Peninsula and Islands, Australia and Polynesia.

Saprosma nativitatis, Bak. fil.

A shrub 3-5 feet tall with dark green oblanceolate leaves obtuse $1\frac{1}{2}$ inches long $\frac{1}{2}$ inch wide and small axillary pinkish white flowers, sessile, tubular with 4 lobes. This shrub very common in the Plateau has been well described by Baker. It is quite unlike any other species of *Saprosma* known to me, and does not possess the horrible odour when broken that the other species of the genus emit. It is endemic, and was first collected by myself in 1890, and is the *Psychotria* sp. of my list.

GOODENOVIÆ.

Scaevola Koenigii, Vahl. A shrub with obovate fleshy leaves and white flowers, fruit baccate white.

On cliffs above the sea. Common. Smith Point, Flying Fish Cove.

First collected by Lister.

Seeds dispersed by sea. Common on sea coasts of India, Malay Peninsula and Archipelago, Australia and Polynesia.

MYRSINÆ.

Ardisia polchra, n. sp.

A tall little-branched shrub with a stem about an inch through, leaves elliptic lanceolate glabrous acute narrowed at the base to the petiole, petiole decurrent as two distinct ridges along the zigzag branches which are red scurfy, lamina of leaf 6 inches long 2 inches wide, petiole and midrib red scurfy above dark green paler beneath with scanty red scales; nerves about 24 pairs. Panicle terminal on the ends of branches 4 to 6 inches long, branches slender widely spreading scurfy, ultimate branches an inch long terminating in umbels of 6 to 12 flowers on slender pedicles $\frac{1}{4}$ inch long, length-

ening to $\frac{1}{2}$ in fruit. Bracts very small ovate scurfy pubescent. Calyx lobes very short ovate pubescent. Corolla rose pink $\frac{1}{6}$ inch across lobes rounded ovate mucronulate. Stamens glabrous with short filaments not spiculate. Style twice as long fruit globose white turning to black $\frac{1}{6}$ inch through finely longitudinally ribbed when dry. *Ardisia complanata*, Hemsl. and Bak. fil. In Monograph of Christmas Island etc. Not of Roxburgh.

Common on the Plateau.

I cannot see how this beautiful and very distinct plant can have been mistaken for *A. complanata*. The winged stems are striking even in the living plant, and more conspicuous in a dried specimen.

COMPOSITE.

Ageratum conyzoides, Cass.

The common white-weed, with its pale blue or white flowers is common in cultivated ground at Flying Fish Cove

First collected by Andrews. It is common now in all tropical countries as a weed of cultivation, and is partly disseminated by the wind but also by its fruit adhering to cloths etc.

Blumea spectabilis, Dec. A tall weedy plant about 6 or 7 feet tall, with yellow flowers.

Common on the plateau in more open spaces in the woods, along paths and wherever the trees have fallen. First collected by Lister and certainly indigenous. Seed plumed and so wind dispersed.

Distribution India, Ceylon, Malay Peninsula.

This is a hill forest plant in the Malay Peninsula and does not grow at all in the low country.

Wedelia biflora, Dec. A half scandent rough herb with yellow flowers.

Common at the Waterfall and beyond to Steep rock always close to the sea, and forming tangled masses very hard to penetrate. The plant seems to be absent from the North Coast. Its fruit is a truncate achene with no pappus and is doubtless seaborne.

Distribution India, Malaya.

Spilanthes acmella. L.

A common weed of cultivation with heads of yellow flowers, Flying Fish Cove. Collected by me in 1890, not seen before or since. It is one of the common fugacious herbs which appears and disappears in cultivated ground.

Synedrella nodiflora, Gaertn.

A common South American weed with small heads of yellow flowers.

Extremely abundant in cleared ground in Flying Fish Cove, and at the Phosphate hill quarries. First collected by Andrews. Abundant in Singapore and Java, from one of which localities it was probably brought accidentally.

SAPOTACEÆ.

Sideroxylon sundaicum, Burck.

A gigantic tree upwards of 100 feet tall with large buttresses at the base, bark grey, exuding a small quantity of latex when cut. Wood white not very hard. Leaves very variable, lanceolate acuminate acute in young trees and on the lower part of old trees; above elliptic or obovate glabrous dark green when adult; covered with ferruginous tomentum when young, four to six inches long, $2\frac{1}{2}$ to three inches wide, nerves 7 to 10 pairs conspicuous on the under surface when dry, petiole slender $\frac{3}{4}$ to $1\frac{1}{2}$ inch long. Racemes numerous in the axils of the leaves $1\frac{1}{2}$ -2 inches long, red tomentose. Flowers 30 or more on each in distant

tufts of 3 or 4 together. Bracts small lanceolate covered with red tomentum. Pedicels rather stout $\frac{3}{16}$ inch long, tomentose flowers green $\frac{1}{8}$ inch across. Sepals 5 ovate obtuse imbricate pubescent. Petals twice as long oblong or ovate oblong pale green glabrous, tube very short. Stamens 5 adnate to the petals and opposite to them, filaments shorter than the petals rather thick and dilated at the base, anthers cordate acute dorsifixed yellow. Staminodes very short acuminate processes alternating with the corolla lobes and adnate below to the tube. Disc thick annular strongly pubescent. Ovary enclosed in disc small conic tapering into a cylindric style shorter than the filaments, glabrous. Stigma minute. Fruit an orange red berry long obovoid, pulpy and sweet, seeds 1 or more, hard dark brown.

This fine tree is common all over the plateau, but generally scarce or absent from the shore terraces. The fruit is much eaten by the pigeons *Carpophaga* who swallow it whole. I have also seen the white-eyes pecking at it and the red crab eating it.

Distribution Pulau Sangian. (I have been unable to locate this island on any map).

The wood is of a smooth creamy white colour with fairly distinct rings, rays very fine and close with numerous fine transverse bars; pores very small in straight lines parallel with the rays, several conjoined with thin partitions between. Weight 36 lbs the cubic foot. A fine light and pretty wood.

Ochrosia Ackeringae var *angustifolia*, Rendle.

Tree about 40 feet tall, 6 inches or more through. Leaves narrow elliptic lanceolate 3 to 6 inches long $\frac{1}{2}$ -1 inch across acute or subacute acuminate at the base dark green closely nerved. Corymbs 1 to 3 inches long on a 1 inch peduncle. Flowers fairly numerous sessile with a small ovate bract at the base. Calyx short $\frac{1}{8}$ inch lobes ovate acute. Corolla tube $\frac{3}{8}$

inch long lobes linear $\frac{1}{2}$ inch long narrow white fragrant. Fruit $1\frac{1}{2}$ inch long fleshy of two yellow cones connate by the base divaricate above.

Common on the lower terraces and also accuring on the plateau.

Distrib Banka.

Seed probably sea-borne as most of the Ochrosias are.

OLEACEÆ.

Jusminum Sambac Ait. The bushy jasmine so commonly cultivated by the Chinese is recorded in the Monograph of Christmas Island as if wild. It is only planted round Ross's old house in Flying Fish Cove and at the Waterfall and has not even spread a dozen yards from where it was evidently planted. It is a large flowered single form. I saw no fruit on it nor indeed have I ever seen any on any plant of it.

APOCYNACEÆ.

Cerbera Odollam Gaertn, forma.

Was obtained at Rocky point by Andrews. I sought it in vain. Much of this ground has been cleared since for cooly lines, and the hospital, and the woods near by form the handiest place for the coolies firewood supply, so that the tree has probably been exterminated. The *Cerberas* the fruit of which is well adopted for dispersal by sea require tidal mud usually for their growth, and there is no suitable spot for them in the island, Judging by the note as to the form of the leaves in the Monograph I should suggest that the plant collected by Andrews might be *C. lactaria*.

Distribution India, China, Malay Peninsula and Archipelago, Australia and Polynesia. Seed found in sea-drift at Christmas Island by Mr. Chapman.

ASCLEPIADEÆ.

Hoya Aldrichii, Hemsley.

A lofty climber, stems covered with pale bark. Leaves elliptic or ovate fleshy 4 to 6 inches long light green acute base cuncate, petiole $\frac{1}{2}$ inch long. Peduncle about 6 inches long. Umbel of flowers $2\frac{1}{2}$ inches across, pedicels $\frac{1}{2}$ inch long flowers over $\frac{1}{4}$ inch across. Petals white or pink. Corona of stamens pink or deep purple pink. Fruit 6 inches long $\frac{1}{8}$ inch through common all over the island. Endemic flowering October to January. One of the prettiest plants in the island. The flowers are fragrant in the evening. Seed plumed.

BORAGINÆÆ.

Cordia subcordata, Lam. A hard wooded rather low straggling tree, with ovate leaves and tubular orange flowers.

Fruit dispersed by sea. Sea coast on the beach Flying Fish Cove and beyond Rocky point.

Distribution East Coast of Africa, India, Malay Peninsula and Archipelago to Polynesia, a typical coral island tree.

The heart wood is light to dark sepia brown the rings being darker wavy and irregular, rays fine and close, pores scattered scanty. Weight 68 lbs.

Tournefortia argentea, Linn. fil.

A large shrub or tree with rough bark, silvery leaves and cymes of small white flowers.

Common on the sea cliffs all round the island. Smith Point, Flying Fish Cove, Waterfall etc. The flowers are fertilized by *Odynerus polyphemus* Kirb.

I saw one plant growing on a rock with large twisted corky roots as thick as a mans body reaching to the sand, after the manner of *Ficus* roots.

Distribution Ceylon, Malay islands, Mauritius, Australia.

Ehretia buxifolia, Roxb.

A shrub with long straggling branches, about 6 feet tall. The leaves vary in size according to habit, those of plants growing in shade being much larger than those of the open dry places. They are stiffly coriaceous scabrid dark green. Flowers white small.

Common at Rocky point and along the coast to N. E. point, and beyond South point. Always near the sea, and so far as I saw absent from the higher parts of the island though Andrews says it forms the worst of the under-growth there.

Distribution India, Malay-islands, Formosa.

CONVOLVULACEAE.

Ipomea chryseides, Ker.

A slender creeping convolvulus with small bright yellow flowers, and ovate often trilobed leaves.

Phosphate Hill, one plant. Not previously recorded.

This little convolvulus is common in waste ground, sand banks etc., in the Malay Peninsula. It may be classed as a weed of cultivation.

Distribution Tropical Africa, India, China, Malay Region and Australia.

I. pes-caproe, Roth.

The common goat's foot convolvulus with its bilobed leaves and dark pink flowers is common Flying Fish Cove, Isabella Beach and at the Waterfall bay. Most of the plants bore no fruit or flowers, and this was apparently due to the attacks of a caterpillar which ate the buds. A small black hawk-moth caterpillar was found feeding on it at the Waterfall. First collected by myself in 1890.

Distribution all tropics.

I. digitata, L.

Large climbing convolvulus with palmate digitate 5-7 lobed leaves, and large dark pink flowers, seeds woolly.

Flying Fish Cove.

It is difficult to say how this plant is spread about, I have never seen it except in places, which have been more or less under cultivation but I never saw it cultivated anywhere.

Distribution South America, Africa, India, Ceylon, Malay Peninsula and Islands and Australia.

I. campanulata, L.

Abundant by Rocky point along the Cemetery road. A large convolvulus, with ovate cordate leaves and large pale-pink flowers across, with a darker centre.

Not collected by Andrews.

Distribution, India, Ceylon and Malay Islands, possibly wild in the Malay Peninsula.

I. peltata, Choisy.

A very high climber with dark green peltate acuminate strongly nerved leaves 12 inches long and 10 inches across or smaller. The stem of this plant which is milky attains a thickness of four inches. The panicles of flowers are nearly 6 inches long on a peduncle of equal length. The calyx half an inch long and wide, sepals ovate subacute and corolla nearly 3 inches wide with a short tube, of a brilliant yellow.

This fine convolvulus is abundant in the centre of the island on the Murray Hill Park covering trees with a dense mat of stems and leaves collected also by Andrews.

Distribution, Malay Peninsula, Java, Borneo, New Guinea, Amboina, Australia, Polynesia, Mauritius.

Some of these outlying localities may be doubted, as the Australian and Amboinese plants are said to have white, the Mauritius one yellowish white red spotted flowers. If this is so these are probably distinct. All I have seen have bright yellow flowers.

I. grandiflora, Lam.

A climber of no great size with moderately thick stems ovate cordate rather thick leaves, and tubular white flowers, turning yellow soon. The sepals ovate obtuse, corolla tube thick $2\frac{1}{2}$ inches long, limb flat 1 inch across. Capsule large an inch through and seeds shortly villous.

Climbing over rocks and bushes at the wharf, collected also by Andrews "climbing on trees north coast."

Distribution Africa and islands, India Laccadives and Ceylon, Timor, New Caledonia, Australia and Polynesia.

Some authors have confused this with *I. bona-nox*, the well known moon flower which is utterly different. The flowers of *I. grandiflora* are very much smaller and it is not at all a conspicuous plant. It is evidently a sea shore plant and the seeds probably sea-borne.

Convolvulus parviflorus, Vahl.

A small climbing and twining convolvulus with ovate acuminate pubescent leaves $2\frac{1}{2}$ inches long, and umbels over half an inch across of small pink flowers, calyx densely silky hairy, capsule hardly longer splitting into 5 rather thin lanceate acute valves.

Common near Smith point and Rocky point, collected also by Andrews.

Distribution, India and Ceylon, Java and Australia. I have never seen this in the Malay Peninsula.

This is possibly introduced as a weed of cultivation, but it is difficult to say how it gets dispersed.

SOLANACEÆ.

Solanum biflorum, Lour. A herb 2 or 3 feet tall with white flowers and scarlet berries.

Not rare in open spots on the Plateau and on the track to the Waterfall.

First collected by Lister.

Distribution East Ava, Mergui, Malay Peninsula and Malay islands.

S. ferox, L. A shrubby herb very thorny and densely covered with yellow wool. On the road above Flying Fish Cove and Phosphate Hill, (Andrews).

Distribution Indo Malaya.

I did not see this plant, which is a village plant in the Malay Peninsula, more or less cultivated.

S. involucratum, Nees. A plant of similar habit with the broad ovate sinuate toothed leaves thinly covered with stellate hairs. Stem and leaves thorny. Flowers white, calyx in fruit large and thorny concealing the fruit.

Phosphate Hill, and on the track towards Murray Hill. Distribution Java. I have never seen this in the Malay Peninsula. My Javanese plant collector recognized it as a Javanese plant used in local medicine and probably introduced for that purpose.

Physalis minima, L.

A common or weedy plant, from a few inches to a foot high, sub-glabrous, pubescent or viscid leaves ovate entire or toothed or lanceolate. Flowers yellow with a dark centre, axillary $\frac{1}{4}$ inch long. Berry red globose in closed in the enlarged ovoid calyx.

Common in Flying Fish Cove and all cultivated ground, and also on the sea rocks.

Three forms were met with, the erect nearly glabrous plant with nearly entire leaves which is common in-waste ground; a shorter more prostrate plant with

broader pubescent leaves more dentate and rather larger fruit, which occurred on dry hot places near the sea, at the Waterfall; and a more woody prostrate plant densely viscid pubescent with many small round fruits, leaves small and crowded. This grows on very hot rocks above the sea at Smith point.

The plant which is common on waste ground and sandy sea shores in the Tropics of the Old World, is probably disseminated by birds, as also accidentally by man. It was first collected by Lister in Christmas Island.

Datura alba, L.

The white *Datura* is abundant along the coast line from Smith point to the Cemetery road. Also at the Waterfall. I did not see this except in the neighbourhood of cultivated ground. Andrews records it on all coasts, and as it was found in the island by Lister it must be classed as a native plant. It is a large flowered single white form.

Distribution Tropical Africa, India, Malay islands.

The *Daturas* probably originating in South America seem to have wandered far over Asia, and I believe from the curious way they have of turning up spontaneously in waste ground the seeds are dispersed by birds in spite of their poisonous nature. I have never seen any really wild in the Malay Peninsula, but *D. fastuosa* is commonly grown in medicinal gardens and is accidentally spread.

ACANTHACEAE.

Asystasia alba, n. sp.

An erect herb about a foot tall and little branched. Leaves opposite in distant pairs $1\frac{1}{2}$ to 1 inch apart blade lanceolate or ovate lanceolate acuminate at the tip, and cuneate at the base, thin light green sprinkled

on both surfaces with pale bristles, especially abundant on the midrib, back of the leaf covered with small pustules, nerves 9 pairs ascending conspicuous, 4-inches long $1\frac{1}{2}$ inches wide, petiole setulose $\frac{1}{4}$ - $\frac{3}{4}$ inch long. Raceme terminal 1 to $1\frac{1}{2}$ inches long. 6-7 flowered, flowers opening singly, rachis setose. Bracts $\frac{1}{8}$ inch long lanceolate acuminate. Pedicel little longer. Calyx split into five narrow lanceolate acuminate lobes nearly to the base $\frac{1}{4}$ inch long glabrous. Corolla one inch long hardly $\frac{1}{2}$ inch across tube narrow, gradually dilated in the upper part sparingly pubescent pure white. Stamens 4 equal, filaments long slender glabrous, anthers lanceolate minutely cuspidate at the tip, shortly prolonged into two blunt lobes at the base. Capsule woody narrow $\frac{3}{4}$ inch long dilated upwards 1-2 seeded.

This plant is very abundant on the lower terraces below Phosphate Hill and beyond the Waterfall. I suppose it to be the plant recorded in the Flora of Christmas Island by Mr. Baker as *Asystasia coromandeliana* forma the distribution of which is given as India and Malaya, Africa and Arabia. It would be interesting to know where in Malaya this plant is wild. It is often cultivated in gardens, and occasionally escapes along road sides in villages and towns, but it is certainly not native of the Malay Peninsula nor has it even established itself as a denizen. The only species of *Asystasia* which is indigenous to the Malay region which I have ever seen or heard of is *A. intrusa* Nees, which ranges from Celebes to Singapore, and the Christmas Island plant is certainly allied to that species and not to *A. coromandeliana*. I have a scrap of an apparently identical plant from the Tenimber islands (Timor Laut) collected by Mr. Pereira. The plant differs altogether in habit from *A. intrusa* Nees, which is a scrambling diffuse weed in hedges, and thickets and in its larger pure white flowers, those of *A. intrusa* being

violet. The seeds of *Asystasia* are dispersed by the exploding of the capsule as in so many *Acanthaceæ* but this of course would not account for the plant's reaching Christmas Island. They are too heavy probably for wind dispersal and were probably sea borne to the island. It grows in the lower woods near the sea, on soil chiefly formed of broken coral reef.

Ruellia prostrata, Lam. var *dejecta* Clarke.

A low spreading herb about 6 inches tall. Leaves ovate or lanceolate acute base cuneate 2 inches long and one inch wide sprinkled with white hairs on both sides especially on the nerves, petiole half an inch long hairy. Flowers solitary axillary opening in the afternoon. Corolla little more than half an inch long light violet dilated upwards. Capsule $\frac{3}{4}$ inch long base narrowed half its length then dilated pubescent. Seeds numerous orbicular flat margined above covered with minute white processes.

Flying Fish Cove common (Andrews) I could find only a few plants on some boulders close to Ross' old house.

Distribution East Africa, India, Ceylon, Malay Peninsula (type).

The variety *dejecta* is extremely different from the typical form, which is more compact with much smaller leaves, flowers much more dilated and at least twice as large. Mr. Clarke however has seen intermediate forms.

Possibly accidentally introduced, but may be dispersed by the adhesion of its minute slightly hooked seed processes, or may be sea borne.

Dicliptera maclearii, Hemsley.

A weedy plant 2 or 3 feet tall branched, growing in masses with lanceolate leaves pointed at both ends 1 to 3 inches long $\frac{1}{4}$ to 1 inch wide pubescent on both sides, petiole $\frac{1}{4}$ inch long or less flowers crowded in the

upper axils, outer bracts needle-like $\frac{1}{4}$ inch long inner bracts, broadly orbicular stalked ending in a sharp needle-like point, $\frac{1}{4}$ inch long green. Calyx very small sepals linear pubescent, corolla $\frac{1}{2}$ inch long narrow two lipped pink. Capsule very small.

Very common on the lower terraces, Flying Fish Cove, Waterfall, Cemetery Road etc. Endemic and first collected by Capt. Maclear.

When ripe the whole of the fruit including the broad spring bracts breaks off and adheres strongly to cloth etc., by which means the seed included between the bracts is carried about.

VERBENACEAE.

Callicarpa longiflora, Lam. var *glabrescens*.

A shrub about 6 feet tall leaves opposite ovate lanceolate acuminate 7 inches long 3 inches wide edge denticulate glabrous except for some stellate tomentum on the midrib on both surfaces and on some of the main nerves, petiole $\frac{3}{4}$ inch long tomentose. Panicles about 2 inches long tomentose. Flowers numerous white small. Calyx cup-shaped glabrescent, corolla lobes glabrous. Drupe globose $\frac{1}{8}$ inch long white.

Common on the Plateau, also the lowest cliffs and near Flying Fish Cove, collected first by Lister.

Distribution of *C. longifolia*, Lam. India, Malay Peninsula and Australia.

The common form of this plant has very tomentose leaves, covered with tufts of woolly hairs arranged stellately, its flowers also are pale lavender in color. The Christmas Island plant differs in its nearly glabrous larger and thinner leaves and white flowers.

The seed is dispersed by birds the small drupes being pulpy and sweet.

Stachytarpheta indica, L.

A low shrubby plant with brilliant blue flowers produced one or two at a time on a long erect raceme.

A few plants in Flying Fish Cove, collected also by Andrews. I met with one plant with white flowers.

Distribution all the Tropics

This occurs as a weed or cultivated plant all over the east, but seldom if ever except in waste ground.

Premna Lucidula, Miq.

A small straggling tree with obovate glabrous leaves narrowed at the base to a petiole, 3 inches long 2 inches wide or less, petiole $\frac{1}{2}$ inch long. Flowers $\frac{1}{8}$ inch across in a small terminal corymb shorter than the leaves 1 inch across tomentose. Calyx cup shaped. Corolla small white. Drupes $\frac{1}{8}$ inch long black.

Rocky places above Andrew's Lookout : collected first by Andrews, on "the first inland cliffs."

Distribution Java.

LABIATAE.

Anisomeles ovata, R. Br. A coarse much branched herb 2 or 3 feet tall, with a coarse scent.

Common Flying Fish Cove, Waterfall, cemetery road Phosphate Hill etc., in cleared ground or in open woods.

Distribution India, Malay Peninsula, and islands and China.

A more robust form than one generally meets with. First collected by Lister.

Leucas mollissima, Wall.

Herb about 2 feet tall, branched, leaves opposite ovate obtuse crenulate, shoots and both sides of the leaf especially lower surface pubescent. Flowers crowded in axillary whorls 11 or 12 in a whorl. Calyx $\frac{1}{4}$ inch long with alternate large and small teeth pubescent

Corolla not twice as long, white upper lip white pubescent, lower one glabrous.

Flying Fish Cove, Cemetery road.

Distribution Malay Islands, India.

First collected by myself in 1890.

APETALE.

NYCTAGINTEE.

Berhaavia repens var *diffusa*.

A branched prostrate herb branches 2 feet long pubescent. Leaves fleshy obovate rounded lower ones an inch long $\frac{1}{2}$ inch across entire with 3 pairs of strong nerves on the back upper leaves much smaller, all pubescent on the edges. Flowers very small pink crowded in terminal very lax panicles with few slender short branches pubescent. Perianth pubescent. Fruit $\frac{1}{8}$ inch long and 4 lobed aciniform viscid pubescent stamens 2 anthers very broad.

Flying Fish Cove on the beach, and along Cemetery road, and high upon bare rocks above the Cove.

Distribution all the Tropics.

This form is more robust and with thicker foliage than the Singapore seashore form, but it appears to be a very variable plant. With the typical form grew one with very condensed leafy branches, the panicle branches very short and flowers a little larger. It seems to be a monstrosity due to some insect attack.

B. repanda Willd is recorded by Hemsley from the summit. This species has not since been seen, and perhaps was an error for *B. repens*.

B. caespitosa, n. sp.

Whole plant forming a big tuft with a prostrate mass of branches two or more feet long, tips obscurely pubes-

cent. Leaves ovate to almost orbicular thinner than in preceding 1 inch long $\frac{1}{2}$ inch wide or much less glabrous pale, nerves 2 or 3 pairs deeply sunk on the upper surface when dry. Panicles lax terminal and axillary with few branches slender viscid. Flowers very small white crowded in small terminal heads viscid. Perianth short campanulate with 5 very short lobes, subacute. Stamens two much shorter, anthers globose. Style stout stigma large thick peltate. Fruit $\frac{1}{8}$ inch long oblong narrowed to the base with several ribs, viscid.

Flying Fish Cove.

I can quite imagine this plant, very distinct when alive, being confused with *B. repens* when dried material only is seen. It differs entirely in habit from any form of *Boerhaavia* I have seen, the flowers are invariably white. Stamens much shorter and stigma larger the fruit is ribbed but not distinctly angled as in the common plant. I have never seen it elsewhere.

Pisonia grandis, R. Br.

A big tree with a very thick stem covered with rather smooth grey bark, branchlets pale grey fragile. Leaves crowded at the ends oblong light green glabrous except the petioles, which are tomentose. Corymbs of green flowers fragrant about 3 inches long pubescent $\frac{1}{8}$ inch long. Flowers $\frac{1}{3}$ inch long tube short conical hardly lobed pubescent. Stamens 8 shortly exsert on fili-form filaments. Style as long pubescent stigma peltate.

Common close to the sea on rocks. Smith Point. Flying Fish Cove etc.

Distribution Australia and Polynesia, also on Cocos Island probably). (Forbes. Wanderings).

The fruit which I have not seen is said to be spiny and glutinous adhering to the feathers of birds, and is doubtless so conveyed about by the sea birds. The seeds of the Cocos Island plant often prove fatal to the herons by adhering to their feathers (Forbes lc. 30).

P. excelsa, Bl. A fairly big tree with deep green shining elliptic obtuse or acute leaves narrowed and often inaequilateral at the base 8 inches long 3 inches across, petiole 1 inch long, glabrous except for the base and axillary buds which are tomentose. The leaves are often whorled. Panicle terminal of a few umbelled branches, 1-2 inches across, on a pubescent peduncle 2 inches long. Flowers green $\frac{1}{4}$ inch long on pedicels $\frac{1}{8}$ inch long all pubescent. Perianth tube elongate conic, with very short rounded recurved blunt lobes. Stamens 8 filaments barely exsert, anthers small. Style as long stigma peltate. Fruit over 1 inch long, $\frac{1}{4}$ inch through, linear 4 angled, glabrous green exuding a very sticky gum, 1 celled.

Common on the Plateau, and the lower terraces. Flying Fish Cove etc. Not however a sea shore tree like the last.

Distribution Andaman Islands, Malay Peninsula, and islands.

This is not a very large tree, much more slender than the preceding species, the long slender fruits when ripe split and exude a very sticky substance which adheres firmly to cloth etc., and doubtless to bird's feathers.

The occurrence of this plant in the Malay Peninsula is curious as it occurs only so far as I know at Kuala Dipang in Perak, on the limestone rocks, a long way inland, but there is a native tradition that within historical times the sea came up to these limestone cliffs.

The flowers which are fewer and longer than those of *P. grandis* do not seem to have ever been previously described.

AMARANTACEÆ.

Deeringia celosioides, R. Rr.

A half shrubby plant usually scandent about 12 or 14 feet long leaves alternate light green ovate or ovate

lanceolate acute 6 inches long and three inches across petiole 1 inch long spikes axillary and terminal, 6 or 7 inches long. Flowers white crowded sessile, sepals 5 oblong stamens 5, stigmas 2-4. Fruit a ribbed crimson scarlet pulpy berry $\frac{1}{8}$ inch long.

Very common all along the coast over the sea, forming thickets.

Distribution India Malay Peninsula and Malay islands, New Guinea, Siam, China and Australia.

The flowers are white not red as stated Rendle. The fruit is bright red pulpy and sweet, and doubtless dispersed by birds. In the Malay Peninsula it only so far as I have seen grows on the limestone rocks in Perak, and this form has usually short inch-long spikes nearly all axillary. A plant inland at Bangtaphan collected by Dr. Keith had he says white fruits.

Achyranthes aspera, L.

A large weedy plant often quite shrubby 3 or 4 feet tall. Leaves ovate lanceolate or lanceolate acuminate at both ends pubescent 6 inches long by 3 wide. Spikes terminal and axillary 4 to 6 inches long, dense flowered bracts and bracteoles subulate with a short wing at the base, straw colored. Sepals 4 or 5 subulate $\frac{1}{4}$ inch long stamens.

Very common shore terraces, all along the coast.

Distribution Africa, India, Malay, Peninsula, Java, New Guinea, Australia and America.

The common form of this plant in the Malay Peninsula is a weed of cultivation the var *porphyrotachys* with longer and more slender spikes smaller rounds and more tomentose leaves.

The seeds are dispersed by the adhesion of the sharp sepals and bracteoles to cloth, bird's feathers etc., the whole flower breaking off.

Celosia argentea, L.

A common garden plant, grows in Flying Fish Cove by the old house etc., and also along the Cemetery Road, evidently introduced for ornament. It is visited by *Megachile rotundipennis*, *Odynerus polyhemus* and a syrphid fly.

Amaranthus viridis, L.

A common green weed occurring everywhere in waste ground where it is warm enough for it, is very abundant in Flying Fish Cove. Phosphate Hill etc.

I believe this plant is commonly dispersed by cattle and horses which eat it and pass the seed. It comes up very commonly in manure.

A. paniculatus, L.

A tall plant with a stout stem and large lanceolate blunt leaves narrowed at the base. Spikes some axillary but most crowded into a dense erect conic thyrse 6 inches long, pale green spikes horizontally spreading 1 inch long or less, acicular; bracts squarrose; seeds deep brown or black lenticular and margined. This plant is introduced as a cultivated one and has spread a little in Flying Fish Cove. It does not seem to be typical *A. paniculatus* which is practically only known in cultivation and is very variable. I have the same form from Kuala Lumpur in Selangor.

Neither of these Amaranthi previously recorded.

BALANOPHORACEÆ.

Balanophora insularis, n. sp.

Rhizome rather small about 2 inches through or less with one or more—about 5 stems, nodular and warted. Volva irregularly split into 4 or 5 rounded lobes. Stems 3 or 4 inches tall, entirely lemon yellow, fleshy $\frac{1}{4}$ inch thick. Leaves oblong linear blunt at first appressed,

later spreading, $\frac{1}{2}$ inch long $\frac{1}{4}$ inch wide upper ones smaller, subacute, margins towards the tip often denticulate. Inflorescence one inch long base with scattered male flowers for $\frac{1}{2}$ inch, apex elliptic ovoid in outline blunt bisexual portion a little longer $\frac{3}{10}$ inch through. Male flowers about $\frac{1}{8}$ inch across nearly sessile. Perianth lobes oblong subquadrate truncate upper and lower ones larger than the lateral ones, at the base where the staminal thecae are numerous, linear oblong and equal above where there are few. Andræcium transversely oblong, thecae 7-8 or fewer hexagonal. Female flowers shortly stalked with numerous obovate tailed spadicels, ovary obovoid obtuse minutely pustulate.

Rare, on the shore terrace south of the Waterfall, on the top of Steep rock, and in the centre of the Island on Murray Hill track, a single plant at each place, growing in soil overlying detritus of coral reef. Also collected in Pulau Aur, on the east coast of the Malay Peninsula by Mr. Fielding in 1892.

The occurrence of a *Balanophora* in Christmas Island was most unexpected, and is interesting from many points of view. The species is allied not as might be expected to any Javanese species but to *B. Hildebrandti* Rchb. fil a native of Tahiti, and the Comoro islands, from which it differs in its smaller size, fewer anthers, and shortly stalked male flowers. The bisexual yellow *Balanophoras* have a curious distribution, ranging from the Polynesian islands, to Salayer Island.

Tenimber, Christmas Island, Pulau Aur and Comoro Island; the species being.

B. jungosa, Forst.

B. Hildebrandti, Rchb. Tahiti and Comoro.

B. Micholitzii, Ridl. Tenimber Laut.

B. Zollingeri, Fawe. Salayer.

B. insularis, Ridl. Christmas Island and Pulau Aur.

B. abbreviata, Bl.

All seem to be insular plants. The seeds are very light, and in *B. insularis*, a puff of wind blew those of a ripe plant away like the seeds of an orchid. The plant is doubtless wind dispersed, and although it grows very low on the ground hardly projecting more than 2 or 3 inches, in thick woods so that one would hardly expect the winds to drift its seeds high enough to cross the sea, still it has a parallel here, in the little woodland plants *Zeuxine* and *Didymoplexis*. The occurrence of the plant in Pulau Aur as well is of interest as that little island is also the only other known locality of *Sarcochilus carinatifolius*.

I could not determine what tree this plant was parasitic on. The first gathered was nearest to a *Barringtonia*; another below a *Ficus retsa*.

PIPERACEAE.

Peperomia laevifolia, Miq.

A small green succulent branched herb with alternate rhomboid lanceolate bright green fleshy leaves pale beneath, an inch long spikes very slender 2 inches long with minute flowers. Fruit globose minute brown closely pustular.

On tree trunks on the Plateau Common.

Distrib. Mt. Salak, and Tjapus river, Java.

P. exigua, Miq.

A small branched succulent herb, erect or half prostrate 3-10 inches long succulent stems slender pinkish branched. Leaves alternate ovate, or ovate cordate shining light green $\frac{1}{2}$ - $\frac{3}{4}$ inch long and broad pale beneath. Spikes axillary erect very slender 1- $\frac{1}{2}$ inch shortly peduncled. Flowers distant. Bract ovate subacute. Fruit globose not distinctly beaked ribbed and warted.

Flying Fish Cove on rocks close to Ross' House.

This little plant has been widely spread over the east in cultivated ground especially in gardens where it come up every where, but I have never seen it wild. It occurs thus all over the peninsula, also in the Philip-pines and New Guinea (and is the *P. ruderalis* Schumann) and is also met with in Burmah.

P. Rossi, Rendle.

This which I did not meet with described as 3-4 inches tall with opposite leaves elliptic petioled, obtuse, black dotted with thick dense flowered spikes, round peltate bracts and a sub-globose apiculate punctate fruit.

No locality is given for it, but it is endemic.

The minute seeds of the Peperomias, might be wind borne, and most of them are more or less sticky so that they might be dispersed on bird's feathers

LAURINEAE.

Cryptocarya Nativitatis, Rendle.

A big tree with ferruginous woolly shoots. Leaves elliptic or ovate lanceolate coriaceous shortly petioled 4-6 inches by $1\frac{1}{2}$ - $2\frac{1}{2}$ inches wide. Panicles terminal 1-2 inches long, many flowered. Flowers greenish white small. Fruit globose shining black.

Common on the Plateau, and upper part of Phosphate Hill. Endemic allied to an Australian species.

The fruit is one of the great food supplies of the pigeon, though it has only a very scanty purple pulp.

Hernandia peltata Meissa.

A very big tree with ovate peltate long-stalked leaves, and corymbs of dull greenish flowers. The black globular ribbed fruit is enclosed in the yellowish white calyx enlarged to a bladder shape, but open at the top. It is 2 or 3 inches through. The fruit is doubtless sea-dispersed as the large bladdery calyx

would easily float and, owing to its being weighted at the bottom with the fruit it would float upright with the aperture upwards.

It is common on the Plateau, but I did not see it on the lower terraces.

Distribution Andaman Islands, Ceylon, Lankawi and a few other places on and round the Malay Peninsula, Malay islands, North Australia, Polynesia, South Africa and Madagascar. Always a sea shore and generally an island plant.

EUPHORBIACEAE.

Euphorbia thymifolia, Burn.

A low prostrate herb common in Flying Fish Cove, on Phosphate Hill and near the Waterfall. Not previously recorded. All Tropical countries.

E. pilulifera, Linn.

An erect weed, abundant in Flying Fish Cove, Waterfall Cemetery road etc. A somewhat diffuse and more flaccid form occurred in woods near the waterfall.

Distributed over all the tropical and sub-tropical countries. First recorded by Andrews.

E. atots Forst.

A shrubby plant 2 or 3 feet tall.

Common on the bare cliffs above the sea Flying Fish Cove, Smith point, Rocky point etc. Distribution India, Malaya, China, Australia.

Phyllanthus Niruri, L.

A common weed about a foot tall.

Flying Fish Cove.

Distribution all the tropics except Australia. A weed of cultivation usually.

Croton caudatus, Geisel.

A woody climber with rough ovate leaves which turn orange red long before falling, making the plant very conspicuous. Flowers in short racemes, yellowish white.

Very abundant and often troublesome to get through. Phosphate Hill, North East Point, Andrew's Look-out etc., and on most of the shore terraces near the sea. I only met with it in male flower as did Andrews. It certainly does not seem very floriferous here.

Distribution India, Ceylon, Malay Peninsula, Java, Philipines.

This is not typically a sea shore plant. The fruit may however be dispersed by sea.

Claoxylon cærulescens, n. sp.

A large bush with white stems. Leaves light green ovate acute or acuminate crenulate dentate 6 inches long, 3 inches wide, pubescent on the back, especially on the nerves, turning indigo-blue when withering. Flower spikes woolly axillary $\frac{1}{2}$ inch long. Calyx 4 lobed, lobes ovate woolly green, ovary pubescent. Hypogynous scales shorter than the sepals linear entire, stigmas entire recurved. Fruit obconic $\frac{1}{3}$ inch long, hairy outside and in the cells green soft obscurely trilobed. Seed sub-globose wrinkled.

Common, Rocky Point, Phosphate Hill.

The fruits, seed and ovary when dried and poisoned with spirits become of a pink color. This plant is obviously the one recorded by Rendle as *Claoxylon rubescens*, Miq. based on a plant of Zollinger's collected in Java, Miquel's description is short and differs from the Christmas Island plant in most respects, thus the peduncle and petiole are described as rubescent, the top of the petiole glandulous, the base of the leaf acute, the leaf itself glabrous, the spikes graceful, and soon glabrous,

not one of which characters fits this plant. There seem however to be indistinct traces of glandular structure covered with hair at the top of the petiole.

The reddish color noticed by Miquel may be due to some post mortem treatment with corrosive subnitrate, for he did not see the plant alive, the bases of the leaves which are distinctly pubescent on the back, are rounded, the spikes are remarkably short, and hairy even in fruit. He gives practically no other characters which are not common to nearly all *Claoxylons*, so that having only his description to go on, which after all is more important than a type specimen, I consider it advisable to give the plant, a new name, alluding to the deep blue colour of the withering foliage.

Macaranga tanarius, L.

A tall tree, with peltate leaves 6-18 inches long ovate subacute gland-dotted and hairy on the nerves beneath, glabrous above, petiole long glaucous. Flower spikes paniced green. Panicle 6 inches long, male flowers very numerous and small, about 8 or more in a head surrounded by a broad entire cupshaped pubescent viscid bract nearly as long as the flowers. Capsule $\frac{1}{4}$ inch long sub-globose with 4 or 5 tails $\frac{1}{2}$ inch long from the upper end; all covered with sticky viscid glands exuding a yellowish gum.

Common on the shore terraces Smith-Point, Cemetery, and below Phosphate hill on both sides, Waterfall etc.

Distribution Andamans, Malay Peninsula and islands.

The *Macarangas* in the Malay peninsula are usually bird-dispersed, the small pigeons being very fond of the seed. The stem of this plant is solid, though nearly all the allied species have hollow stems tenanted by ants.

Cleidion javanicum, Bl.

A shrub or small tree, leaves oblanceolate acuminate, narrowed towards the base, usually more or less den-

tate, glabrous bright green 6 inches long by 3 inches wide. Male spikes paniced terminal slender 3 or 4 together pubescent 2 or 3 inches long. Flowers distant tufts very small yellow. Calyx lobes ovate obtuse 4. Stamens 4 filaments very short, anthers large globose. Female panicles axillary or terminal. Fruit sub-globose 3 lobed $\frac{1}{4}$ inch long smooth. Seed sub-globose oblong slightly flattened on one side smooth grey.

Common Rocky point, Plateau, Phosphate hill.

Distribution India, Ceylon, Penang, Java.

Very variable in the form of its leaves which are usually toothed, but a very distinct looking form along the Cemetery road had all its leaves entire.

Acalypha fallax, Muell. Arg.

A; *Wightiana* Muell. Arg.

A common herbaceous weed about a foot tall, very hispid. Leaves ovate acuminate crenulate dentate hispid $1\frac{1}{2}$ inch long 1 inch wide, petiole $\frac{1}{2}$ inch lower leaves smaller. Spikes very numerous green $\frac{1}{2}$ -1 inch long axillary. Male flowers terminal very small. Females enclosed in a broad toothed hairy bract. Capsule hairy very little longer than the bract.

Common in Flying Fish Cove.

Distrib. India, Ceylon, Malay Peninsula, Sumatra, Java.

This weed is common in waste ground round towns etc., and is probably introduced into Christmas Island accidentally by man.

URTICACEAE.

Celtis cinnamonea, Lindl.

A moderate sized or tall tree with very foetid old wood. Leaves deciduous before flowering ovate acuminate or subacute, with crenulate edges, bright green, nerves 3 prominent beneath pubescent, petiole and branches

pubescent 2-4 inches long $\frac{3}{4}$ -3 inches wide. Flower spikes $\frac{1}{2}$ inch long dense-flowered on the bare parts of the branches yellowish. Flowers $\frac{1}{8}$ inch long shortly pedicelled, pedicels and peduncles woolly hairy. Sepals 4 oblong glabrous. Stamens 4 filaments slender surrounding a woolly disc. Drupe green $\frac{1}{4}$ inch long obpyriform, base narrowed, and apex pointed, on long slender axillary peduncles 2 inches long.

Common Flying Fish Cove, Phosphate Hill, North East Point, Plateau etc.

Flowering October, and one tree fruiting the same time.

Distribution India, Ceylon and Malay Islands, absent so far as is known from the Malay Peninsula.

The seeds are probably dispersed by birds as those of the allied *Gironniera* certainly are. The horrible odour of the dead wood is caused by scatol, which is often deposited in crystals in cracks in the bark. I observed a number of pigeons (*Carpophaga*) in a flowering tree apparently eating the young flowers.

Trema amboinensis, Bl.

A common shrub or almost a tree about 12 or 14 feet tall. Very abundant in Flying Fish Cove and at the lower part of Phosphate hill, forming a great part of the secondary scrub after clearing. The small red drupes are eaten by birds, but as this appears to be a comparatively late introduction into the island, and has spread no further than cultivated ground it may have been accidentally introduced by man.

Distribution India, Siam, Andamans, Malay Peninsula and Islands, Australia, Polynesia.

Ficus retusa var *nitida*.

A large spreading tree with very many strong aerial roots. Leaves small coriaceous dark green shining

oblong or elliptic blunt or rounded at the tip or subacute, base cuneate 2-3 inches long 1-1½ wide. Figs globose as big as small peas, green. The flowers are mostly distinctly pedicellate.

Common over the whole island. Fine trees occur about Flying Fish Cove and on the Plateau, and also near the Waterfall. It is very abundant too on Steep rock.

Distribution India, Assam, Burmah, Malay Peninsula and Islands, Philippines, South China, New Caledonia and Australia. The var *nitida* India, Burma and Malay region.

Sir George King describes it as having "a few aerial roots" but it produces very many of large size.

F. saxophila, Bl.

A short stout much branched tree about 20 feet tall. Leaves quite glabrous thinly coriaceous ovate cordate at the base and subacute or blunt at the tip 5 inches long 3 inches wide, petiole 3 inches long. Figs clustered in the upper axils sessile half an inch long, yellow or crimson scarlet shortly beaked, bracts ovate pubescent. Achenes keeled or angled fusiform dark red. Female flowers with 4 lanceolate acute narrow sepals.

On Andrew's Look-out, and also on steep rock, and about Flying Fish Cove, on rocks.

This differs from *F. saxophila* of King's Annals of Calcutta Garden vol. I. p. 17, pls 12 and 8. in the blunter leaves, much larger figs, and the bracts being pubescent which he does not mention, but he says that the plant is not well represented in herbaria. It is however doubtless the plant intended by Blume.

Distribution Java Timor and Buru. The fruits in the tree at Andrew's Lookout though apparently ripe were yellow, those at Steep Rock of a brilliant red.

Laportea crenulata, Gaud.

A shrub or small tree with grey white bark and hollow branches. Leaves deep shining green glabrous above and often beneath except for a few stinging hairs, edge usually undulate or almost crenulate, blade broadly oblong ovate base rounded to oblong lanceolate narrower 10-15 inches long 5 to 8 across, petiole 2 to 6 inches long. Male panicles 1-2 inches long axillary below the leaves, armed with stinging hairs. Flowers in small clusters globose, stinging. Females panicles much longer lax a foot long or less covered with stinging hairs. Flowers very small green 4 sepals hairy, style longer. Achene discoid $\frac{1}{8}$ inch long flat wrinkled or warted.

Common in Flying Fish Cove, Phosphate Hill Waterfall etc.

Distribution India, Malay Peninsula, Siam, Sumatra, Java, Borneo.

Apparently very variable in foliage if all the forms included are of this species. It is well known from its stinging powers which however vary a good deal some being very severe stingers, others sting hardly at all. The Christmas Island one stings somewhat severely.

L. Murrayana, Rendle.

A tree about 20 feet tall with pale bark branches hollow. Leaves ovate or orbicular peltate acute or obtuse 3-7 inches long 2-4 wide nearly glabrous light green. Male panicles 2 inches long glabrous. Flowers in small distant clusters, buds globose, sepals four obovate obtuse glabrous. Stamens very short 4. Pistil- lode globose. Female panicles 3-5 inches long much more diffuse. Flowers very small in small tufts. Stigma much longer. Achene discoid $\frac{1}{16}$ inch across margined.

Flying Fish Cove, on rocks near the magistrate's house, apparently unsexual. I only saw two or

three trees, which flowered at the end of October. The leaves sting and the flowers are green. Rendle says it is near *L. laxiflora* of Java, which has leaves pubescent beneath and the female inflorescence larger than the petioles, but in my specimens the inflorescence of the female plant is certainly longer than the petioles.

Cudrania javanensis, Trecul.

A big woody climber, with pale branches and strong $\frac{1}{2}$ inch spines. Leaves very variable from lanceolate acuminate to elliptic obtuse 1-3 inches long $\frac{1}{2}$ -1 $\frac{1}{2}$ across, glabrous, petiole and branchlets pubescent and the nerves of very young leaves also. Male flowers in small yellow balls $\frac{3}{16}$ inch across leaves shortly peduncled pubescent. Sepals cuneate hairy; stamens 4. Female heads twice as large style. Fruit a fleshy head of drupes.

Very common Rocky point, Phosphate hill, Plateau etc.

Distribution East Africa, Ceylon, India, Malay Peninsula and Archipelago, Australia.

An abominably spiny plant with deep green leaves forming a bush in open places but a big climber with a stem as much as 4 inches through in the forest. The style in all the specimens I have seen from Christmas Island is simple.

Fleurya ruderalis, Gaud.

A common weed about a foot tall herbaceous with ovate crenate subacute leaves 2-4 inches long, sparsely hairy or nearly glabrous with rather long petioles. Panicles axillary lax but numerous much branched 1 inch or less long, the flowers in small peduncled tufts. Achenes very small, smaller than in *Fl. interrupta* ovate flattened edge thickened and ribbed, beaked.

Common, Flying Fish Cove, Smith Point.

Distribution Java.

This plant was first collected by Lister and as no one had lived on the island previously it may be taken that it was not introduced by man, but I could not find it on Christmas Island except in cleared cultivated spots, and at places where fishermen went to fish off the rocks. On frequented tracks it often occurred but not off the tracks, so that it is certainly now carried about by man.

The common species in the Malay Peninsula is *Fl. interrupta*.

Boehmeria platyphylla, Don.

A shrub or very soft wooded tree about 18 feet tall, branches pubescent hairy. Leaves soft green ovate acuminate crenulate dentate base rounded 3-6 inches long 3-4 inches wide, sprinkled with short hairs above, silky pubescent beneath, petiole 1 to 3 inches long. Male panicles 1 to 3 inches from the axils of the upper leaves, branches an inch or less long. Flowers small globose clustered in distant heads. Calyx cupshaped pubescent with four short acute lobes. Stamens 4. females rather longer and slender. Flowers much smaller silky pubescent stigma very slender. Achene minute ovoid or fusiform, angled covered with sticky pubescence.

Common Flying Fish Cove, Phosphate Hill.

Distribution Africa, India, Ceylon, Sumatra, Java.

This shrub stings about as badly as the *Laportea*.

Proctis pedunculata, Wedd.

A succulent herb hardly shrubby with bright green fleshy stems and leaves. Leaves 5-6 inches long $1\frac{1}{2}$ inch wide entire obliquely lanceolate acuminate, shortly petioled, nerves 4 pairs alternate, opposite leaves reduced to a oblong lanceolate or ovate lamina $\frac{1}{4}$ inch long male panicles 1 inch long, peduncles slender branches 3. Flowers very small in cymes green.

Female flowers in small sessile heads $\frac{1}{4}$ inch through. Achenes small lanceolate acuminate punctate brown.

Abundant on the shore terraces and Plateau growing on rocks.

Distribution Mascarene Islands, Malay Islands, Polynesia.

UNIDENTIFIED PLANTS.

A. A big tree about 80 feet tall with thick stem covered with flaky bark, branches smooth. Leaves alternate ovate or elliptic acute glabrous deep shining green, 6 inches long 4 inches wide, nerves 6 pairs anastomosing within the margin petiole one inch long, Panicles terminal. Flowers minute $\frac{1}{16}$ inch long, sepals 5 free nearly to the base ovate pubescent, petals 5 as long subspathulate or ovate pubescent. Pistil superior. Fruit a yellow berry $\frac{1}{4}$ inch long, sepals persisting below, globose ovary 2 celled 2 ovuleds.

Not common, Flying Fish Cove, and along road to Cemetery.

This fine tree appears to be a *Mappia* (*Olacineae*) but I was unable to get complete flowers of it. There is a small piece of what appears identical with this plant in the Singapore herbarium apparently collected by Mr. Canttey in Singapore, but I have never seen the tree elsewhere in the Peninsula.

B. A big woody climber, climbing to the tops of the trees on the plateau. Branchlets stout covered with a deciduous ferruginous tomentum. Leaves alternate or subopposite elliptic subcoriaceous 6 inches long by four inches wide obtuse base broad glabrous above; midrib beneath elevated red tomentose, and lamina finely gland dotted, nerves about 10 pairs alternate elevated, reticulations transverse distinct when dry, petiole thick $\frac{1}{4}$ inch long red tomentose. Flower spike

axillary peduncled, but too young to give any further information about it.

This is a very common liane all over the plateau, but all search for flowers or fruit was in vain except of a very young spike once found. It does not seem to have been collected by any previous botanists.

C. A medium-sized tree, branches slender covered with rather stiff appressed pale hairs. Leaves opposite lanceolate acuminate 4 inches long, one and a half inch wide, nerves about 8 pairs not very distinct, dull green nearly glabrous except for a few hairs on the midrib beneath petiole $\frac{1}{4}$ inch long.

Common in the Plateau woods and on Phosphate hill, I could find no trace of flowers or fruit.

D. A shrub abundant at Waterfall bay on the rocks in the wood, very closely resembling *Clerodendron inerme* and possibly it, but I could not find a trace of flowers or fruit though I visited the place at several periods.

MONOCOTYLEDONS.

ORCHIDÆ.

Dendrobium pectinatum, n. sp.

D. Macraei Rendle (not of Lindley).

Creeping stems $\frac{1}{4}$ inch through closely jointed, branches numerous 6-12 inches long greenish yellow pseudo-bulbs elliptic oblong flattened $1\frac{1}{2}$ inches long $\frac{1}{2}$ inch wide. Leaf lanceolate obtuse coriaceous 3 inches long 1 inch wide. Flowers opening singly $\frac{1}{2}$ inch long pale yellow sepals lanceolate acute. Petals narrower lanceolate. Lip shorter, claw narrow linear, blade somewhat dilated, slightly retuse with numerous very narrow linear filaments on each side.

Abundant on trees on Phosphate Hill and the Plateau, flowering October.

Dendrobiums of the section *Desmotrichum* are very difficult to describe from dried specimens, as the flowers are of thin texture and very fugacious, and as they only open for a few hours in the morning and are withered by midday. It is not often that collectors can procure good specimens. These are no doubt the reason why there has been so much confusion over these plants and for the identification of the Christmas Island plant with *D. Macraei* Lidley a species apparently confined to Ceylon, and utterly different, belonging indeed to a different, subsection.

In the Flora of British India, a number of different species are recorded as synonymous with *D. Macraei*, including the Himalayan *D. Rabani* and Javanese *D. flabellum*, a plant with large red spotted flowers. *D. pectinatum* is more nearly allied to the *D. calopogon* Rihb. fil, Xenia, Orch. p. 23 pl. 109, fig. 1. 2. of unknown locality but differs in the form of pseudobulb and narrow claw of the lip, and I cannot identify it with any described species. A considerable number of Javanese *Desmotrichums* were described by Blume in the *Bijdragen*, but as in most of his early work so badly that it is utterly impossible to guess at what he meant, and thus they had better be relegated to the class of *nomina nuda* and ignored.

D. crumenatum, Sw.

Common all over the island especially on trees on the Plateau. The plant which is quite typical, was scantily in flower at the time of our visit. I obtained it in 1890 and Andrews also got it.

Distribution, Malay Peninsula and Islands, Southern Siam.

Phreatia Listeri, Rolfe.

A small orchid with greenish white flowers in slender spikes. Common on trees on the Plateau.

Endemic. Collected also by Lister and Andrews.

Ph. congesta, Rolfe.

A small orchid with tufted spikes of white flowers.
Common on trees on the Plateau. Endemic.

Saccolabium Archytas, Ridley.

Very common especially on the trees of the lower Terraces. Endemic. This pretty plant grows in masses on the bare trunks of the *Gyrocarpus* and other trees. The flowers are white with pink spots.

Dendrocolla carinatifolia, Ridley.

Sarcochilus carinatifolius, Ridley.

Less common than the last, and chiefly on the trees on the Plateau. One plant I found had the petals of a pale ochre colour.

Collected also by Andrews. It occurs also on Pulau Aar, an Island off the East Coast of Johor.

Thelasis elongata, Bl? A quantity of plants of a *Thelasis* resembling *Th. elongata* Bl. occurred on trees in the plateau near Murray Hill, no trace of flowers, was to be seen, and I have failed to flower it in the Botanic Gardens. *Thelasis elongata*, Bl. is a native of Java.

Corymbis angusta, n. sp.

Stems 2-3 feet tall slender woody. Leaves lanceolate acuminate acute, dark green 8-11 inches long 2-2½ inches wide sheaths ribbed. Panicles 2 or 3, 4 inches long lax. Bracts ovate lanceolate acute ⅙ inch long. Pedicels ¾ inch long rather slender. Flowers white smaller than usual. Sepals 1¼ inch long very narrowly linear. Petals similar. Lip as long, claw very long and narrow channelled, limb ovate shortly cusped edges crisped, ¼ inch across and little longer. Column slender 1 inch long, anther lanceolate blunt. Stigma ovate triangular. Rostellum very small narrow deeply bifid. Chinandrium sides winged. Fruit 1 inch long as long as the column costae very narrow.

Common on the plateau and occasionally descending to the lower reefs, in forest. Flowers fragrant.

The genus *Corymbis* includes about six or seven species ranging from tropical Africa to Australia. All it is true are closely allied, and the differences are so slight in many that one would be almost inclined to consider them as forming one species only. There are few forms however as distinct specifically as the Christmas Island plant. In habit it is slender and weak, very different from the tall stout *C. veratrifolia* Bl. with which it has been confused by Rendle, but this might have been due to the peculiarly dry locality in which it grows. The flowers are smaller, and the extremely narrow petals and sepals, long narrow claw to the lip, the limb of which is more ovate and much smaller, and the different form of the clinandrium which has thin elevated wings on either side, and of the small narrow rostellum and broader stigma, make it quite distinct from the Javanese and Malayan species.

Didymoplexis pallens, Griff.

A small terrestrial orchid. Stem slender 4 inches long in flower becoming stouter and growing to 8 inches tall in fruit. Leaves $\frac{1}{6}$ inch long ovate. Flowers 2 or 3, shortly pedicelled flesh-colored. Sepals oblong obtuse. Petals ovate obtuse. Lip entire with 3 nerves not elevated, numerous scattered papillae and a raised mass at the tip of crowded papillae, apex broad crisped denticulate. Column broad, anther rounded flat papillose. Wings obscure. Stigma transversely elliptic. Pedicels lengthening in fruit to 6 inches long. Capsule globose, with slender ribs $\frac{1}{2}$ inch long.

Woods in the centre of the island towards Murray Hill. This plant is always difficult to find. I got 3 specimens in flower and one in fruit, growing among a carpet of *Acrostichums*.

I cannot distinguish this plant from the *C. pallens* of India and the Malay peninsula. It is probably a native too of Java, but I am doubtful as to the *D. pallens* of Smith in the Ic. Bogor, found at Buitenzorg.

Zeuxine exilis, n. sp.

Whole plant 12-18 inches tall succulent, rhizome shortly creeping, roots fleshy. Leaves lanceolate acute light green 1-3 inches long $\frac{1}{2}$ - $\frac{3}{4}$ inch wide glabrous, shortly petioled, sheaths papery $\frac{1}{2}$ inch long. Stem white-hairy, peduncle (portion of stem above leaves) 3-6 inches long, raceme many flowered 1-3 inches long. Bracts lanceolate acuminate hairy. Sepals reddish hairy lanceolate acute $\frac{1}{8}$ inch long. Petals thin white adnate to the upper sepal. Lip base saccate with broad wings, then narrowed, limb broadly bilobed, lobes broad oblong divaricate edges crenulate, processes in the base of the lip 2. slender subulate curled, whole lip white with a central yellow bar. Column short, anther lanceolate beak up curved dull red, pollinia elongate pyriform, disc large oblong. Rostellum lobes linear acuminate. No accessory processes. Capsule pubescent elliptic $\frac{1}{4}$ inch long.

Centre of the island, among ferns not rare.

Endemic.

AMARYLLIDAE.

Crinum asiaticum, L. The common white *Crinum* of the Indo-Malayan shores, is abundant on the rocks in many places, e.g. Andrews Look-out, N. E. point, at the Waterfall and Rocky point. It grows in clefts in rocks often in somewhat inaccessible places over the sea, and occasionally on the more inland terraces. The form is quite typical. It commenced to flower at the close of our stay and fruit were also found. It is a natural flowering plant, and a certain attraction for *Sphinx Convolvuli*, of which insect I took two or

three at the flowers of plants growing in the Settlement at Flying Fish Cove, this being the first record for this almost ubiquitous hawkmoth in the island. The large corky seeds are sea-dispersed being well adapted for this. Plants however occur often abundantly in hollows in rocks far from the sea at the present time, and at a great height above it, suggesting that the ancestors of these plants were there at the time when these now inland reefs were close to the sea. The plant though doubtless rapidly dispersed by sea, moves but slowly inland and apparently climbs up the rocks in the following manner. The long peduncles after flowering droop as the fruit develops till it reaches the ground when the seeds all fall and usually lie in a pile on the ground, where some at least germinate. On the sloping rock-faces the peduncles which fall towards the upper slope drop their seeds thus about four feet above the parent-plant, and so it creeps gradually up. Seeds from peduncles which droop downwards over the precipice either fall into the sea, or into the woods at the base of the precipice where they can seldom grow. Around the Malay coasts the plant almost invariably grows in sand or mud, close to the sea, but there is hardly any suitable place for this on Christmas Island as all the shores are mere masses of coral fragments turned over by the waves in the seasons of gales, and with no soil beneath. It grows however well enough where there is soil in Flying Fish Cove.

Crinum Asiaticum, L. is distributed over India, Ceylon, the Malay Peninsula and Islands Admiralty Isles, Japan and North Australia, Polynesia, Fiji Islands.

PALMÆ.

Arenga Listeri, Becc.

A single stemmed palm about 30-70 feet tall and 6-15 inches through, grey and distinctly ringed.

Spathes 4 or 5 lanceolate acuminate coriaceous pale brown ribbed and keeled towards the tip 6-8 inches long $1\frac{1}{4}$ inch across, spadices numerous about 2 feet long with numerous spikes 18-24 inches long male flowers, calyxlobes 3 rounded imbricate. Petals $\frac{1}{4}$ inch long spatulate woody yellow.

Stamens shorter about 40, filaments connate at the base, free about half their length, slender filiform, anthers linear oblong.

Fruit oblong elliptic $\frac{1}{2}$ inch long pink, 3 seeded. Common all over the island but chiefly on the upper terraces. When the tree has fruited all the leaves fall off and the dead or dying stem with the inflorescences persisting has a most curious appearance. The spadices are in threes 2 males and 1 female. They are only produced about half way down from the top not down to the base as in the other species of the genus. The flower has a musky scent.

Endemic, and not closely resembling any other species. The fruit is much more like that of a *Didymosperma* being small elliptic and pink with 3 seeds elongate flattened acute at both ends, pale brown. It is very difficult to get ripe seed of this plant, as soon as the fruit is ripe hundreds of the large robber crabs swarm round the tree and devour the seeds, crushing them in their jaws. They do not eat the pulp of the fruit. Hardly one seed is left and only those survive which have fallen into cracks, or got somehow covered up and concealed from the crabs. The young shoot of the palm is excellent either raw or cooked, and formerly I procured some excellent flour made from the stem.

PANDANÆÆ.

Pandanus nativitatis, n. sp.

A bushy pandan with branched stems, about 8-14 feet tall. Leaves six feet or more long 2 inches wide linear

acuminate edge and keel with close-set pale thorns. Male spadix a foot or more long. Bracts about 10 linear acuminate 2 feet long or less 1 inch wide white. Branches of spadix 2 inches long or less numerous, acuminate not candate. Stamens very numerous in racemes, anthers linear mucronate much longer than the filaments which are very short.

Fruit as big as a man's head orange when ripe, rachis stout 6 or more inches long. Syncarps of 5 to 22 carpels, 2 inches long oblong, top broad, $\frac{1}{2}$ inch wide irregularly angled. Stigmas little elevated.

Common along the coast edges forming dense almost impenetrable thickets along the whole coast line above the sea. Very near *P. Forsteri* of Lord Howe's Island. This has just the habit and general appearance of *P. odoratissimus*, L. the plant that is so common along the Malay coasts, but it is less glaucous, the leaves and bracts not tailed, the syncarps a little shorter and broader and more deeply grooved. The male flowers are indistinguishable.

P. elatus, n. sp.

Stems few together 40 to 60 feet tall 6 inches through very hard with numerous short hard aerial roots at the base, grey and sparingly thorny, above with a few erect branches. Leaves when young 6 to 10 feet long, adult 6 feet linear acute 4 inches across thorns at the base and tip very numerous and close bases swollen tip red brown $\frac{1}{8}$ inch long more distant in the middle of the leaf, and distant on the keel. Male spadix dense about 8 inches long. Bracts over a foot long linear acuminate hardly thorny. Spikes very dense 6 inches long 1 inch through or shorter. Stamens fasciated on a short stem, anthers crowded at the top, filaments short anthers oblong obtuse shortly mucronate. Fruit on a peduncle 2 feet long and $2\frac{1}{2}$ inches thick, oblong 12 to 15 inches long 7 inches through. Syncarps $1\frac{1}{2}$ to 2 inches across and $\frac{3}{4}$ inch

wide. Drupes 9 to 10 or fewer in a syncarp glaucescent bluntly angled tops free, 3 inches long $\frac{1}{2}$ inch or less through style short. Stigma ovate acute sloping nearly $\frac{1}{4}$ inch long. Common in the interior on the Plateau. Endemic.

AROIDEAE.

Remusatia vivipara, Schott.

This was obtained by Andrews on the Phosphate Hill Road in January no one has seen it there before or since. I carefully sought both the old road and the new one and the surrounding region in vain for it. But possibly it had temporarily vanished during the hot and dry season. It should be looked for again in the rains.

The plant occurs in India, Ceylon, Siam and Java but is apparently absent from the Malay Peninsula proper.

CYPERACEAE.

Cyperus Iria, L.

Small plants of this very widely distributed sedge were found at Smith Point.

It was evidently a recent introduction, as it was not seen by Andrews, and seemed hardly to have established itself.

Mariscus albescens Gaud, *Cyperus pennatus*, Lam.

This fine rough sedge with its great tufts of stiff glaucous leaves and panicles of pale brownish spikelets, grows on the basaltic rocks over the sea just beyond the Waterfall. It was nearly out of flower at the time of our visit and had not previously been seen.

It is a common sea shore plant distributed over Tropical Africa, India, Ceylon, Malay Peninsula and Islands, Australia and Polynesia.

Apparently it would not grow on the limestone rocks, being confined to the basaltic outcrop.

Fimbristylis cymosa, R. Br.

A narrow leaved tufted sedge forming clumps resembling those of the Thrift (*Armeria*) in rocky dry spots above the sea. This was first recorded from the island by Hemsley from Lister's collection and was overlooked by Andrews. It is very common on the rocks by the wharf in Flying Fish Cove, Smith Point, beyond north-east point, and at the Waterfall and beyond towards Steep Point. It occurs in Polynesia, and Australia.

GRAMINEAE.

Paspalum conjugatum Berg. This grass probably of South American origin, and now abundant in the Malay Peninsula has quite recently been introduced, accidentally, and has hardly established itself yet. It was met with at the wharf, and occurs too in Flying Fish Cove by one of the houses.

P. sanguinale var *commutatum*.

Common all over the area cleared for cultivation and along paths. There are three forms of this, one the typical form with broad leaves and several spikes. Another with narrower leaves and narrow finely ribbed glumes. At Flying Fish Cove and Phosphate hill; and a dwarf tufted form with narrow bright green foliage, slender and few spikes and slightly ciliated glumes. This grows on Phosphate hill and in Flying Fish Cove and the Waterfall in dry open spots.

The plant is distributed over nearly all the regions warm enough for it and is very variable, but all the forms here belong to the variety *commutatum*. It had reached the island by 1890 when I saw it there, but was not collected before that, and I do not think it is indigenous.

P. colonum, L.

This common grass occurs in Flying Fish Cove in no great abundance. It is probably of recent introduction as it was not collected by Andrews.

It is common all over the tropics and warmer parts of the world.

P. Andrewsii, Rendle.

This elegant grass described by Rendle in the monograph of Christmas Island p. 192, and figured on Pl. XVIII of that work, seems to be very local. Andrews gives no specific locality for it, and I sought it unsuccessfully everywhere till I found it on the basalt outcrop above Flying Fish Cove. The plants, were almost completely dried up, and those I found were much more elegant than the figure represents. It is more graceful and slender than *P. ovalifolium*.

Distribution Timor.

Panicum clivale, n. sp.

A tufted grass with a short creeping rhizome about 6 inches tall, stems slender. Leaves narrow linear acute glabrous 2 inches long $\frac{1}{8}$ inch wide, ligule ciliate. Panicle slender few branched erect, branches scabrid. Spikelets solitary shortly pedicelled with a sinuous slender scabrid barren branch subtending each, about $\frac{1}{4}$ inch long. Pedicel of spikelet very short with a cup-shaped top spikelet ovoid barely $\frac{1}{8}$ inch long. Glume I. ovate subacute small. Gl. II. more than twice as large ovate obtuse 3 ribbed purple. Gl. III. ovate lanceolate twice as large as Gl. II. purple. Glume IV. white crustaceous finely dotted large lanceolate boatshaped Palea thin lanceolate narrower.

Very local on the dry earth above Tom's Ladder, in Flying Fish Cove not previously collected.

Setaria glauca, Beauv. A single plant of this almost world-wide weed of cultivation was found by me on Phosphate

hill on ground cleared by the Chinese for cultivation. It occurs nearly all over the world.

Oplismenus compositus, Beauv.

Perhaps the most abundant grass on the island, growing all through the more open woods. It is the best fodder grass on the island and is regularly collected for the horses and cattle. As it is so widely distributed in the island I surmise that it is indigenous, though it was not obtained by Lister. Andrews however collected it and found it abundant. There are two forms here, one tall with long spikes the other more compact. Distribution, all tropical and warm countries.

Ischaemum foliosum var *leiophyllum*, Hack.

A somewhat variable usually tufted grass growing on the rocks above the sea, from beyond Smiths' Point to Flying Fish Cove, and along to near the Waterfall but scarcer on this coast. It does not grow inland. Rendle suggests that it is probably only a form of *I. ciliare*, but no two species could be more different in habit and structure. It is the *I. murinum* Forst, of Hemsley's list. The plant varies somewhat. Specimens growing in less exposed places are taller and more flaccid than those of the much exposed places. The spikelets break off when ripe and are drifted along the coast by the wind. One often sees little piles of them in holes on the rocks. Distribution New Caledonia.

Eleusine indica, L. This common grass is abundant on Flying Fish Cove and Phosphate Hill and near the Waterfall. It only occurs in cultivated ground, and is evidently introduced. It first appears in Andrew's collection.

Distribution all warm countries.

Eragrostis plumosa, Link. A pretty feathery grass forming large tufts, very abundant in dry open places. Flying Fish Cove, Smith Point, Waterfall.

First collected by Lister and doubtless indigenous.

Distribution. Africa, India, Malaya.

Lepturus fliformis, Br.

A grass 6-8 inches tall, forming a thick soft mat, stems branched. Leaves linear setaceous $1\frac{1}{2}$ inch long, narrow glabrous, margins denticulate at tip. Ligule short not ciliate. Spikes solitary fragile very slender 2 inches long, joints articulate deeply excavate on one side, 1 flowered. Glume I. very small linear spathulate. Gl. II. lanceolate acuminate strongly 8 inch nerved tip and margins denticulate $\frac{1}{4}$ inch long. Gl. III. lanceolate acute shorter base pubescent not nerved. Palea oblong lanceolate obtuse. Grain elliptic oblong smooth. Second rudimentary flower, a small linear spathulate organ.

Abundant near the Waterfall and to the north along the cliff edge, also occurring towards steep point, and sporadically at Smith point.

Distrib. Ceylon, Malay Islands, Australia, Polynesia.

Always a sea shore plant the spikes break up readily into joints and are doubtless sea drifted.

GYMNOSPERMS.

Cycas circinalis var *javana*, Miq.

A tall plant about 20 feet high, with rather slender pinnae to the leaves. I did not see fruit or flowers, Andrews says it grows all round the island and is most plentiful on the upper terrace at the west end of the south coast. I found it comparatively scarce, and the plants all isolated, one in Flying Fish Cove, one on Phosphate hill, one near Andrew's Lookout, and one on Steeprock. Except the one in the Cove, all were on the upper terraces a good way from the sea. This is interesting as the seeds of *Cycas* are typically sea disseminated, and these plants though growing on the coral

rocks formerly washed by the sea, are now far out of reach of the waves, and the plant probably reached the island in its early days. I saw no young plants and it does not appear to be spreading. I am not sure as to the species of this plant but have followed Rendle in the name. The pinnae are much more narrow than in *C. Rumphiana*, the common Malayan species.

FERNs.

Trichomanes parvulum, Poiret.

On trees on the Plateau, (Andrews.) I found very young plants of a species of *Trichomanes* probably this, on the Plateau.

Distribution, Madagascar, Malaya, Polynesia.

Davallia solida, Sw.

Very common on trees on the Plateau, etc.

Distribution. Malay Peninsula and Islands, Polynesia.

D. dissecta, J. Sm. On trees and rocks Plateau, N. Coast, etc.

Distribution Java.

D. speluncæ, Baker.

One frond brought by Andrews. Common in Flying Fish Cove and on the road to the Waterfall.

Distribution most warm regions.

Pteris quadriaurita.

Near houses in Flying Fish Cove and one young plant along the track to the Waterfall. Doubtless a recent introduction. It often turns up in this way in the Malay Peninsula.

Asplenium Nidus, L.

Very common on trees on the plateau. First collected by Lister.

Distribution, tropics of the old world.

A. falcatum, Lam.

Common on trees on the plateau. First collected by Lister.

Distribution Africa, India, Malaya, and Polynesia.

A. centrifugale, Bak. Journ. Linn Soc. XXV p. 360.

This endemic fern was first found by Mr. Lister. It seems very rare as Andrews did not find it, and I only found a small plant of what I take to be this on the rocks, at Tom's Ladder in Flying Fish Cove. My plant is very small only about 3 inches tall.

Nephrolepis exaltata, Schott.

Rocks, West End of Flying Fish Cove.

Distribution, Tropics.

N. acuta, Presl. Common on the ground all over the Plateau, etc.

Distribution, Tropics.

N. ramosa, Moore. A very pretty fern with a slender rhizome creeping up the trunks of trees on the Plateau near Irvine Hall.

Distribution. Africa, Ceylon, Malaya, Australia.

Niphobolus adnascens, Sw. A very abundant epiphytic fern on tree trunks; Flying Fish Cove, Plateau etc.

Distribution, Africa, India, Malaya, Polynesia.

Pleopeltis irioides, Lam.

Epiphytic on trees and rocks Plateau. Very fine large plants. One frond forked at the tip was found.

Distribution Africa, India, Malaya, Australia, Polynesia.

Pl. phymatodes, L.

On rocky cliffs above Flying Fish Cove, scarce. This form had the sori in two rows only. Not previously recorded. Distrib. Africa, Ceylon, Malaya, Polynesia.

Vittaria elongata, Sw. A common epiphytic fern on trees on the plateau, a large form. Distribution Africa, India, Malaya, Australia, Polynesia.

Lastræa dissecta.

A big fern common at Flying Fish Cove and Phosphate hill.

Distribution, India, Malaya, Polynesia, Madagascar.

L. Blumii, Nees. *Nephrodium intermedium* Baker.

Collected by Lister, I did not meet with it.

Distribution India, Malaya.

L. syrmatica.

Flying Fish Cove. Common.

Distribution, India, Malaya.

Aspidium polymorphum, (Bak).

North West Point not common (Andrews) I did not get to this locality and saw the plant nowhere.

Distribution, Indo-Malaya.

Pleocnemia membranacea (*Aspidium membranaceum*, Hook).

Abundant on the plateau and the sloping talus of Flying Fish Cove. A most attractive bright green fern, Andrew's gives it "on trees everywhere" but it is always terrestrial.

Distribution, Ceylon, Malay Islands, China.

Nephrodium truncatum, Presl.

On the wet rocks of the fresh-water stream near the Waterfall. Doubtless the same spot at which Andrews got it.

Distribution, Indo-Malaya.

Gymnopteris flagellifera.

Very common all over the plateau densely covering the ground in parts. Andrews gives it as rare but it

grows in very extensive patches and is very abundant
Distribution India, Malaya.

G. Listeri, Bak.

Abundant on the Plateau. This grows like the last in great masses on the ground, often mixed with the other species but more frequently alone, also on Phosphate Hill.

Endemic.

LYCOPODIACEÆ.

Lycopodium phlegmaria, L.

Fairly common high up on trees, on the Plateau.
Distribution tropics of the old world.

Selaginella rupicola, n. sp.

A slender plant 6 inches tall with few sub-erect branches, rooting for half or more than half its length, stem terete below, angled above. Leaves dimorphous ovate sub-clasping obtuse edges ciliate 1/16 inch long, distant; the others much smaller ovate cuspidate ciliate. Spikes $\frac{1}{4}$ inch long. Bracts dimorphous, sterile ones boat shaped subacute edges ciliate, fertile ones ovate cuspidate ciliate keeled.

In holes in the rock at Smith Point rare. Endemic.

MOSESSES.

Identified by Mr. A. Gepp.

Fissidens Hollianus Doz. and Molk. Bry. Jav. I. p. 4 t. 4.

On the Plateau, a new record.

Leucobryum chlorophyllosum, C. Muell.

On the Plateau, collection also by Andrews.

Distribution, Sumbawa, Celebes.

Leucophanes glaucescens, C. Muell.

With the last, a new record.

Thyridium fasciculatum, Mitten.

Waterfall, Phosphate Hill common : also collected by Andrews.

Distribution Indo-Malaya, Polynesia, Chile, Mauritius.

Trachymitrium revolutum, Hampe, Christmas Island, no special locality, collected by Andrews.

Java and Borneo.

Syrrhopodon revolutus, Dozy. and Molk.

Phosphate Hill, new to the flora.

Orthorrhynchium philipinense, C. M.

Phosphate Hill, new to the flora.

Neckera Lepineana, Mont.

Plateau, also collected by Andrews.

Distrib. Malay Archipelago, Oceania, Mauritius.

Neckera lorifarmis, V. D. Bosch.

Plateau, new to the flora.

Callicostella Prabaktiana, V. D. Bosch.

Irvine Hall, new to the flora.

Taxithelium instratum, Broth.

Common, Plateau, Phosphate Hill, new to the flora.

Thuidium plumulosum, Doz. and Molk.

Christmas Island, no special locality (Cole Andrews.)

Distrib. Ceylon, Malaya, Oceania.

Hypnum Montagnei, Lec. Christmas Island, no special locality

Coll. Andrews.

Distrib. Java.

Isopterygium Jelinkii, (C. Muell.) Fleisch.

Common all over the hill Plateau. (Identified by M. Fleischer.)

Ectropothecium micronesiense, Fleisch.

Common Flying Fish Cove. Phosphate Hill, Irvine Hall, etc., a new species.

HEPATICIS.

Identified by Mr. A. Gepp.

Ptychanthus squarrosus, Mont.

Christmas Island, no specific locality (Coll. Andrews.)
Distrib. Malay Archipelago.

Pt. striatus, Nees.

Plateau, a new record.

LICHENS.

Leptogium sinuatum, Kalchbr.

Phosphate Hill, a new record.

L. phyllocarpum, Nyl? Christmas Island; no specific locality
(Coll. Andrews.)

Usnea trichodea, Asch.

Common on the Plateau; also collected by Lister.

U. articulata, Hoffm.

Common on Phosphate Hill. New to the flora.

Ramalina callicarpis, Fries.

Flying Fish Cove, Phosphate Hill, new to the flora.

- R. fraxinea*, Ach. Christmas Island; no special locality (Coll. Andrews.)
- Parmelia perforata*, Ach.
Phosphate Hill, new to the flora.
- P. tinctorum*, Despr.
Christmas Island; no specific locality (Coll. Andrews.)
- P. appendiculata*, Fee? Christmas Island; no specific locality (Coll. Andrews.)
- Physcialicta*, Nyl. Christmas Island, no specific locality (Coll. Andrews.)
- Lecanora*, sp.
Phosphate Hill, with *Parmelia perforata* Asch.
- L. varia*, Asch. Christmas Island, no specific locality (Coll. Andrews.)
- Lecidia lutea*, Schaer? Christmas Island, no specific locality (Coll. Andrews.)
- Pannaria rubiginosa*, Del? Christmas Island, no specific locality (Coll. Andrews.)
- Pynine soredata*, Ach. Christmas Island, no specific locality (Coll. Andrews.)
- Graphis*, sp. Christmas Island (Ridley.)
- Nephromium tomentosum*, Nyl. Christmas Island (Ridley) a new record.
- Thelotrema glaucescens*, Nyl.
Flying Fish Cove, a new record.

FUNGI.

Identified by M. G. Masee.

Basidiomycetes.

Favolus albidus, Masee. A small white agaric luminous at night. Plateau at Irvine Hill.

Endemic, a new species.

Flammula sapinea, Fries. Pileus violet above, fulvous orange beneath; a new record.

Volvaria haplotricnia, Berk and Broom. A grey agaric. Flying Fish Cove, a new record.

Pleurotus promethius, Berk and Curt. A white fungus growing on dead wood; eaten by natives

Common on the Plateau, a new record.

Lentinus Lecontei, Fries.

Dark brown, Murray Hill track, centre of Island. A new record.

L. fulvus Berk, no special locality, a new record.

L. velutinus, Fries. „

Lenzites platyphyllus, Cooke. Common pale fawn above, white below. Waterfall, Phosphate Hill, a new record.

Schizophyllum commune, Fr.

A common grey fungus; Phosphate Hill etc., on dead timber. Common all over the world. Collected also by Andrews.

Polyporus confluens, Fr. No special locality; collected by Andrews.

P. subzonalis, Cook. Fawn colored.

Common Phosphate Hill, Murray Hill track, Flying Fish Cove. On dead wood, a new record.

Fomes lucidus, Fr.

Phosphate Hill, common, on dead wood. Also collected by Andrews.

Fomes australis, Fr.

Collected by Andrews and Lister.

Fomes conchatus, F. (Collected by Lister without special locality.)

Polystictus flabelliformis, Kl.

Common everywhere, Phosphate Hill ; also collected by Andrews.

Polystictus occidentalis, Klotsch.

Velvety light brown. Phosphate Hill ; a new record.

P. xanthopus, Fr.

Common Phosphate Hill, collected also by Andrews.

P. brunneo-pictus, Berk. A dark sepia brown fungus, Flying Fish Cove ; a new record.

P. sanguineus, Fries. Common red fungus on old timber. Flying Fish Cove, also collected by Andrews.

P. luteo-olivaceus, B. and Br. no special locality, collected by Andrews.

Hexagonia palygramma, Mont. no special locality, collected by Andrews.

H. similis, Berk.

Phosphate Hill, Murray Hill road, new record.

Daedalea tenuis, Berk. No special locality, collected by Andrews.

D. subcongener, Berk. pale brown. Flying Fish Cove, a new record.

D. pavonia, Berk. ocreous brown with darker rings, Phosphate Hill, a new record.

Favolus tessulatus, Berk and Curt.

Light brown, Phosphate Hill, a new record.

F. boucheanus, Klotsch, no special locality collected by Andrews.

Laschia coespitosa, Berk. no special locality collected by Andrews.

Stereum lobatum, Fr. common. Phosphate Hill collected also by Lister.

Hydnum concrecens, Fries, no special locality, a new record.

Lachnocladium furcellatum, Sw. no special locality a new record.

Xylaria digitata, Fr. Black. Flying Fish Cove, a new record.

X. fistulosa, Lev. Black. Phosphate Hill, a new record.

X. hypoxylon, Grer. Black. Flying Fish Cove, Murray Hill Track, a new record.

Hirneola polytricha, Mont. Common used as food by natives. Flying Fish Cove, Plateau; a new record.

H. auriculæ—Judæ, Berk, no special locality, collected by Andrews.

Guepinia sparassoides, Kalchbr (collected by Andrews.)

G. spathularia, Fr. no special locality, a new record.

Poria chlorina, Masee. a new species; a yellow crustaceous fungus on dead wood, Flying Fish Cove, not rare.

Rhopalopsis heliscus, Mont. on dead wood, black. Irvine Hall, a new record.

Daldinia concentrica, Cesati. Common everywhere on dead wood, Phosphate Hill, Steep point etc., a new record.

GASTEROMYCES.

Cyathus montagnei, Tul. no special locality, collected by Andrews.

Geaster Andrewsii, Blackm. Endemic, collected by Andrews.

Lycoperdon hiemale, Bull. A large fawn colored puff ball. Smith Point, a new record.

L. piriforme, L. Small brown puff balls on rotten wood, Smith point, a new record.

ASCOMYCETEES.

Trichoscypha tricholoma, Mont. no special locality, coll. Andrews

HYPHOMYCETES.

Stilbum javanicum, no special locality, coll. Andrews.

MYCETOZOA.

Stemonitis splendens var *genuina*, common Flying Fish Cove and Phosphate Hill (Andrews) Plateau.

Arcyria flava, Pers. no special locality, coll. Andrews.

Lycogala miniatum, Pers. no special locality, coll. Andrews.

ALGAE.

No algae have previously been collected on the Island.

Bangia ciliaris, Carm. Hook. Brit. Flora. II. 316 subspecies *disparsa*.

No. 231.

Halymeniapolyclada, A and E.S Gepp n. sp.

Flying Fish Cove (231 on rocks at the West End.)

Gracilaria corticata, J. Ag. Sp. Alg. Waterfall Cove.

Caralliua, sp. Waterfall Cove.

Jania micrarthrodia, Lam. Polyp. Flex. p. 271.

No. 235.

Rhodophyllia peltata. Grun. Alg. Tidschr. p. 34.

Ceramium clavulatum, Ag.

Cove near the Waterfall.

Hypnea pannosa, J. Ag. Liebm, p. 14.

Waterfall Cove.

Bostrychia tenella, J. Ag. Sp. Alg. II. p. 3.

In the mouth of the blowhole on the cliff a mile beyond the Waterfall.

Ectocarpus spongiosus, Dickie Journ. Lam. Soc. XIV. p. 191.

Cove near the Waterfall.

Dictyota dichotoma, Lam. Desv. Journ. de Bot. 1809, p. 42.

Padina Commersonii, Bory. Voy. Coquille 41.

Common, Flying Fish Cove.

Turbinaria ornata, J. Ag. Sp. Alg. I. 266.

Very common, covering the rocks all round the coast.

Sargassum Wightii. Grev. J. Ag. Sp. Alg. I 329.

Cove near Waterfall on rocks.

Avrainvillea lacerata, J. Ag. Till. Alg. Syst. VIII. p. 54.

Common, Flying Fish Cove and Waterfall Cove.

Chnoospora fastigiata, J. Ag. Alg. Lichm.

Cove near Waterfall.

Ulva Lactuca, L. Flying Fish Cove.

Cladophora repens, Har. Phycol. Brit. t 236.

Flying Fish Cove, Cove near Waterfall.

Caulerpa peltata, Lam. Journ. de Bot. 1809 p. 145.

Waterfall Cove.

Choctomorpha javanica, Kuetz. Sp. Alg. p. 376.

Flying Fish Cove.

Enteromorpha compressa, Grev. Alg. Brit. p. 180.

Flying Fish Cove.

Siphonocladus Zollingeri, Born. Journ. de Bot. 1887, p. 56.

Flying Fish Cove.

DISSEMINATION OF THE PLANTS OF CHRISTMAS ISLAND.

Christmas Island as far as there is any reason to believe is a true Oceanic Island, that is to say, it has never at any time been connected with the mainland of Java or with any other land. Its geology was carefully studied by Andrews and is described in the Monograph of Christmas Island. He shews it to be an extinct volcano covered with coral reefs of various ages from the eocene period to the present day. This being so it follows that the indigenous plants reached the island by means which enabled them to cross the sea either by their seeds being drifted by sea-currents, or blown there by the wind, or carried by birds or bats.

It is probable that some part of the island was above water, and capable of maintaining terrestrial plants in Miocene times so that some of the plants may have established themselves as early as that period, but no fossil plants have yet been

obtained there, nor are we yet acquainted with the Miocene flora of the neighbouring countries, so as to be able to suggest which of the plants if any belong to that date.

For the purposes of this paper I have classified the plants found in the various islands which are considered to have been always isolated from the mainland according to the methods by which their seeds or fruits can be disseminated and conveyed across a large tract of sea.

In this way plants may be divided into seven classes, viz. 1. *Sea-borne*. 2. *Bird or bat-borne*, by the seeds being swallowed by these animals and eventually deposited uninjured. 3. *Adhesive* (the seeds or fruits being attached to their fur or feathers and so conveyed). 4. *Plumed seed*. 5. *Winged seed or fruit*. 6. *Powder seed*; these last three being conveyed by gales of wind: and 7. *Weeds*, plants dispersed accidentally or more or less intentionally by man. There are some other methods of dissemination on land which cannot come into play in populating islands, such as dispersal by terrestrial animals, and insects, and by streams or rivers, and these may be neglected though they may act in dispersing a plant (the seeds of which have once been successfully landed) over the remainder of the island.

There are a certain number of plants often widely distributed which are certainly disseminated by one of these seven methods, but by which is at present doubtful. Such for instance are the herbaceous *Malvaceae* and many grasses and sedges, and again there are some plants which may reach these islands in more ways than one. *Portulaca obracea* may be an example of this. In some cases it appears to have been accidentally introduced as a weed, while in others it apparently came by sea. In this paper I class it as *Sea-borne*.

The weeds of human introduction have been already discussed. It remains to deal with the six other classes. (1) *Sea-borne* seeds or fruits. The larger *Sea-borne* seeds or fruits are tolerably well known for the most part. They have often some adaptation or modification for protection from the action of the sea water, as in the case of the strongly developed bladder-like calyx of *Hernandia* which protects the seed

enclosed in it from the action of the salt water, and also aids to float it, and the corky outer coat of the seed of *Carapa*.

But many of the seeds often sea-dispersed have no more protection than the hard seed-coat. Such are the beans *Canavalia*, *Erythrina*, *Strongylodon*, *Entada*, *Guilandina* etc. It is essential of course that these seeds should float uninjured and it is necessary also that the plant should be able to grow on the sea shore when it arrives; so that the greater number of Sea-borne plants are always to be found on the shores or close to the sea. But there are some, such as *Terminalia Catappa* and *Eugenia grandis* which also can grow for some way at least inland, and their fruits are carried by bats or birds to some distance from the sea, whence they originally landed. Probably a good many plants travel by sea occasionally and arrive in safety at distant islands which one would not imagine to be able to travel so. I have seen plants of *Dendrobium crumenatum* a widely distributed plant floating apparently quite uninjured by sea water in the Banka Strait far from land, and I have been informed by Mr. Ross, that a clump of sugarcane had once drifted up upon Cocos Island where it began to grow and was eventually propagated. Many small seeded plants which commonly occur on sea beaches and shores are almost certainly sea dispersed, but owing to the smallness of their seed they have not been detected in sea drift, and thus one may be uncertain about them. A good deal more information is wanted on this head.

As to the direction of sea-currents in these seas, I have but little information but I may remark that we found plenty of pumice-stone in the eastern corner of Flying Fish Cove and this had doubtless come from Krakatau, which is west of Christmas Island, and in 1890 I saw, in going from the Sunda Straits to Cocos and Christmas Islands, much of this pumice floating in large patches. The pumice also occurred some years ago in quantity on the point known as Tanjong Gol in the extreme south west of Singapore. So that currents capable of carrying pumice-stone run both east and west from Krakatau. Seeds therefore of plants could be brought to Christmas Island at least from Java and Sumatra without

requiring to be drifted to Australia and back. Andrews points out that the Ocean current which passes the island is the equatorial drift which comes down from the Timor sea and receives tributaries through the Straits between Bali and Lombok etc. This would bring down doubtless all the Seaborne seeds of Australian types on the island. But there must be also currents from the north to account for the typically Javanese plants.

The absence of many plants of which the seeds must at times have reached the island is perhaps due to the unsuitability of soil for them. Thus the Mangrove plants, *Rhizophora*, *Bruguiera* and *Avicennia* the fruit of which may be seen in abundance drifting down the Banka Straits are absent, *Cerbera odollam* too seems to have failed to properly establish itself though a tree of this was seen by Andrews. It seems to have disappeared since. There is in fact no suitable ground for these plants which require a muddy soil for their existence. *Pangium edule* a riverbank plant, the seeds of which have been seen in sea drift in other parts of the Archipelago besides Christmas Island where I found one battered seed, has not succeeded in establishing itself as there is no place suited for it.

Some of the plants which have established themselves are very local and only growing special soils, such are *Mariscus albescens*, on the out crop of volcanic rock near the Waterfall, and *Nephrodium truncatum* on the mud by the fresh-water stream in the same locality, both evidently plants which cannot grow on the coral reefs or their detritus.

The great height of the cliffs surrounding the island for its greatest part would also militate against the successful landing of sea-drifted seeds. There are as far as is known only two or three possible landing places for such plants, Flying Fish Cove, the Waterfall bay and a few smaller beaches beyond, the West white beach and a few other possible spots, but in former years there may have been other suitable spots, and during the Monsoon the waves beat up very high on parts of the coast, and seed might be thrown to the top of many of the lower cliffs.

During my stay in Christmas Island I looked for fruits and seeds washed ashore in the bays but could find very few.

During the heavy storms there might be more. All I could find were *Terminalia Catappa*, *Guettarda speciosa*, (sunk) and the remains of a seed of *Pangium edule*. Portion of a rhizome of a bamboo, long dead however, was found in a bay near the Waterfall. No bamboos are grown on the island. Mr. Chapman however after my departure at my request kindly sought for seeds etc., after heavy storms, and obtained seed of *Cerbera odollam*, *Terminalia*, *Entada scandens*, *Pandanus*, and fruits of *Bruguiera* dead and nibbled by molluscs, and carrying barnacles. Also he found many large bamboos with shoots but dead on the West white beach.

The following is the list of plants probably introduced by sea-currents to Christmas Island.

- Portulaca oleracea*.
Ochrocarpus ovalifolius.
Calophyllum inophyllum.
Malvastrum tricuspdatum. Probably.
Sida spinosa. Probably.
Abutilon auritum. Probably.
A Listeri. Probably.
Hibiscus vitifolius. Probably.
H. tiliaceus. Common sea drifted plant.
Colubrina pedunculata.
Erythrina indica.
Strongylodon ruber.
Galactia tenuiflora.
Canavalia. Common in sea drift.
Pouqamia glabra.
Inocarpus edulis.
Gudandina bonducella. Well known as a sea drift seed.
Entada scandens. Well known as a sea drift seed.
Terminalia Catappa. Well known as a sea drift seed.
Combretum acuminatum.
Quisqualis indica.
Gyrocarpus asiatica.
Bvrringtonia rubra.
Pemphis acidula.
Sesuvium portulacastrum.

Guettarda speciosa.

Morinda citrifolia.

Wedelia biflora.

Scoevola Koenigii.

Cerbera Odollam.

Ochrasia Ackeringoe.

Tournefortia argentea.

Cordia subcordata.

Ipomea pes-caprae.

I. grandiflora.

Possibly also *I. peltata*, *digitata* and *Campanulata*.

Convolvulus parviflorus.

Asystasia alba?

Boerhaavia. The fruits however are adhesive and may have been brought by birds.

Hernandia peltata.

Euphorbia atoto.

Croton caudatus.

Crinum asiaticum.

Pandani.

Mariscus albescens.

Finbristylis cymosa.

Lepturus repens.

Ischoemum foliosum?

Cycasiciscinalis.

Some years ago a number of seeds drifted up in Cocos Island were sent me by Mr. Ross. They included.

Mucuna sp.

Cynometra. Pods containing seed.

Entada scandens.

Strongylodon ruber.

Guilandina bonduc.

Garcinia mangostana fruit.

Carapa moluccana.

Hodgsonia heteroclitia.

Ochrocarpus ovalifolius.

Pangium edule.

Heritiera littoralis.

Terminatra catappa.

Aleurites moluccanus.

Quercus 2 species.

Erythrina probably *indica*.

Canavalia lineata.

Barringtonia 2 species?

and several other indeterminable seeds. Most of these were in good condition, and would probably have readily germinated but of all, only two species are established on the island, viz. *Guilandina bonduc*, and *Aleurites moluccanus*. Mr. A. S. Keating in Holmans travels quoted by Mr. Hemsley (Voy. H. M. S. Challenger Botany of South Eastern Moluccas p. 114) records also the "Soap-tree" (probably *Sapindus*) Castor-oil (*Ricinus communis*), and timber from Java and Australia and suggests that the seeds were first drifted to the Australian coasts by the North-West monsoon and then back again by the South-East trade wind. In view of the fact that there are no plants on the island nor seeds in these lists at all characteristic of Australia, and the abundance of specimens of almost all kinds mentioned in Mr. Ross' collection and the absence of the Australian and Polynesian forms occurring in Christmas Island, viz *Inocarpus edulis*, *Ischoemum foliosum* and *Finbristylis cymosa* (represented in Cocos by the Malayan *F. glomerata*.) I should doubt this very much, in spite of the trees of blue gum wood of Australia said to have drifted there.

All the plants recorded from Cocos Island in Forbes' list (introduced plants excepted) occur in Christmas Island, except *Triumfetta procumbens*, *Guilandina Bonduc* (replaced by *G. Bonducella*, *Ochrosia parviflora* (represented by *O. Ackeringae*) *Dicliptera Burmanui*, (*D. macleari* in Christmas) *Fleurya aestuans* (*Urera Gandichandiana*) represented by *Fl. ruderalis* Gaud. *Stenotaphrum lepturoide* (said to be identical with *S. americanum* by Hemsley) and *Finbristylis glomeratus*.

There are however in Christmas Island three noticeable plants of Australian and Polynesian origin only, *Inocarpus edulis*, *Ischoemum foliosum* and *Finbristylis cymosa*. These it is most probable arrived by sea at Christmas Island. It would indeed be unlikely for any bird except sea birds to fly successfully for that distance, nor is it probable that even

plumed seed would be drifted by wind from Australia to Christmas Island.

2. *Bird and bat-borne seed and fruit.* By this class of seed I mean those that are carried about by birds or fruit-bats swallowing the fruit or seeds and afterwards passing the seed in their excreta. Fruits and seeds dispersed by adhering to fur or feathers are classed separately for they may be dispersed by sea birds only, while this class require the aid of frugivorous birds.

Most of the seeds borne by birds and bats internally are enclosed in fleshy drupes, berries, and figs, but it is certain also that a number of seeds of small hard seeds or fruits such as those of the capsular *Euphorbiaceæ* are also swallowed by birds and passed unharmed, though it is hard to see why a hard dry seed such as those of *Macaranga*, and *Sapium sceleratum* (a plant thus dispersed by birds in Fernando de Noronha) should be attractive to birds. Possibly also some of the fruits of the *Cyperaceæ* and grasses found in Oceanic Islands have been brought there by birds.

Fruit-bats though fond of large-sized drupes do not usually at least swallow them but flying to a neighbouring tree nibble off the flesh and drop the stone on the spot. They however eat figs greedily, swallowing the whole fruit.

Christmas Island possesses at present as residents the following frugivorous birds and mammal. A fruitbat, two pigeons, *Carpophaga whartoni* and *Chalcophaps natalis*, the white-eye *Zosterops natalis* and an occasional fruit or seed-eater *Merula erythropleura*. All are endemic, but the *Chalcophaps* is hardly distinct from the common Malay one. The white pigeon *Myristicivora* has been seen on the island, blown over in heavy gales, and a minah (*Acridotheres*) was shot on the island during our visit but may possibly have been brought over by a native. How many more birds have been driven on to the island by the heavy gales and either perished or managed to fly back again no one can say. Many waders, as well as wagtails and a duck seem to come over regularly from Java.

In the commencement of the afforestation of an Oceanic Island, it is obvious that the first terrestrial birds who bring the seeds of such fruit as they eat must perish of starvation or less probably fly on to other places where they can get food. It is only when food has become plentiful by the growth of the seeds birds have brought that the frugivorous birds can settle down in an island.

In Cocos Island there seem to be no frugivorous birds, nor can the *Pteropus* occasionally finding its way there survive its voyage. (Forbes wanderings p. 32). *Pteropus* however can subsist very well on shoots of trees as well as fruits.

In Cocos Island there are no fruits suitable for frugivorous birds except those of a few introduced plants so that birds requiring food of this nature would hardly be likely to survive a long voyage to the island.

I made some experiments in the Botanic Gardens in Singapore with fruit-eating birds, to discover if possible how long they retained the seed of fruits they had swallowed before passing them.

A Cassowary was fed with fruits of the *Cocoplum* (*Chrysobalanus Icaco*) at 9.20 a.m. and passed the seed after 8 p.m. but before morning.

A Hornbill fed with *Cocoplum* passed the seed at the same time as the Cassowary. It ate berries of *Rhodamnia trinervia* at 10 a.m. and passed some of the seed at 12, and the rest at 2 p.m. It ate fruits of *Carissa carandas* at 7 a.m. and passed some at 8 a.m. the rest at 1 p.m.

Myristicivora, the white pigeon known as the Rawai was unable to swallow seed of the *Cocoplum* or that of the Rambu-tan, *Nephelium lappaceum*. It ate *Rhodamnia* fruits at 10 a.m. and passed all the seed at once at 1 p.m. It ate fruits of *Pinanga kuhlii* at 8.30 a.m. and began to pass them at 10 a.m. continuing till it passed the last at 4 p.m. *Carissa* fruits, it swallowed at 7 and passed the seed at 8 a.m. and 1 p.m. as did the Hornbill.

It was observed that when fed with much fruit, and these birds passed the seed more slowly than when they had but little given them.

Betel nuts with the husk on were swallowed by the hornbill but it vomited up the seed. Naturally this fruit is not eaten by any animal so far as I am aware. Rambutans (*Nephelium*) it only pecked and sucked not swallowing the seed.

It would appear from these observations that these birds would only carry the seed for a distance which could be covered by them in 8 hours or a little more, so that in conveying seeds from say Java to Christmas Island about 300 miles the birds must make the passage in a comparatively few hours.

BIRD AND BAT-BORNE SEEDS.

Limacia nativitatis.

Pittosparum nativitas, fruits of *P. ferruginens* in Singapore commonly so carried.

Grewia two species.

Acronychia Andrewsii, Fruits, pink berries.

Dysoxylon amooroides, Seed swallowed by birds.

Celastrus paniculatus?

Vitis repens.

V. pedatus, Berries pink.

Lea sambucina.

Allophyllus Cabbe, Berry red.

Eugenia, Drupe small red.

Zehneria, Berry small pink.

Heptopleurum.

Randia densiflora, Drupe small red.

Ardisia pulchra, Drupe small.

Sideroxylon sundaicum, Favourite food of *Carpophaga*.

Ehretia buxifolia?

Solanum biflorum, Berry red.

Physalis minima.

Datura alba, From the way *D. fastuosa* spreads in Singapore I believe it is dispersed by birds, though its dry and indeed poisonous seed does not seem inviting.

Callicarpa longifolia, Drupe white small.

Premna lucidula, Drupe white small.

Deeringia celosoides, Drupes red.

Cryptocarya nativitatis, Favourite food of *Carpophaga*.

Claoxylon caeruleascens.

Macaranga tanarius ?

Celtis cinnamonea.

Trema amboinensis, Drupes orange, commonly dispersed by birds in Singapore.

Ficus retusa, Eaten by bats and birds.

F. saxophila, Figs bright red or orange.

Laportea ?

Boehmeria platyphylla ?

Arenga Listeri, Berry pink.

Spondias dulcis may have been sea-drifted to the Island as fruits of one species have been found in sea-drift in Jamaica, but it is stated that it is commonly carried about by Hornbills in Java, and as these are far-flighted birds one or more may have reached Christmas Island at some period. The fruit appears to be too big for *Carpophaga*, as it remained untouched at the foot of the trees, and the trees were confined to a limited area.

It is perhaps worth noting that all these plants in this list are either Javanese or from one of the neighbouring islands or allied to plants from this region, with the exception of *Cryptocarya nativitatis* of Australian affinities.

ADHESIVE SEEDS OR FRUITS.

These are furnished with hooks, bristles, or hair, or a gummy secretion by which they adhere to the fur or feathers of birds and animals and are so borne from place to place. This class of seeds is rare in Oceanic Islands, the greater number of the plants possessing such means of dissemination being low growing plants, with which birds seldom come in contact. Such are *Centotheca* and *Laphotherum* grasses dispersed by mammals walking through the forests. These plants through common and widely dispersed through the Malay region are absent from the

Island. Several of the weeds are dispersed by their adhesive fruits such as *Synedrella* and *Paspalum conjugatum* but these evidently did not reach Christmas Island without the aid of human beings and are not yet to be found in any parts of the island which is not constantly visited by man.

The following list contains all the plants exclusive of weeds which seem to have reached Christmas Island by adhering to the feathers of birds.

Triumfetta suffruticosa, A shrub with capsules covered with hooked bristles very adhesive. Probably brought by sea-birds, as it was abundant in two places where the birds nested.

Dicliptera Macleari. Low herb, adheres by its spiny bracts.

Anisomeles ovata, perhaps adheres by its spiny calyx.

Leucas, adheres by its spiny calyx.

Boerhaavia, fruits glutinous and sticky may be sea borne, but I found it not only on the sea shore but on high cliffs above Flying Fish bay, where it is hardly likely to have been thrown by the sea.

Pisonia grandis, and *P. excelsa*, Fruits when ripe split and exude a glutinous matter very adhesive. Forbes mentions (Naturalist's wanderings pp. 30, 33) how he found a *Pisonia* in Cocos the fruits of which adhered to the feathers of the herons, and often killed them by clogging their feathers. One of these herons was *Demiegretta sacra*, not rare in Christmas Island. Many sea birds nested in the trees of *Pisonia grandis*, but I did not find any fruits of this species so that I am not sure whether they are as adhesive as those of *P. excelsa*.

Achyranthes aspera has spiny burrs which are adhesive, and is commonly to be found on the cliff edges near the booby's nesting places.

All these plants are either Javanese or have Javanese affinities except *Pisonia grandis*, a native of Australia and Polynesia.

PLUMED SEED AND FRUITS.

These are chiefly of plants belonging to the orders *Apocynaceae*, *Asclepiadeae*, *Compositae*, with a few *Gesneraceae*, and grasses. The seed or fruit are disseminated by wind, and it might be thought that these would readily be conveyed to Oceanic Islands, as are the dust seed plants. This is not the case. They are comparatively scarce, and curiously most of the *Compositae* of Oceanic Islands are the ones which have plumeless fruits, introduced weeds excepted. Only 3 plants with distinctly plumed fruits or seeds are known from Christmas Island, of these one *Ageratum conyzoides* is certainly a weed. The others are *Blumea spectabilis* and *Hoya Aldrichi*. The former is a hill forest plant of the Malay region, the latter an endemic species allied to Javanese species.

WINGED FRUIT AND SEEDS.

These are still rarer than the plumed seeds, and of the very few that are to be met with in Oceanic Islands, it may be doubted very much whether their wings have played a large if any part in their dissemination. The *Dipterocarpaceæ* for instance are quite absent from Oceanic Islands. *Gyrocarpus* which occurs in Christmas Islands and other Islands a sea shore plant is certainly disseminated by its wings, but I suspect it reaches the islands by sea. I cannot conceive of the winged fruits of *Berria* being drifted by the severest gale for two hundred miles, as it is really hardly adapted for flying more than about 40 yards, yet it occurs on Christmas Island. The fruit is a winged capsule which splits when ripe and releases its pubescent seed, so that really ripe fruit if blown out to sea in a gale of wind, would almost certainly break up ere it had gone far and the seed would fall into the sea.

DUST SEED.

The very fine dust like seed of orchids, and *Balanophara* and the spores of ferns, Lycopods and cellular

plants have perhaps the widest and most rapid dissemination of any group and there can be no doubt that they are the first seeds to arrive at an Island when it first becomes in a fit state to receive terrestrial vegetation, but there are islands in which plants with this class of seed are scanty, notably Fernando de Noronha on which I found no orchids, only one fern and very few cellular plants. The reasons for this seemed to be that the neighbouring land from which the wind could bring seed was somewhat of a desert nature, and ferns at least were not very common, also the island itself was distinctly xerophilous with a very dry season during which no rain fell and the ground became very dry. In Cocos Island also dust—seed plants are very scarce no orchids or ferns, and only one moss and one fungus being recorded. Here again it is doubtless the unsuitability of soil and climate that prevents these plants from establishing themselves. In Christmas Island indeed that though the number of ferns is large, the ground and rocks were in the dry season so arid that a considerable area produced no ferns or mosses. Where the ground was damper in the forests of the plateau, ferns and mosses were plentiful. One fern was confined to the fresh water stream never dry at the Waterfall, and mosses and fungi were commoner round the water tanks where water was often spilt.

Cellular plants, algæ and fungi, have an extremely wide dispersal area, far more so than the more elaborate vascular plants, and a good many seem to occur in all corners of the world. Some of the fungi, such as *Polyporus sanguineus*, *Guepinia*, *Schizophyllum commune* which are common on old timber may easily have been brought on pieces of wood by ships stopping at the island but most at least of the fungi must have arrived by the drifting of their spores by the wind. Considering the dryness of the weather a large number were obtained and some more were seen which could not be preserved. There are probably very many more to be collected at more suitable seasons. Besides the cellular plants there occur of the dust—seed group, the following, one *Balanophora*, ten orchids, 21 ferns two *Lycopodiaceae*. Of these 34 plants 17

are epiphytic plants, 7 orchids, and 10 ferns, the rest are small low-growing terrestrial plants. All are either Javanese or closely allied to Javanese species, but two; *Balanophora insularis* and *Dendrocolla carinatifolia* have hitherto been only met with in the island of Pulau Aur off the East coast of the Malay Peninsula. Balanophoras of this type however occur in Tahiti, Salayer Island, Timor Laut, and the Comoro Islands. They seem to be all insular and to occur only in the Southern Islands in a line fringing the South of Asia and reaching to Tahiti and Comoro respectively. The endemic species of dust seed plants are 6 orchids and two ferns.

Besides these there are a large number of cellular Cryptogams, most if not all brought to the island by the drifting of their seeds in the wind. Two species of *Peperomia* also occur the very small fruits of which may possibly have been blown by the wind to Christmas Island.

I have assumed that the epiphytic orchids have all reached the island by their seeds, but it is quite possible that some of them have been sea drifted to the Island. For in 1890 I saw plants of *Dendrobium Crumenatum* apparently quite fresh and green floating about in the sea off the coast of Banka and Moseley (Notes by a Naturalist p. 368) mentions finding in Little Ki Island an epiphytic orchid washed up by the sea in a quite lively state. Most epiphytic orchids however are very quickly killed by sea water.