

# Vascular plants from the Galápagos Islands: new records and taxonomic notes

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Thirty-five taxa are reported as being new for the Galápagos Islands, among them 8 species of *Thelypteris* (Polypodiaceae). Attention is drawn to a collection of *Thelypteris* that probably represents a new species. A key to the species of *Thelypteris* known from the archipelago is provided. Taxonomic and nomenclatural notes are made on taxa in the genera *Jaegeria* (Compositae), *Lippia* and *Verbena* (Verbenaceae), *Acalypha* (Euphorbiaceae), *Polygala* (Polygalaceae), *Hydrocotyle* (Umbelliferae) and *Tillandsia* (Bromeliaceae).

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From April 1974 to October 1975 the author conducted field work on the Galápagos Islands for a vegetation study of Santa Cruz and Volcán Alcedo, Isabela. Plants were collected on other islands as well. Thirty-five taxa are new for the archipelago. When determining the material, I found some changes in nomenclature to be necessary.

The first set of the collection is in U while a duplicate set will be deposited in CAS. A representative set will be deposited in an Ecuadorian Herbarium. The sequence of the taxa in the Flora of the Galápagos Islands (Wiggins & Porter 1971) is followed.

## Hymenophyllaceae

### *Hymenophyllum plumieri* Hook. & Grev.

Hook. & Grev., *Icon. Fil.* 2: pl. 123 (1829).

*Collections:* Isabela, the S slope of Cerro Azul, 750 m, van der Werff 2241 – San Cristóbal, summit area, 600 m, van der Werff 2190.

New for the Galápagos Islands. *H. plumieri* belongs to the section *Sphaerocionium*, which is characterized by the presence of hairs on veins and leaf margins and sometimes also on the leaf surface. *H. hirsutum*, reported by Morton (1947)

from San Cristóbal, lacks hairs on the leaf surface, while such hairs are present in *H. plumieri*. The hairs are never numerous, but are always found on closer inspection. On the specimens from San Cristóbal they are quite sparse.

Both on San Cristóbal and Isabela this fern is terrestrial and found in wet areas, often on a slope with pendent leaves. The fronds are of a light colour and contrast rather sharply with the dark venation.

The Isabela specimens conform well with the Mille collection cited by Morton (1947). The specimens from San Cristóbal have fewer hairs, especially on the abaxial side, but otherwise conform.

*H. plumieri* is not common. On the mainland it is only reported from Ecuador, from where Morton (1947) cited 8 collections.

## Polypodiaceae

### *Arachniodes denticulata* (Swartz) Ching

Ching, *Acta Bot. Sin.* 10: 260 (1962).

*Collection:* San Cristóbal, on vertical walls of streambeds near the summit, 630 m, van der Werff 2188.

New for the Galápagos Islands. *A. denticulata* keys out in Wiggins & Porter (1971) to the group *Rumohra*, *Dryopteris* and *Polystichum*. It can be distinguished from the species of these genera by a combination of hairlike scales on the costae below, hairlike scales at the base of the stipe, laterally attached indusia and the semi-erect rhizome. *A. denticulata* is widespread on the American mainland.

***Ctenitis pleiosorus* (Hook. fil.) Morton**

Morton, Leaf. West. Bot. 8: 190 (1957).

*Collections*: Isabela, a small crater on the S slope of Cerro Azul, 600 m, van der Werff 2244, 2256; same locality, but growing in a cave, van der Werff 2257 – Santa Cruz, Media Luna, 600 m, van der Werff 966.

*C. pleiosorus* is one of the few ferns endemic to the Galápagos Islands. It is fairly common but confined to the wetter zones.

Normally this species is not very tall and the description is based on medium-sized specimens. A few of the plants I collected were considerably larger (van der Werff 2256). The size of the pinnae, pinnulae and the branching of the veins in the pinnulae are quite different from that of medium-sized plants. Intermediates do exist and there are no differences in pubescence or scale characters. The measurements given below were obtained from the larger plants. Measurements from Wiggins & Porter (1971) are given in parentheses. Characteristics not mentioned do not differ from the description in the flora.

Fronds up to 25 dm tall (4–8 dm); stipe not measured separately but correspondingly larger, up to 7 mm thick (3–4 mm); length of the blades not measured separately; pinnae up to 30 cm long (8–12 cm); pinnulae up to 5 cm long (1.3 cm), 1.5 cm wide (0.4 cm), entire to incised 4/5 down to the costule; veins free, 1–4 times branched; sori up to 35 per pinnule (4–8), 2 mm in diameter (1 mm).

***Dryopteris parallelogramma* (Kunze) C. Alston**

C. Alston, Amer. Fern J. 47: 92 (1957).

*Collection*: Isabela, in a small crater on the S slope of Cerro Azul, 600 m, van der Werff 2243.

New for the Galápagos Islands. *D. parallelogramma* will not key out to *Dryopteris* in Wig-

gins & Porter (1971) as it is very scaly but not very glandular. It differs from *D. patula*, the only other *Dryopteris* species known from the archipelago, by having bipinnate fronds, a densely scaly stipe and rhachis, and rufous brown rhizome scales. *D. patula* has bipinnate-pinnatifid to tripinnate fronds and few, light-coloured rhizome scales.

*D. parallelogramma* is rather widespread on the American mainland, ranging from Colombia to Argentina, mostly at higher altitudes (2500 m or more).

***Dennstaedtia dissecta* (Sw.) Moore**

Moore, Ind. Fil. 305 (1861).

*Collection*: Isabela, from a small crater on the S slope of Cerro Azul, 600 m, van der Werff 2268.

New for the Galápagos Islands. Two other species of *Dennstaedtia* are known from the archipelago, *D. globulifera* and *D. cicutaria*. *D. dissecta* differs from *D. globulifera* by not having green alate axes of the pinnules, and from *D. cicutaria* by having larger sori (slightly over 1 mm in my specimens, 0.3–0.4 mm in *D. cicutaria*). *D. dissecta* occurs on the American mainland from Mexico to Bolivia.

***Polypodium astrolepis* Liebm.**

Liebm., Vid. Selsk. Skr. B 1: 185 (1849).

*Pleopeltis revoluta* (Spr. ex Willd.) A. Reid Smith, Proc. Cal. Acad. Sci. ser. 4, 40: 230 (1975).

*Collection*: San Cristóbal, epiphyte on *Hippomane mancinella* near Tres Palos, 120 m, van der Werff 2174.

New for the Galápagos Islands. *Polypodium astrolepis* was recently transferred to *Pleopeltis*. As Wiggins & Porter only use the name *Polypodium*, I prefer not to introduce the name *Pleopeltis* here.

*P. astrolepis* has distinctly elongated sori up to 2 cm long. This characteristic distinguishes it from the rather similar *P. lanceolatum*. On San Cristóbal *P. astrolepis* is not uncommon as an epiphyte at middle elevations, mostly found on *Hippomane mancinella*. It occurs on the American mainland from S Mexico to Brazil.

Key to the species of *Thelypteris* known from the Galápagos Islands

1. Lamina bipinnate–bipinnatifid ..... *T. torresiana*
- Lamina pinnate or pinnate–pinnatifid ..... 2
2. Basal veins of adjacent segments united in the sinus between the segments or united in the leaf tissue below the sinus with an excurrent veinlet running to the sinus ..... 3
- Basal veins of adjacent segments not united and reaching the leaf margin slightly above the sinus ..... 9
3. Lamina with conform terminal pinna; some hairs on the lower side of the rhachis forked 2–4 times; basal veins united with excurrent veinlet ..... 4
- Lamina with pinnatifid apex; rhachis hairs not repeatedly branched; basal veins united in leaf tissue or meeting in sinus ..... 5
4. Lamina pinnate, the pinnae crenate; 5 or 6 pairs of uniting veins per segment; frond with 4 or 5 pairs of pinnae ..... *T. poiteana*
- Lamina pinnate–pinnatifid, the pinnae lobed at least halfway down to the costa; only 1 or 2 pairs of veins united per segment. Frond with 7–9 pairs of pinnae ..... *T. tetragona* ssp. *aberrans*
5. Pseudovein running from the costa to the sinus between the segments; lamina coriaceous and glabrous; veins conspicuous, white, sometimes forked ..... *T. gardneriana*
- No pseudovein running from costa to sinus ..... 6
6. Basal veins in adjacent segments united in leaf tissue and sending an excurrent veinlet to the sinus; rhizome erect or suberect ..... *T. quadrangularis*
- Basal veins in adjacent segments not united in leaf tissue but connivent in the sinus ..... 7
7. Costae with some ciliate, castaneous scales below; basal segments of the lower pinnae reduced in size; rhizome creeping ..... *T. grandis*
- Costae without scales below ..... 8
8. Rhizome erect; basal superior segments enlarged; veins on upper surface not hairy; lower pinnae not reduced in size ..... *T. patens*
- Rhizome creeping; veins on upper surface hairy; lower pinnae reduced in size ..... *T. conspersa*
9. Croziers covered with mucilage, aerophores present ..... 10
- Croziers not covered with mucilage, aerophores present or absent ..... 12
10. Rhachis with short, fasciculate hairs; aerophores at bases of pinnae 4 mm long; small aerophores present at bases of segments ..... *T. thomsonii*
- Rhachis without fasciculate hairs; aerophores small, not present at the bases of segments ..... 11
11. Rhizome erect, fronds caespitose. Stipe shorter than lamina. Rhachis glandular, distance between pinnae about 2 cm ..... *T. cheilanthoides*
- Rhizome creeping, fronds distant. Stipe as long as lamina. Rhachis not glandular. Distance between pinnae 0.6–0.8 cm ..... *T. sp. nov.?*
12. Indusia absent ..... 13
- Indusia present ..... 14
13. Sori elongated along veins ..... *T. linkiana*
- Sori round; rhachis densely and shortly hairy ..... *T. oligocarpa*
14. Rhachis glabrous below; costa below with few stramineous, adpressed scales ..... *T. pachirrhachis*
- Rhachis pubescent below; no scales on costae below ..... 15
15. Rhachis with stiff, short and non-septate hairs ..... 16
- Rhachis with long (1.5– 2 mm), slender and multicellular hairs ..... 17
16. Uncinate hairs present on lamina below ..... *T. oligocarpa*
- Uncinate hairs absent ..... *T. pilosula*
17. Well-developed pinnae up to 15 cm long, nearly always exceeding 10 cm. Segments with 12 or more pairs of veins; lamina with many sessile glands below ..... *T. balbisii*
- Well-developed pinnae up to 7 cm long. Segments with about 8 pairs of veins. Lamina with few red glands below ..... *T. aff. glandulosolanosa*

*Thelypteris torresiana* (Gaudich.) Alston

Alston, Lilloa 30: 11 (1960).

Collection: Pinta, Cerro Colorado, 220 m, T. de Vries s.n. (U).

New for the Galápagos Islands. *T. torresiana* is the only species of *Thelypteris* known from the archipelago with bipinnate–bipinnatifid fronds (cf. the key). It originates from tropical Asia

and has been introduced into the American tropics.

*Thelypteris gardneriana* (Baker) Reed

Reed, Phytologia 17: 278 (1968).

Collections: San Cristóbal, on vertical walls of deep streambeds near the top, 600 m, van der Werff 2189; Adersen 720 (C).

New for the Galápagos Islands. *T. gardneriana* is the only member of the subgenus *Steirop-teris* known from the Galápagos Islands. The presence of a pseudovein running from the costa to the sinus between the segments is characteristic for this subgenus. *T. gardneriana* has coriaceous and glabrous fronds with conspicuous veins, which are almost white on the dark leaf tissue. Most mainland collections are from Brazil but a few records are from Colombia and Ecuador.

***Thelypteris conspersa* (Schrad.) A. Reid Smith**

A. Reid Smith, Univ. Cal. Publ. Bot. 59: 60 (1971).

*Collections*: Santa Cruz, Wiggins 18.617a (DS); van der Werff 1755 – Isabela, Cerro Azul, van der Werff 2265, 2266.

New for the Galápagos Islands. A specimen identified as *T. kunthii* (Desv.) Morton belongs to *T. conspersa* (Wiggins 18.617a, DS). *T. conspersa* differs from *T. kunthii* by having reduced lower pinnae. Most mainland collections of *T. conspersa* are from S Brazil, but it is also known from the Andean countries.

***Thelypteris grandis* A. Reid Smith var. *pallescens* (C. Chr.) A. Reid Smith**

A. Reid Smith, Univ. Cal. Publ. Bot. 59: 99 (1971).

*Collections*: Santa Cruz, Howell 9274 (CAS), Bowman 93 (CAS), Dawson E-23 (DS) – Isabela, Alcedo, van der Werff 1201.

*T. grandis* var. *pallescens* was reported by Smith (1971) from the archipelago. It was not included in Wiggins & Porter (1971).

*T. grandis* is widespread in tropical America, ranging from the Antilles and Costa Rica south to Bolivia. Four varieties have been described from the mainland of which only var. *pallescens* has been found in the Galápagos Islands.

***Thelypteris cheilanthoides* (Kunze) Proctor**

Proctor, Bull. Inst. Jamaica, Sci. Ser., 5: 58 (1953).

*Collection*: Isabela, in a small crater on the S slope of Cerro Azul, 600 m, van der Werff 2242.

New for the Galápagos Islands. In addition to the characteristics mentioned in the key, *T. cheilanthoides* has submarginal sori that are

partly covered by the reflexed leaf margin. It is widespread in tropical America.

***Thelypteris thomsonii* (Jenm.) Proctor**

Proctor, Bull. Inst. Jamaica, Sci. Ser., 5: 65 (1953).

*Collection*: Isabela, in a small crater on the S slope of Cerro Azul, 600 m, van der Werff 2258.

New for the Galápagos Islands. See key for characteristics. The species is known from Jamaica, Hispaniola and Colombia.

***Thelypteris oligocarpa* (Humb. & Bonpl. ex Willd.) Ching**

Ching, Bull. Fan Mem. Inst. Biol., Bot. 10: 253 (1941).

*Collections*: Isabela, in a cave above Villamil, Stewart 905 (CAS); in a small crater on the S slope of Cerro Azul, 600 m, van der Werff 2260, 2262, 2263 – Fernandina, Adersen 937 (C).

New for the Galápagos Islands. *T. oligocarpa* belongs together with *T. linkiana* to the section *Uncinella* A. Reid Smith, characterized by the presence of uncinat hairs. *T. oligocarpa* has round sori with small, setose indusia that are sometimes hard to find. It is widespread in the West Indies and tropical America.

***Thelypteris pachirhachis* (Kunze ex Mett.) Ching**

Ching, Bull. Fan Mem. Inst. Biol., Bot. 10: 253 (1941).

*Collection*: Santiago, in a *Cyathea weatherbyana* brake near the top, 750 m, van der Werff 2349.

New for the Galápagos Islands. For characteristics see the key. Mainland collections are from Venezuela and Colombia.

***Thelypteris* aff. *glandulosolanosa* (C. Chr.) Tryon**

Tryon, Rhodora 69: 6 (1967).

*Collection*: Isabela, in a streambed on the W slope of Volcán Alcedo, 790 m, van der Werff 1263.

New for the Galápagos Islands. *T. glandulosolanosa* belongs to a group that Smith (1974) places in the section *Adenophyllum* A. Reid Smith of the subgenus *Amauropelta* (Kunze) A. Reid Smith because of its suberect rhizomes, sessile red glands and stramineous stipe with a dark base. This group is in need of revision and

consequently the identification is tentative. *T. glandulosolanosa* is known from Peru.

#### *Thelypteris* sp. nov.?

*Collection:* Isabela, from the SW slope of Cerro Azul, 750 m, van der Werff 2239.

This collection probably represents an undescribed species. It belongs to the subgenus *Amauropelta* (Kunze) A. Reid Smith. In some but not all of its characteristics it agrees with sect. *Blennocaulon* A. Reid Smith. It differs for instance by having a creeping rhizome with distant leaves. As the systematics of this group of ferns are rather confused I prefer to leave it unnamed until a revision of the genus has been made. It is included in the key as *Thelypteris* sp. nov.?

*Description:* Rhizome slender, creeping, up to 10 cm long and 0.4 cm thick. Tip of the rhizome and young leaves covered with some mucilage. Scales at rhizome very few, base of stipe almost glabrous. Stipe 10–25 cm, lamina 10–25 cm. Pinnae 20–25 pairs, up to 2.5 cm long and 0.5 cm wide. The lowermost pinnae (about 5 pairs) gradually reduced. The pinnae are pinnate or pinnatifid. Small aerophores present at the bases of the pinnae. Costae below with few dark scales and many stiff hairs, some of which are pluricellular. Veins dark, sunken in the leaf tissue, slightly widened towards the tip. Indusia absent, sporangia glabrous. Lamina coriaceous, a little shiny above.

I found this fern in only one locality on Cerro Azul, where fresh lava was overgrown by a thick layer of terrestrial mosses (*Thuidium delicatulum* (Hedw.) BSG and *Breutelia* sp. – Dr R. Gradstein and H. Sipman, pers. comm.). Apart from mosses and ferns few plants were present. The *Thelypteris* was creeping over the lava with only the laminae appearing above the moss layer, the stipes and rhizomes being completely hidden.

#### *Thelypteris* species excluded from the key

*Thelypteris invisus* (Sw.) Proctor var. *aequatorialis* (C. Chr.) Morton was reported from Santa Cruz. *T. invisus* is a hybrid between *T. grandis* and *T. serra* (Sw.) R. St. John (for an extensive

discussion on the name *T. invisus*, see A. Reid Smith 1971) only known from Cuba, Haiti and Jamaica. All Galápagos material in DS and CAS identified as *T. invisus* turned out to belong to *T. grandis*.

*T. kunthii* (Desv.) Morton was reported from Santa Cruz. The specimens identified as *T. kunthii* in DS and CAS belong to *T. grandis* (Wiggins 18528) and *T. conspersa* (Wiggins 18.617a). *T. kunthii* is known from the West Indies and the Caribbean coast of Venezuela and Brazil. No collections are known from the W coast of S America and I do not think *T. kunthii* occurs on the Galápagos Islands.

### Amaranthaceae

#### *Achyranthes aspera* L.

L., Sp. Pl. 204 (1753).

*Collection:* San Cristóbal, along a fresh water stream near Tres Palos, 150 m, van der Werff 2180.

New for the Galápagos Islands. *A. aspera* can be distinguished from the other Amaranthaceae known from the archipelago by its long (up to 20 cm or more) spikes with reflexed flowers and fruits. It is a common weed in tropical and subtropical regions.

#### *Alternanthera sessilis* (L.) R. Br.

R. Br., Prodr. 417 (1810).

*Collection:* San Cristóbal, common along the road near Tres Palos, 150 m, van der Werff 2179.

New for the Galápagos Islands. *A. sessilis* can be distinguished from other *Alternanthera* species in the archipelago by its creeping habit and large, obcordate utricles a little longer than the tepals. *A. sessilis* is a widespread weed in the tropics of the Old and New World.

### Piperaceae

#### *Peperomia tequendamana* Trel.

Trel., Journ. Wash. Acad. Sci. 16: 207 (1926).

*Collections:* Isabela, SE rim of Alcedo, 1020 m, van der Werff 1970 – Santiago, epiphyte on *Zanthoxylum* near the summit, Adersen 1070 (C) – Santa Cruz, in *Scalesia* forest near the two craters behind Santa Rosa, Adersen 1311 (C).

New for the Galápagos Islands. *P. tequendamana* has opposite or alternate leaves like *P. petiolata*. However, *P. tequendamana* has densely rufous hirsute young shoots, petioles up to 2 cm long and the lower surface of the leaves are copiously black-dotted.

The Isabela collection is from the SE rim of the Volcán Alcedo where it grows as a creeping epiphyte on mossy branches of *Zanthoxylum fagara*. This habitat is much wetter than the preferred habitat of *P. petiolata* which is usually found in the lower *Scalesia* or Transition zones.

*P. tequendamana* is known from Colombia and Venezuela where it occurs at higher altitudes (2800–3700 m).

### Compositae

#### *Delilia biflora* (L.) Kuntze

Kuntze, Rev. Gen. Pl. 333 (1891).

*Collection*: Isabela, near the tortoise nesting area in the NE part of the caldera of Alcedo, 740 m, van der Werff 1905.

New for the Galápagos Islands. *D. biflora* is an erect annual weed with leaves up to 6 cm. The two endemic *Delilia* species on the Galápagos Islands differ from *D. biflora* in several respects. *D. repens*, a fairly common plant in mesic forests, is a decumbent to trailing weed usually with small leaves (up to 3 cm). *D. inelegans*, collected only by Darwin, is erect and has larger leaves. It has three staminate and three pistillate flowers per head while *D. biflora* has only one staminate and one pistillate flower per head.

*D. biflora* is widespread in tropical America.

The name *Elvira* has often been used for this genus. The name *Delilia* is older and should therefore be used instead of *Elvira*.

#### *Erechtites hieracifolia* (L.) Raf. ex DC. var. *cacaloides* (Fisch. ex Spreng.) Griseb.

Griseb., Fl. Brit. W. Ind. 381 (1861).

*Collection*: Santa Cruz, from pasture land below Santa Rosa along the trail to El Chato, van der Werff 1372.

New for the Galápagos. For a discussion of the relationships between this species and *Senecio* and other genera, see Belcher (1956). *E. hieraci-*

*folia* var. *cacaloides* is a widespread weed in S America.

#### *Galinsoga urticaefolia* (H.B.K.) Benth. in Örsted

Benth. in Örsted, Vidensk. Meddel. Dansk Naturhist. Foren. København 1852: 102 (1852).

*Collection*: Santa Cruz, occasionally along the New Road, van der Werff 1284.

New for the Galápagos Islands. *G. urticaefolia* is a weedy species found in USA, C and S America and in Europe.

#### *Jaegeria gracilis* Hook. fil.

Hook. fil., Trans. Linn. Soc. Lond. 20: 213 (1847).

*J. crassa* Torres, Brittonia 20: 71 (1968).

*Collections examined*: Howell 9576, 9222, 9551a, 9006, 9204, Bowman s.n., Schimpf 91, Stewart 634, 637, Taylor G 34, Wiggins & Porter 633, 646, all in CAS – Colinvaux 347, 388, Wiggins 18.356, 18.774, 18.807, Itow 112, 30701-1, all in DS – van der Werff 957, 1175, 1154, 1353, 1401, 1509, 1528, 1678.

Cronquist recognised two species of *Jaegeria*, *J. gracilis* and *J. crassa*, in the Galápagos Islands. He uses the following differentiating characteristics:

*J. gracilis*: Involucral bracts thin and barely, if at all, wrapped around the edges of the subtended achene. Outer receptacular bracts slightly to strongly differentiated from the middle and inner ones, often somewhat clasping their achenes and occasionally approaching the structure and texture of those of *J. crassa*.

*J. crassa*: Involucral bracts thickened, wrapped around and fully enclosing the subtended achene, often some or even all of the bracts very like outer receptacular bracts; these are glabrous, strongly thickened, conspicuously grooved-striate, wrapped around and fully enclosing the achene. Larger, more robust and often less hairy than *J. gracilis*.

In addition to these differences I noticed that characteristic for *J. crassa* the number of flowers per head decreases to 15 (c. 50 in *J. gracilis*), that the achenes become fused with the receptacle and the head falls as a unit (achenes falling individually in *J. gracilis*), that the growth is erect (*J. gracilis* is trailing), and that it grows in forest (*J. gracilis* grows in wet, disturbed places).

Field observations and study of herbarium and

my own collections have revealed that we are not dealing with two distinct *Jaegeria* populations, but rather with one variable population. A large number of collections are intermediate between the *gracilis* and *crassa* extremes. The plants are found in wet, disturbed sites (especially the *gracilis* type) but sometimes the more stable forest habitat is invaded. It is the collections from the forest that show the *crassa* characteristics: increased size (leaves up to 10 cm), strongly thickened involucre bracts, reduction in the number of flowers per head and fusion between the receptacle and the achenes.

Carlquist (1974) cites several examples from islands in the Pacific of evolutionary changes in originally weedy species upon their spread to more stable habitats. One of the changes is very often a reduction in dispersal ability. *Jaegeria* on the Galápagos Islands seems to be another example of this process. Eventually, the forest type will possibly separate from the weedy type and each of them will become a distinct taxon. Nowadays, however, the intermediates are so numerous that it does not seem possible to recognise the extremes taxonomically.

#### *Tridax procumbens* L.

L., Sp. Pl. 900 (1753).

*Collection:* Santa Cruz, on the open roadside along the new road just outside Puerto Ayora, van der Werff 2238.

New for the Galápagos Islands. *T. procumbens* is a decumbent, stiff-hairy weed with yellow-flowered heads on long, erect peduncles. It is a pantropical weed; I saw it in great numbers along roads in Guayaquil and it has doubtlessly been recently introduced into the Galápagos Islands.

#### Convolvulaceae

##### *Merremia umbellata* (L.) Hallier fil.

Hallier fil., Bot. Jahrb. 16: 552 (1893).

*Collections:* Santa Cruz, along the road near Bella Vista, van der Werff 1289, 2044.

New for the Galápagos Islands. *M. umbellata* is the only member of the Convolvulaceae in the archipelago with bright yellow flowers. It

has been reported from both the New and Old World tropics.

##### *Ipomoea pulchella* Roth

Roth, Nov. Pl. Sp. 115 (1821); O'Donnell, Lilloa 29: 221 (1959).

*Collection:* San Cristóbal, along the road from Baquerizo Moreno to El Progreso, 180 m, van der Werff 2170.

New for the Galápagos Islands. *I. pulchella* is a slender plant that can easily be distinguished from all other Galápagos *Ipomoeas* by its long, filiform and coiled peduncles. The leaves are palmately pentafoliate. *I. pulchella* is pantropical.

##### *Ipomoea stolonifera* (Cyrill.) Gmel.

Gmel., Syst. Nat. ed. 13, 2: 345 (1791).

*Collection:* Isabela, common on sand dunes behind Villamil, van der Werff 2317.

New for the Galápagos Islands. *I. stolonifera* grows on sandy sea shores. *I. pes-caprae* occupies the same habitat but is purple-flowered, while *I. stolonifera* has white flowers with a yellow throat. It is reported from both the Old and New World tropics.

#### Rubiaceae

##### *Oldenlandia corymbosa* L.

L., Sp. Pl. 119 (1753).

*Collection:* San Cristóbal, from the airport near Puerto Baquerizo Moreno, van der Werff 2201.

New for the Galápagos Islands. *O. corymbosa* is a low, branched annual that differs from the other indigenous, herbaceous Rubiaceae by having several seeds in each of the two cells of the fruit. It is widely distributed in the tropics of both hemispheres.

#### Solanaceae

##### *Physalis peruviana* L.

L., Sp. Pl. ed. 2: 1670 (1763).

*Collection:* Santa Cruz, along the road near Sta Rosa, 400 m, van der Werff 1830.

New for the Galápagos Islands. *P. peruviana* is a perennial, pilose species that is considerably larger than the other *Physalis* species reported from the archipelago. A good difference is the size of the anthers: 3 mm in *P. peruviana*, 1.5–2.4 mm in the other species. According to Macbride (1962) *P. peruviana* is frequently cultivated for its edible fruit.

### Verbenaceae

#### *Lippia rosmarinifolia* Anderss. var. *rosmarinifolia*

Anderss., Kongl. Svenska Vet.-Akad. Handl. 1853: 198 (1855).

*L. rosmarinifolia* var. *stewartii* Moldenke, Phytologia 14: 217 (1967).

*Collections*: Isabela, Volcán Alcedo, van der Werff 1038, 2331, 2337.

*L. rosmarinifolia* var. *rosmarinifolia* is known from Isabela, Fernandina and Pinta.

Moldenke (in Wiggins & Porter 1971) gives as diagnostic characteristics for var. *rosmarinifolia*: leaves entire or obscurely toothed. Var. *stewartii* is described as having pinnately lobed leaves. Howell, on the label of his collection no. 9585 (CAS), states that the juvenile leaves are lobed. My own field observations confirm this: van der Werff 2337 is a juvenile, non-flowering plant from the coast below Volcán Alcedo, and has distinctly lobed leaves. All flowering *Lippia* plants in the area had entire leaves. Apparently *L. rosmarinifolia* keeps the lobed leaves longer on the top of the volcanoes than in the coastal areas, but such plants with juvenile, lobed leaves do not deserve taxonomic recognition.

*L. rosmarinifolia* var. *latifolia* Moldenke, described from Santiago, also has entire or obscurely toothed leaves when mature and lobed leaves when juvenile.

#### *Verbena brasiliensis* Vell.

Vell., Fl. Flum. 17 (1825); Icones 1: pl. 40 (1827).

*Collection*: San Cristóbal, along the road near Tres Palos, 150 m, van der Werff 2182.

New for the Galápagos Islands. *V. brasiliensis* has distant leaves and short, densely flowered spikes in fascicles. In *V. litoralis* the spikes

soon become elongate. *V. brasiliensis* is a widespread weed on the American mainland.

#### *Verbena townsendii* Svens.

Svens., Amer. Journ. Bot. 22: 253 (1935).

*V. galapagosensis* Moldenke, Phytologia 2: 55 (1941).

*V. glabrata* var. *tenuispicata* Moldenke, Phytologia 14: 283 (1967).

*V. stewartii* Moldenke, Phytologia 2: 56 (1941).

*Collections examined*: Isabela, Stewart 3317, 3318, 3319, 3320, Howell 9007, all in CAS; van der Werff 2280, 2286, 1172, 1192, 1218, 1897, 2152; Vagvolgyi s.n. (C) – Fernandina, Lynn Hendrix s.n. (DS), Adersen 486, 512, 543, 572, 913, 920, 944, 969 (C) – Pinta, Adersen 1148, 1189 (C); van der Werff 2124.

*V. townsendii* in this wide sense is known from Santa Cruz, Isabela, Pinta and Fernandina.

*V. townsendii*, *V. glabrata* var. *tenuispicata*, *V. galapagosensis* and *V. stewartii* have been separated on leaf characteristics by Moldenke (in Wiggins & Porter 1971). In these four species the leaves range from linear to lanceolate or oblong and from entire to lobed or deeply trifid. Since there were only few collections of these species it appears that Moldenke came to accept them by correlating leaf characteristics with locations. From a study of the herbarium material available, my own collections and field observations I conclude that the taxa mentioned belong to one single, extremely variable species.

There are great differences in leaf shape within the population of Alcedo, Isabela (the type locality of *V. galapagosensis*) where I collected repeatedly. Juvenile plants have relatively wide leaves and would be referred to *V. glabrata* var. *tenuispicata*. Some older plants have linear, entire leaves and would be called *V. galapagosensis*, while others have lobed leaves and are closer to *V. townsendii* or *V. stewartii*. On Cerro Azul old plants have greatly reduced leaves or have leafless flowering branches, while the leaves at the base of the plants are large. Thus, by using material from the upper or lower part of the same plant one can easily arrive at different identifications.

In open, wind-exposed locations the plants are decumbent and the stems regularly carry young shoots with juvenile leaves. Old parts have much narrower leaves. Even the isotypes of *V. stewartii*, *V. galapagosensis* and *V. townsendii*



(CAS) do not show the characteristics ascribed to these species.

Consequently, the lax-flowered, narrow-leaved *Verbena* plants from the Galápagos Islands should not be separated into four species but should all be called *Verbena townsendii* Svens.

## Euphorbiaceae

### *Chamaesyce lasiocarpa* (Kl.) Arthur

Arthur, *Torreyia* 11: 260 (1911).

*Collection*: San Cristóbal, along the road outside Puerto Baquerizo Moreno, 50 m, van der Werff 2171.

New for the Galápagos Islands. Diagnostic characteristics of *C. lasiocarpa* are pubescent capsules, cyathia arranged in leafy dichasia and erect habit. It is known from the Antilles, C America and the northern part of S America.

### *Acalypha parvula* Hook. fil.

Hook. fil, *Trans. Linn. Soc. Lond.* 20: 185 (1847).

*A. parvula* var. *chathamensis* (Robins.) Webster, *Madroño* 20: 263 (1970).

*A. parvula* var. *reniformis* (Hook. fil.) Muell.-Arg., *Linnaea* 34: 48 (1865).

*A. parvula* var. *strobilifera* (Hook. fil.) Muell.-Arg., *Linnaea* 34: 47 (1865).

*Collections*: van der Werff 1026, 1087, 1094, 1100, 1138, 1241, 1250, 1731, 1812, 1853, 1953, 1996, 2053, 2071, 2141, 2147, 2149, 2200, 2274, 2275, 2351 from Santa Cruz, San Cristóbal, Pinzón, Santiago, Santa Maria, Española and Rábida.

*A. parvula* is known from all the larger islands with the exception of the northern islands Pinta, Marchena, Genovesa, Wolf and Darwin.

There is a wide variation within *A. parvula*. Webster (in Wiggins & Porter 1971) recognises four varieties. However, nowadays when more collections are available, it is clear that the size, pubescence and leaf characteristics used in Webster's key do not separate four taxa. The four varieties are "simply arbitrary assemblages of plants selected from a mosaic of clinal and microgeographic variation" (Webster 1970).

### *Acalypha sericea* Anderss. var. *baurii* (Robins. & Greenm.) Webster

Webster, *Madroño* 20: 261 (1970).

*A. sericea* var. *indefessus* Webster, *Madroño* 20: 261 (1970).

*Collections*: Santa Cruz, van der Werff 1278, 1297, 1391, 1667, 1736, 1746, 2617 - Isabela, Volcán Alcedo, van der Werff 1180, 1467, 1502, 1525, 1534, 1861, 1980.

*A. sericea* var. *baurii* in this sense is known from Isabela, Santa Cruz and San Cristóbal.

My collections clearly show that both *A. sericea* var. *baurii* and var. *indefessus* occur on Santa Cruz and Volcán Alcedo, Isabela. On both locations plants from dry areas show characteristics of var. *indefessus*, whereas plants from wetter areas correspond with var. *baurii*. A number of plants are intermediate. Consequently, the varieties *baurii* and *indefessus* do not deserve separate recognition and var. *indefessus* should be regarded as a synonym of *A. sericea* var. *baurii*.

*A. sericea* var. *sericea* and var. *baurii* can be distinguished by the following characteristics:

var. *baurii*: Staminate spike curved, often pendent; its peduncle very short in relation to the fertile part; terminal pistillate spike generally absent, present in specimens from southern Santa Cruz; leaves with 17 or more teeth on each side.

var. *sericea*: Staminate spike erect; its peduncle about as long as the fertile part; terminal pistillate spike present; leaves with 8-15 teeth on each side.

My collections of *A. sericea* var. *baurii* from Alcedo and western and northern Santa Cruz all lack a terminal spike. However, several collections from southern Santa Cruz do have a terminal pistillate spike. Near the Caseta at southern Santa Cruz I found a large heterogeneous population of *Acalypha* (van der Werff 1413, 1414, 1415, 1417, 1419). Some plants belonged to *A. parvula*, which often has well-developed terminal spikes. Others were typical *A. sericea* var. *baurii* lacking a terminal spike. A great number of intermediates were also collected. In this locality *A. sericea* var. *baurii* interbreeds with *A. parvula*. Plants with a terminal pistillate spike but in other respects similar to ordinary *A. sericea* var. *baurii* probably represent introgression from *A. parvula*.

## Lythraceae

### *Cuphea racemosa* (L. fil.) Spreng.

Spreng., *Syst.* 2: 455 (1825).

*Collection*: Santa Cruz, open terrain near Media Luna, 540 m, van der Werff 1692.

New for the Galápagos Islands. Only one other species of *Cuphea* is known from the archipelago, viz. *C. carthagenensis*. This species has axillary, purple flowers while *C. racemosa* has a terminal raceme with almost white flowers. *C. racemosa* is found in tropical S America, extending northwards to Mexico and Cuba.

### Malvaceae

*Sida glutinosa* Commers. ex Cav.

Cav., Mon. Cl. Diss. Dec., t. 2 (8) (1785).

*Collections:* Isabela, E slope of Volcán Alcedo, 750 m, van der Werff 1135; 1020 m, van der Werff 1987 – Santa Cruz, near the Puntudo, Adersen 173, 622 (C).

New for the Galápagos Islands. *S. glutinosa* is immediately distinguished from other species of *Sida* known from the archipelago by being glandular-pilose. The leaves are up to 4 cm long and 2 cm wide, serrate, cordate at base, acuminate at tip and have a stellate pubescence. The flowers are pale orange. *S. glutinosa* is reported from the West Indies and Mexico to S America.

### Polygalaceae

*Polygala* L.

L., Sp. Pl. 701 (1753).

The genus *Polygala* in the Galápagos Islands was recently discussed by Howell & Porter (1968). They recognise five taxa, one of which, *P. anderssonii* Robins., is puberulent and the remaining four glabrous. Other characteristics said to separate *P. anderssonii* from the glabrous taxa show partially overlapping ranges. The difference in ratio of aril length to seed length is not as well-marked as indicated in the key.

Among my collections of *Polygala* are two from Rábida, one (no. 1092) from near the coast and one from the top (330 m, no. 2354). The coastal collection keys out to *P. sancti-georgii* Riley var. *oblanceolata* Howell while the specimens from the top only differ in being puberulent. I found a similar situation on Volcán Alcedo, Isabela: the coastal plants (no. 1000) were glabrous, belonging to *P. galapageia* Hook. fil. var. *galapageia*, while plants growing inside the caldera near the fumaroles at 840 m

(no. 1928) were puberulent but otherwise similar to the coastal plants.

I expect that intense collecting along an altitudinal gradient on Rábida or Alcedo will show that taxa which are glabrous at sea level become puberulent at higher altitudes and that *P. anderssonii* should be reduced to synonymy under *P. galapageia*. At this moment not enough material is available to support this change.

### Umbelliferae

*Hydrocotyle umbellata* L.

L., Sp. Pl. 234 (1753).

*Collections:* Santa Cruz, open terrain near Cerro Crocker, 600 m, van der Werff 1689 – San Cristóbal, near the summit, Adersen 805 (C).

New for the Galápagos Islands. There is only one previous collection of *Hydrocotyle* from the Galápagos Islands. This collection was at first regarded as belonging to *H. umbellata* (Robinson & Greenman 1895) but was later on (Robinson 1902) described as an endemic species, *H. galapagensis* Robinson. This species is extremely similar to *H. umbellata*, the only difference being the leaf margin, which is shallowly crenate in *H. umbellata* but double dentate in *H. galapagensis*. It is quite possible that the type specimen of *H. galapagensis* (originating from San Cristóbal from where *H. umbellata* is reported here) is nothing but an aberrant individual of *H. umbellata*.

### Bromeliaceae

*Tillandsia insularis* Mez in DC.

DC., Monogr. Phan. 9: 765 (1896).

*T. insularis* var. *latilamina* Gilmartin, Phytologia 16: 163 (1968).

*Collections examined:* Gilmartin 875, 876, 877, 879, 882, 883, 884, 885, 886, 906, 908, 917, all in CAS; van der Werff 2316.

*T. insularis* has been reported from San Cristóbal, Santa Maria, Santa Cruz, Santiago, Isabela and Pinzón.

Gilmartin (1968) recognises two varieties in this endemic species. The var. *latilamina* has floral bracts with lepidote outer surface, partly purple leaf sheaths, 4.3–7 cm wide leaves and ascending spikes. In contrast the var. *insularis*

has glabrous outer floral bracts, not partly purple leaf sheaths, 2.4–4 cm wide leaves and spreading to recurved spikes.

These characteristics correlate with regard to size and vary between small and large specimens. Since large specimens are bulky and inconvenient to handle, quite a few older collections consist only of an inflorescence or part of an inflorescence, and a leaf rosette mounted on the same sheet. Usually the rosette comes from a small plant and the inflorescence from a larger one. This gives inaccurate information about the size of flowering plants. To illustrate this I will give the leaf widths of a number of flowering plants from two locations.

I measured 38 plants at Cerro Azul, Isabela. One had a leaf width of 4.0 cm, the others varied from 5.5 to 8.0 cm. At Pinzón I measured 20 plants: two were in the range ascribed to var. *insularis* (3.5 and 4.0 cm) and the remaining ranged from 4.3 to 8.0 cm. Only var. *insularis* had been reported from these localities. The data indicate that most flowering plants have a leaf width in the *latilamina* range but that a few small flowering plants are also found. Since large and small plants grow together extensively, there is no reason to keep them apart taxonomically.

### Cyperaceae

#### *Cyperus densicaesпитosus* Mattf. & Kuekenth.

Mattf. & Kuekenth., *Pflanzenr.* 4–20 (2): 597 (1936).

*Collection:* San Cristóbal, in mud along a fresh water stream near Fresh Water Bay, van der Werff 2175.

New for the Galápagos Islands. *C. densicaesпитosus* is similar to *C. brevifolius* (Rottb.) Hassk. regarding inflorescence characteristics. However, it is a caespitose annual while *C. brevifolius* is a perennial with a slender, long-creeping rhizome. *C. densicaesпитosus* is widespread in tropical America and Africa.

#### *Cyperus odoratus* L.

L., *Sp. Pl.* 46 (1753).

*Collection:* Santa Cruz, along the road near Santa Rosa, van der Werff 1829.

New for the Galápagos Islands. The rachilla in this species becomes corky after flowering and

finally breaks into single-fruited segments. This characteristic is not found in any other species of *Cyperus* known from the archipelago. *C. odoratus* is a common pantropical species.

### Gramineae

#### *Axonopus compressus* (Swartz) Beauv.

Beauv., *Ess. Agrost.* 12 (1812).

*Collections:* San Cristóbal, near El Junco lake, 660 m, van der Werff 2192 – Isabela, southern slope of Cerro Azul, 600 m, van der Werff 2289.

New for the Galápagos Islands. *Axonopus* resembles *Paspalum* in a number of characteristics but can easily be distinguished by its abaxial spikelets. Both areas where I collected *Axonopus* had large herds of free-roaming cattle. *A. compressus* is a widespread tropical grass.

#### *Digitaria decumbens* Stent

Stent, *Bothalia* 3: 150 (1930).

*Collection:* Santa Cruz, in pasture land near Santa Rosa, van der Werff 1838.

New for the Galápagos Islands. *D. decumbens* originates from South Africa and is widely introduced as a forage grass in the tropics. Unfortunately, in the Galápagos Islands this species easily escapes from cultivation and it threatens to overrun the native vegetation in the fern-sedge zone by means of vegetative reproduction. Locally, this grass is called ‘pan-gola grass’.

#### *Melinis minutiflora* Beauv.

Beauv., *Ess. Agrost.* 54 (1812).

*Collection:* Santa Cruz, along the road near Santa Rosa, van der Werff 2087.

New for the Galápagos Islands. *M. minutiflora* is also an introduced forage grass. It does not spread as extensively as *Digitaria decumbens*, but is fairly well confined to the patches where it was planted.

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### Resumen

Desde abril de 1974 hasta octubre de 1975 se realizaron trabajos de campo en las Islas Galápagos (Ecuador), para estudiar la vegetación de la Isla Santa Cruz y de la Isla Isabela, especialmente el volcán Alcedo. Durante dicho estudio además hubo oportunidad de coleccionar plantas en otras islas. Se encontraron 35 especies nuevas para el archipiélago y en unos casos hubo necesidad de cambios de nomenclatura. La presentación de los datos es según la secuencia en la "Flora of the Galapagos Islands" de Wiggins & Porter (1971).

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