XV.

SEMPERVIVA OF THE CANARY ISLANDS AREA.

By R. LLOYD PRAEGER, D.Sc.

(Plates IX–XVI.)

[Read 10 June. Published 24 September, 1929.]

Introduction.

Arising from a request by the Council of the Royal Horticultural Society of London that I should prepare an illustrated account of the Semperviva, I spent three months on the Canary Islands in 1924, studying and collecting the large section of the group which has its headquarters there. On that occasion all seven islands of the archipelago were explored, as well as portions of Madeira. In a paper[1] dealing with some of the results of that visit I explained how an extensive examination of material in Botanic Gardens had shown the necessity of the collecting and study of these plants in their natural habitats. During this 1924 visit, some 50 out of the 60 or so plants, usually considered good species, which inhabit the Canary Islands, were collected, and brought home alive for study, while six additional species were described. The study of any plant-group on these islands is laborious, for several reasons. One is the remarkable degree of strict endemism that prevails in the flora, very many species being confined to one island, often to one small area of one island, thus necessitating much travel. Then again the absence of roads from large areas, the scarcity of inns, and above all the extreme steepness and roughness of the ground, make travel and exploration laborious, difficult, and slow.

The working out of the 1924 material raised a number of questions which called for further investigation on the ground—points relating to identity, to variation, to distribution, and above all to hybridity.

Further work was therefore carried out in the course of a four-months' visit to Teneriffe, Gran Canaria, La Palma, and Gomera in the spring of 1927, during which much difficult and inaccessible ground was explored, and special attention given to species of doubtful standing and to unverified records. As a result, it has been possible to write with some confidence regarding the extent and range of the Sempervivum complex

[1] Praeger: Notes on Canarian and Madeiran Semperviva. Trans. Bot. Soc. Edinburgh 29 199–217. 1925.

upon the Canary Islands,[2] and to speculate upon its past history. Under the term Sempervivum I include the genera Aichryson, Aeonium, and Greenovia of Webb and Berthelot (by some authors included with the European section in the genus Sempervivum), and also Monanthes, which, though more clearly entitled to generic rank, still comes much closer to Sempervivum than to any other genus of the Crassulaceae.

HYBRIDS.

The phenomenon of hybridity, which proved to be a very striking feature of the Canarian Sempervivum-flora, calls for some discussion here. Previous to the date of my first visit, the only hybrid Sempervivum recorded from the islands was *Ae. Smithii* × *spathulatum*, stated by Bornmüller (Bot. Jahrbücher **33** 432) to have been found on Teneriffe by R. P. Murray. Another, of garden origin, *S. barbatum* W. & B. non C. Sm. (*Ae. caespitosum* × *spathulatum*) has been in cultivation for a century, and a third, also of garden origin, *S. velutinum* N. E. Br. (*Ae. caespitosum* × *canariense*) for at least 50 years. During the earlier part of my first visit, before the limits of variation of the species had been determined, hybrids were not noticed. A strong family resemblance pervades the members of the group, and many species vary to a considerable extent as regards both their more conspicuous characters and the details of their flowers, etc. But it became clear before I left the islands that interspecific hybridization was frequent. On my second visit special attention was given to this question, with surprising results. Instead of hybridity being very rare in the group in nature, as was generally supposed (cf. Murray, Journ. of Bot. **37** 203), it turns out that the Semperviva are the most hybrid-producing group in the whole Canarian flora, comparable in this respect to the roses and willows of our own country. The determination of these hybrids *in the field* is usually easy, in spite of the strong likeness which is found throughout the group. This arises from the limited and frequently endemic nature of the distribution of the various species within the island limits. Over two-thirds of the species are confined to some one island of the archipelago, and many of these to a single area (some even to a single station). Also, the species most closely allied to each other seldom occur together, or even on the same island. In consequence, where a hybrid is found, the choice as regards its possible parentage as revealed by a study of the neighbouring vegetation and a knowledge of the species found upon that particular island, is usually very limited. Generally there is no choice at all, and an examination of the minuter characters of the hybrid at once confirms the opinion formed by its general appearance and by observation of the local Sempervivum-flora. For instance, where *Ae. percarneum* × *virgineum*

[2] See Praeger: The Canarian Sempervivum-flora: its Distribution and Origin. Journ. of Bot. 66 (1928) 218.

occurs on Gran Canaria, the only other Aeonia in the vicinity are *Mauriqueorum* and *undulatum*; and the hybrid, showing the characteristic leaf-shape of the first parent and the characteristic pubescence of the second, is unmistakable. But if *Ae. lancerottense* (an ally of *percarneum*), on the one hand, or *canariense* (which comes close to *virgineum*), on the other, were also present, the determination of the hybrid as between these two pairs of possible parents would be much more difficult. This point will be referred to again. In Botanic Gardens, too, where many hybrids are found under a variety of specific names, the parentage of these is generally difficult to surmise, since many species have their counterpart, and since there is in garden material a wide possibility as to parentage, a considerable number of species being in cultivation.

On the Canaries such difficulties are seldom present; and indeed, in several instances, where a pair of Aeonia or Monanthes with the same flowering-time were found growing together, one was able confidently to predict a hybrid, and to find it within a few minutes, for in most cases the hybrid grew quite close to the parents, in spite of the minuteness of pollen-grains and the small size of the seeds[3] of Semperviva, and consequent ease of dispersal. The number of hybrids found during my two visits was no less than 32: 3 in Aichryson, 21 in Aeonium, 1 in Greenovia, and 7 in Monanthes; several others have been found by Dr. Burchard. The species of Aichryson do not appear to cross much. They have indeed little opportunity, since few species are found growing in company. In Aeonium, some species are in bloom as early as December, others do not flower till July, which tends to keep these apart; but in spite of this, hybridization is very common in the genus, and a small overlap in flowering-time appears to suffice for crossing. As regards Greenovia, I found only one distinctive pair of species at any time growing in consort—*G. Aizoon* and *G. aurea*; but wherever they occurred together, a hybrid accompanied the parents. The species of Monanthes often grow several together, and they have a common flowering-time; in these circumstances hybridization is easy, and in fact almost all possible crosses occur, some of them quite commonly.

While the Aichrysa and Greenoviae are mostly plants of strong generic resemblance, in Aeonium a wider diversity is found—plants large or small, tall or short, branched or unbranched, leaves glaucous, glabrous or pubescent, toothed or very finely ciliate; and with a large number of natural hybrids to study, it was interesting to note the dominance or otherwise of this character or that. The result is varied. Thus, glabrescence × pubescence may give either glabrous or pubescent offspring, or slightly pubescent. As regards most characters, a middle course is

[3] According to Hayek (in Hegi Illustr. Fl. Mittel Europa 4 ii 545) the seeds of the hardy Semperviva run about 50,000 to the gram; in the tender Semperviva the seed is about of the same weight.

most frequently taken by the offspring. Sometimes the corresponding characters of the parents are both inherited; this is well displayed as regards the ciliation of the leaves. When serrate-ciliate is crossed with pubescent-ciliate, the result is usually serrate-ciliate spaced out so as to allow pubescence between the large teeth. In certain hybrids, ciliation appears to get quite out of hand—e.g. *Ae. caespitosum* × *percarneum,* in which the ciliae change abruptly from forward-pointing to backward-pointing, and from either to patent; and in *canariense* × *cuneatum,* which on the same leaf may have the ciliation characteristic of one parent or of the other, or none at all. Occasionally crossing has the effect of intensifying a character beyond the amount to which it is present in either parent. Thus some of the hybrids of the *canariense* group have rosettes more dense than in either of the parents (e.g. *Ae. Castello-Paivae* × *subplanum*). Usually the general appearance (i.e. the larger characters) of the hybrids is fairly intermediate, and when the parents are of widely different stature and appearance (as *Goochiae* × *subplanum* or *caespitosum* × *Mauriqueorum*), the resulting plants are curious.

It will be observed that many of the hybrids are described from vegetative characters only. Flowers were absent when they were found, and many of them appear to be slow to produce bloom in cultivation, as some of the species themselves are: a few have been grown for five years and have made large plants without producing blossom. In many other genera certainty of identification would be impossible in the absence of flower, but in the present group this is not so, because in the Canarian Semperviva habit, stem, and leaf usually possess more distinctive characters than do the flowers, and also because it is seldom that two species of at all similar general appearance occupy the same area. As I have said, there is mostly no alternative to one's diagnosis as to the parents of any hybrid found, if one is well acquainted with the characters of the various species. This is true especially as regards the Aeonia. For instance, on Gomera the Aeonia present are *Castello-Paivae, decorum, gomerense, holochrysum, subplanum, Saundersii, viscatum.* These are all so distinctive in habit, stem, and leaf, that the parentage of any hybrid between them is obvious in the absence of flower. On Palma again, the Aeonia are *ciliatum, cruentum, Goochiae, holochrysum, nobile, palmense.* To anyone with even a superficial knowledge of the species, the analysis of any cross between these is quite easy. On Teneriffe, Gran Canaria, and Hierro alone occasionally difficulty in this respect is experienced. On Teneriffe, where *urbicum* and *ciliatum* occur together, the parentage of a hybrid between either of these and a third species may be very difficult to analyse, since the leading characters which separate them, such as the unbranched or branched stem, may be characteristic also of the other parent of their hybrids. On Gran Canaria, *Mauriqueorum* and *undulatum* offer a similar difficulty in places where both are present. On Hierro, *hierrense* and

valverdense present a similar case. But close observation of the plants on the ground usually makes things clear. On the Canaries the various species mostly assume a characteristic habit, colouring, &c., which greatly facilitates the recognition of their hybrid offspring. These characters, especially the latter, are to a great extent lost when the plants are grown under glass in our climate. The parentage of a hybrid, immediately obvious on the ground, would often be almost impossible to determine in European greenhouses.

Summing up our present knowledge on the subject of natural hybrids among the Sempervivum group in the Canaries, we find that out of a total flora of 53 species (of which four are known only from their original records, having never been refound), 35 species are known to cross, producing in all 36 hybrids, the number of crosses which any species produces varying from one to five. Without question, many additional hybrids remain to be discovered. In the majority of cases the hybrids are clearly first crosses, and occur very sparingly — often as single plants, though occasionally in a number of stations: in only a few cases did a hybrid form a colony, and in a few cases also the truly intermediate form which resulted presumably from a first cross was accompanied by a series of forms connecting it with either parent, suggesting subsequent crossings between the hybrid and each of the species concerned.

In a recent communication (Genetica, **10**) J. P. Lotsy has discussed the question of hybridity in the South African flora (in Cotyledon and Euphorbia in particular), and has shown that natural crossing and also re-crossing are common in certain genera, tending greatly to confuse floristic work unless very careful observation accompanies collecting. At a recent meeting of the Linnean Society (28 February), further evidence of the kind was brought forward from South Africa by Professor C. E. Moss, and from New Zealand by Dr. A. W. Hill, F.R.S.—and as regards New Zealand, of a far-reaching character. Among the Canarian Semperviva the danger in this respect is not so great, for reasons already mentioned, and also because crossing is not on so exuberant and conspicuous a scale as it appears to be in some of the South African plants. (But hybridization among the Semperviva has nevertheless led to the publication of certain false "species" — *S. barbatum* W. & B., *S. exsul* Bornm., *S. poculiforme* A. Berger, *S. velutinum* N. E. Br., *Petrophyes tilophila* Bolle). Among the natural hybrids of the Canarian Semperviva, as among the South African genera studied by Lotsy, the most confusing cases are where the first cross crosses back with the parents, producing eventually a series of forms ranging from one parent to the other, as well as other segregates in which certain characters may acquire special emphasis. Lotsy gives to such a congeries the name *populus hybridogenus* (l.c. 100). Among 32 hybrid Semperviva which I had an opportunity of studying *in situ* on the Canaries, 11 displayed this disconcerting tendency to a greater or less

extent, the most striking cases including *Aeonium ciliatum* × *urbicum*, *Ae. Haworthii* × *urbicum*, *Greenovia Aizoon* × *aurea*, *Monanthes anagensis* × *laxiflora* (all of Teneriffe), *Aichryson dichotomum* × *Porphyrogennetos* on Gran Canaria, and *Ae. hierrense* × *palmense* on Hierro. In all the cases quoted except the last, these pairs of parents are more closely allied to each other than to the majority of the Canarian species, and this may possibly tend to facile crossing; whenever any of these pairs of plants grew together, various intermediates usually occurred.

An interesting case was that of *Ae. Smithii* × *spathulatum*, another Teneriffe hybrid, which at one spot (Vilaflor) occurred as a plant fairly intermediate between the parents, and at its only other habitat twenty miles away (above Güimar) appeared in a quite different form, nearer to *spathulatum*. Possibly in this case the parentage was (*Smithii* × *spathulatum*) × *spathulatum*, and the hybrid parent was overlooked, or has died out; or possibly one form represents *Smithii* ♂ × *spathulatum* ♀ and the other *Smithii* ♀ × *spathulatum* ♂.

In a number of cases the hybrid between two species, though found in several or many localities, maintained a quite uniform facies: this, it may be assumed, signified that in all cases it was a first cross. Thus, on the island of Palma, *Ae. ciliatum* × *palmense* turned up again and again, mostly as a single plant; on Gomera, *Ae. Castello-Paivae* × *subplanum* similarly. On Gran Canaria, *Ae. percarneum* × *virgineum* in one valley was dotted about among the parents, but all so uniform as to offer no suggestion of secondary crossings.

No less than one-third of the 32 hybrids found occurred as single plants, mostly immature, but occasionally forming a good clump evidently derived from a single seedling. Indeed, the large proportion of immature plants in both the present category and the last, suggests that as a rule these hybrids are ephemeral things, of little importance in the evolution of the group. Many appear to have no success. Even in those cases where they cross back freely with the parents, the whole hybrid offspring still bears quite a small proportion to the population of the parents. In one instance (*ciliatum* × *holochrysum*) the presence of both old and young plants in a single limited area suggested that the hybrid had produced similar offspring by self-crossing. That this is possible is shown by the case of *Ae. Castello-Paivae* × *subplanum*. This flowered at Glasnevin, and from its seed arose a series of plants of quite uniform character, and indistinguishable from the parent.

The whole question of these hybrids needs elucidation, which can only be carried out in the greenhouse and laboratory by a lengthy series of experiments in breeding and study of these forms, their parents, and their offspring. Dr. Lotsy has recently received from me a series of the species and their hybrids for this purpose, and it is to be hoped that results of his study of them will appear.

Bigeneric Hybrids.

Over a century ago, Haworth (Revisiones Pl. Succ., p. 63, 1821) suggested that a plant, which he named *S. calyciforme β spurium,* which had arisen from seed in the Chelsea Physic Garden, was *Aeonium glutinosum* × *Greenovia aurea*—to use modern names; but the matter was not carried further, and no bigeneric hybrid has been suggested or observed since in the Sempervivum group. But now one can put forward evidence—and of a much more definite character—for the crossing of Aeonium and Greenovia. In Dr. Burchard's garden on Teneriffe in the spring of 1927 I saw a box containing several hundred seedlings about a year old of *Greenovia dodrentalis,* among which were several which looked different from the others, being larger, more stalked and with more acute leaves. Dr. Burchard stated that the whole batch arose from seed from a single fruiting panicle of *G. dodrentalis* gathered in the previous year near Carrisal in N.W. Teneriffe. He kindly gave me cuttings of these plants, and subsequently sent another from the same batch of seedlings which was quite different both from the normal and the abnormal seedlings. He, indeed, distinguished four different abnormal plants, but of these, three appear to me, on cultivation, to be the same in all essentials. Two of these three have now flowered, and their hybrid character is clear—they are *Greenovia* × *Aeonium.* The Greenovia parent is known: as to the other parent, there are several possibilities. *Ae. tabulaeforme* was the only Aeonium I noted at Carrisal as growing close to *G. dodrentalis,* but *canariense, ciliatum, cuneatum, Haworthii, sedifolium, spathulatum,* and *urbicum* all occurred within a few miles, and some of them—possibly all or nearly all of them—much nearer. The characters of the hybrid eliminate most of these at once, and leave *Haworthii* as almost certainly the male parent. Habit, leaf, and flower all suggest this. The other abnormal seedling, sent subsequently by Dr. Burchard from the same batch, is a much smaller greener plant, whose leaf-margins combine the white cartilaginous edge of Greenovia with the green edge and bead-like ciliation found only in *Ae. spathulatum* and *Smithii* (and the Madeiran *glandulosum*). As between these two, the characters of the hybrid all point to *spathulatum.* This plant has not flowered yet.

That flowers of a single panicle should have been pollinated—and successfully pollinated—by two different species of Aeonium, thus producing the only bigeneric hybrids so far known in the group, is a very extraordinary coincidence, but Dr. Burchard's testimony is clear as to the collecting and raising of the seed.

The Figures.

These difficult species, and especially their hybrids, require figuring, and indeed full-size coloured plates alone would give an adequate idea of

their characteristics. In the present paper, the most that can be attempted is partial figuring of the new hybrids; and for this purpose the leaf is more important than either the whole plant or the flower. A single leaf, with details of its ciliation, will often suffice for determination where a single flower with its details would be useless.

The leaves are all drawn natural size, with the ciliation shown enlarged about 10 or 12 times. The figures of Monanthes are likewise $\frac{1}{1}$; where other figures are not to that scale the enlargement is indicated.

For proper study and comparison, corresponding drawings of the parents would be essential. These will follow in the account of the whole group which I am preparing for the Royal Horticultural Society of London, and which is now nearly completed.

The following notes deal mainly with the floristic results of my 1927 sojourn on the Canary Islands, but include also some plants collected in 1924, and overheld from a previous paper (Trans. Bot. Soc. Edinburgh **29** (1925)). One interesting Madeiran hybrid (*Ae. glandulosum* × *glutinosum*) is also included, as well as a note on *Ae. arboreum* correcting a suggestion of my own as to its native country.

For help most willingly given, without which the results of my trip would have been much the poorer, I have to thank especially the representatives of Messrs. Fyffes, Ltd., at Las Palmas, Santa Cruz, and Orotava, for arrangements made in connection with visits to remote parts of Gran Canaria and Teneriffe; Don Bruno Beese, of Santa Cruz, for kindly housing my growing collection in his garden; and Captain Haug, of the Olsen liner San Carlos, who, by granting the use of a state-room for spreading out the plants during the voyage home, secured their arrival in good condition.

AICHRYSON Webb and Berthelot.

A. brevipetalum Praeger.

1928. *Aichryson brevipetalum* Praeger in Journ. of Bot. **66** 221.

HABITAT.—Palma: on rocks in the bottom of the Barranco del Rio above Santa Cruz de la Palma, 1927.

The island of Palma was already the headquarters of the genus Aichryson, possessing five species as compared with three on Teneriffe and three on Gran Canaria, both of which islands are considerably larger. *A. brevipetalum* adds another endemic Aichryson to the Palma flora.

A. dichotomum (DC.) W. & B.

Hierro, Palma, Gomera, Teneriffe, Gran Canaria. Webb and Berthelot (Phyt. Canar. **3** i 30) include this species in List of Plants collected on Lanzarote; no station is given. This is probably the source of Bolle's record mentioned in my previous paper (l.c. 213). Not found since on that island.

In Gomera, and in the Taganana region of Teneriffe, the plant grows luxuriantly to a height of 1 metre among tall ferns in damp forests, often mixed with *Ranunculus cortusaefolius,* and also as an epiphyte on mossy tree-trunks up to 10 metres above the ground; it was seen also high up on palm-trunks, growing from old leaf axils.

Like most of the Aichrysa, this is usually a winter annual, arising with the autumn rains, growing during the winter, and flowering in late spring. But in April I noted many plants that showed no sign of flowering, and were apparently of biennial duration (see note appended by Webb and Berthelot to their description, l.c.). In cultivation in our climate it is usually biennial.

In a form seen at Bco. Añavingo above Güimar, Teneriffe, the flowers were 8–9-parted, with broadly lanceolate petals — not 9–12 linear-lanceolate petals, as is typical; in this particular mimicking the flowers of *A. palmense.*

f. **foliis purpureis.**

A single plant with deep brown-purple leaves, on rocks close to the church at Valverde, Hierro, and another at Taganana, Teneriffe. The former came true from seed, and grown in the open in summer became almost black in colour.

A. dichotomum × Porphyrogennetos Praeger hybr. nov.

On both Gran Canaria and Teneriffe, in places where *dichotomum* and *Porphyrogennetos* grow together, and only there, intermediate plants are present which are without doubt due to hybridization. The two species are so similar that it would be of little service to give an independent description of the hybrid: it is better to say that the distinguishing features of both species—the erect habit, dichotomous branching, broadly ovate leaves, and depressed compact inflorescence of *dichotomum,* and the divaricate branching, rhomboidal leaves, and lax leafy inflorescence of *Porphyrogennetos*—become merged, producing truly intermediate plants. The presence of plants distinctly nearer to one or other parent would appear to point to secondary crossing. Fl. April–May.

Habitat.—Teneriffe: woods at head of Bco. Tajodio, near Santa Cruz; Bco. Añavingo above Güimar. Gran Canaria: Bco. de la Virgen, Bco. de los Tilos, Buen Lugar (all near Firgas).

A. dichotomum × punctatum Praeger hybr. nov.

Description.—Inter parentes media. Planta pedalis, caule ramisque subcrassis hirtis (ut in *dichot.*). Folia rhomboidea ut in *punct.*, hirta ut in *dichot.* Inflorescentia ut in *punct.*, sed hirta ut in *dichot.* Flores 8–meri, petalis lanceolatis acutis.

Habitat. — The particular specimen described, which grew with the

parents in Bco. Añavingo above Güimar, Teneriffe, was on the whole nearer to *punctatum* than to *dichotomum,* both of which were present; but was far removed from the *punctatum* among which it grew. Other intermediate plants nearer to *dichotomum* were also seen. No other species of Aichryson was present. In several glens on Palma (Bco. del Rio, Bco. de los Pinos, &c.) plants not yet in flower were seen which were close to *dichotomum,* but had the marginal purple-fringed crenations of *punctatum,* up to 6 on each edge of the leaf; and the leaves were more rhomboidal than in *dichotomum,* and less densely hairy. I have little doubt that these also were hybrids.

A. palmense Webb.

This plant proves not so rare as was thought. In 1927 I found it in a number of barrancos on the eastern side of Palma, from 150 to 600 metres—Bco. Carmen, Bco. de los Pinos, Bco. Quintero (both the last above Santa Cruz), Bco. de los Gomeros (north of S. Cruz), Bco. de los Sauces, Bco. Herradurra and Bco. Nogles (all near Los Sauces). The plant of the Santa Cruz area differs from that of Los Sauces (which is to be reckoned as the type) in being greener in the leaf, thus more closely resembling *dichotomum.* The plant of the Los Sauces area (1927) and of La Galga (1924) is very grey-leaved. Young plants not yet branched look very like *dichotomum,* but the leaves are more densely hairy, and quite limp and sticky, and drop off easily. The plant usually grows in very dry chinks of overhanging rocks, often quite apart from other vegetation. Any doubt as to the identity of an immature plant is best solved by seeking a dead plant of the previous year; its short stem and very divaricate long branches differ widely from the comparatively long stem of *dichotomum,* dividing only near the top into shortish subcrect branches.

The fresh plant smells of tobacco.

A. Porphyrogennetos Bolle.

Hitherto on record only from Tenteniguada on Gran Canaria, where it is abundant, 600–1,200 metres, chiefly along the streams of that wide valley. Additional stations:—

G. Canaria: Bco. de la Virgen 300–700 metres, and Bco. de los Tilos, abundant; sparingly at Questa de Silva, and at Buen Lugar below Firgas.

Teneriffe: woods at head of Bco. Tajodio near Santa Cruz, 750 metres; Bco. de los Huelcos 900–1,200 metres, and Bco. Añavingo (both above Güimar), and on field walls above Arafo in the same neighbourhood.

In most of these stations *A. dichotomum* is also present, and when this is the case hybrids occur (see under *dichotomum* × *Porphyrogennetos*).

A. Porphyrogennetos has an odour resembling tobacco. The Teneriffe plant is not so much suffused with purple pigment as that from Gran

Canaria, especially from the type locality, Tenteniguada, and in some other respects also it approaches *A. dichotomum.*

A. Porphyrogennetos × punctatum Praeger hybr. nov.

DESCRIPTION.—Inter parentes media. Planta circa 20 cm. alta, 30 cm. lata. Caulis crassus, ramis late divaricatis (ut in *Porph.*). Folia forma et indumento intermedia, viridia, margine punctulis nigris (ut in *punct.*) sed non erosis notato, non mamillato (ut in *punct.*), dorso plus minus rubrostriato (ut in *Porph.*). Flores intermedii.

HABITAT.—Gran Canaria: Tenteniguada, with the parents, in two spots.

Fairly intermediate between the parents, the form of *punctatum* occurring there being a large shade form, shining green, lightly hairy in the upper parts.

A. Porphyrogennetos crosses also with *dichotomum*—see under that species.

A. punctatum (C. Sm.) W. & B.

The most variable Sempervivum on the Canary Islands, and often puzzling. What I take to be the type or something close to it occurs on all the islands except Fuerteventura and Lanzarote.

var. **subvillosum** (Lowe) Pitard and Proust.

1868. *Sempervivum subvillosum* Lowe Man. Fl. Madeira **1** 332.

Distribution the same as the type, but occurs on dry rocks and roofs, not in dampish or shady places.

var. **pachycaulon** (Bolle) Praeger.

1859. *A. pachycaulon* Bolle in Bonplandia **7** 244.

1928. *A. punctatum* W. & B. var. *pachycaulon* Praeger in Proc. R.I. Acad. **38** B 23.

This I take to be little more than a state, not a variety, occurring mostly in very wet places. It appears not separable from *A. immaculatum* Webb: I have grown plants of each from its type locality side by side.

HABITAT.—Palma: Bco. Herradurra and Bco. de los Sauces. Teneriffe: in dense woods at head of Bco. Tajodio; Madre de Agua near Las Mercedes (the type locality of *immaculatum*); woods above Taganana 600–1,000 metres, in deep shade among ferns and Selaginella. The last three stations are all in the Anaga region.

A. punctatum crosses with *dichotomum* and with *Porphyrogennetos*—see under those species.

AEONIUM Webb and Berth.

Ae. arboreum (Linn.) W. & B.

In 1925 (Journ. of Botany **63** 40) I argued in favour of this plant's being native in the eastern Mediterranean, basing this opinion on its known occurrence there as early as the first century A.D., and the continued absence of satisfactory stations elsewhere, all the Canarian stations having now been proved erroneous. I was unaware that in 1921 Gattefosse had recorded it (in Ann. Soc. Bot. Lyon **41** ii 57) from the gorges of Chicht near Mogador, in S.W. Morocco. To this station M. Emile Jahandiez (*in litt.*) adds Cap Saffi, more to the northward, where it was found by M. Ducellier in 1917, and Cap Ghir south of Mogador. MM. Maire and Jahandiez are convinced that the Morocco plant (which grows abundantly in quite wild stations) is true *arboreum* L. I have only seen cuttings, which agree with *arboreum*. So I take it that the home of *Ae. arboreum* has been fixed at last.

It would appear that its introduction into the Mediterranean from the Canarian region, "by, say, the Phoenicians," which in the paper beforementioned I considered as a suggestion savouring too much of romance, is after all the correct one.

Enquiry shows that the Mediterranean is not the only area into which this plant has been introduced, and in which, in some instances, it has become half wild. Its occurrence in Madeira is well known, and I have mentioned (l.c.) that it was collected on St. Helena by Banks and Solander in 1771, and by others subsequently. At the Cape of Good Hope it was found by Ten Rhyne in 1673, and sent to Breyn (Breyn Exot. Plant. Cent. prima 178); by Oldenburg (in gardens) in 1772 (Herb. Brit. Mus.); by Wallich in 1842–43 (Herb. Brit. Mus.); and Mrs. Bolus has sent me living garden specimens. In Peru it was collected at Lima by Dr. Wawra on the "Donau" Expedition of 1868–71, and I have seen a living plant in the Munich botanic garden sent by a lady from Cordoba, in western Argentina. Professor L. H. Baily has sent me dried specimens and excellent photographs from Californian gardens, and Mr. James West of San Rafael living material from the same area. The plant spreads so easily that it will no doubt be eventually at least half naturalized in many of these stations.

Ae. Burchardii Praeger comb. nov.

1925. *Sempervivum Burchardii* Praeger in Trans. Bot. Soc. Edinb. **29** 202.

A study of this plant as grown in the open in Dr. Burchard's garden on Teneriffe leads to some minor corrections in my original description (l.c.). While in British greenhouses the plant assumes a very loose straggling habit, with few branches, and leaves occupying some inches of

their upper part, grown in the open it forms a bush as compact as that of *Haworthii*, with the leaves in rather lax terminal rosettes.

Dr. Burchard's station, where he has re-collected it, is by the road from Masca to Santiago, a little on the Santiago side of the summit. It occurs quite sparingly there, he says.

Ae. caespitosum (C. Sm.) W. & B.

A very strong form in Bco. Umbrada at Tenteniguada, with massive erect stems up to 1·5 cm. thick and 15 cm. long. On roofs at Tenteniguada.

Ae. caespitosum × **Mauriqueorum** Praeger hybr. nov.

(Plate IX, fig. 1.)

DESCRIPTION.—Inter parentes pulchre media. Caulis ut in *Mauriq.*, erectus, elongatus, crassus, parce ramosus. Folia apice ramorum in rosula subplana densa congesta, lineari-spathulata, acuta, 7–9 cm. longa, 1·5–2 cm. lata, glabra (ut in *Mauriq.*), parte inferiore attenuata, margine ciliis densis rectis robustis subulatis 1 mm. longis basi minute hirtulis obsita, dorso glandulis longis immersis (ut in *caesp.*) ornata.

HABITAT : Gran Canaria : one plant in Bco. Umbrada (the most eastern valley of Tenteniguada), 960 metres. *Ae. Mauriqueorum* grew close by, *caespitosum* higher up the hill. Other species in the vicinity—*undulatum, percarneum, spathulatum.*

The rosette of this plant is that of a glabrous *caespitosum*, enlarged and flattened to the size and shape of *Mauriqueorum*. The stem is entirely *Mauriqueorum*. The ciliae are crowded as in *Mauriqueorum*.

Ae. caespitosum × **percarneum** Praeger hybr. nov.

(Plate IX, fig. 2.)

DESCRIPTION.—Habitu *S. caespitosi*, sed multum major. Caulis erectus, subgracilis (c. 7 mm. diametro), ramosus, semipedalis, denique prostratus, elongatus; rami breves, patentes, denique adscendentes. Folia oblanceolata, apice acuminata, c. 9 cm. longa, 2 cm. lata, glabra, carnosissima, undique glandulis elongatis immersis confertis ornata, margine valde ciliata ciliis gracilibus, erectis, 1 mm. longis. Rami floriferi ex basi rosulae, adscendentes, pedales, foliosi. Inflorescentia c. 4 cm. longa, 7 cm. lata, superficie subplana, ramis suberectis. Flores pallide viridescenti-lutei, parvi, petalis 6 mm. longis. Fl. April.

HABITAT.—Gran Canaria: near Agaete and Tirajana (O. Burchard). The finder, to whom I owe plants which I have grown and flowered, states that the plant grew at Agaete with *Mauriqueorum* and *undulatum* and at Tirajana with *percarneum*. I feel confident about the parentage, and believe that search will reveal both parents—or at least the female parent, whichever that may be—within a not excessive distance in both cases.

The leaves much resemble those of *caespitosum* × *Mauriqueorum,* but are darker green (like *percarneum*) and more strongly ciliate, the rosettes are more lax, and the habit completely different from that hybrid. The very pale yellow of the flowers, so different from the gold of *caespitosum,* points to the non-yellow parent.

Ae. caespitosum × **undulatum** Praeger hybr. nov.
(Plate IX, fig. 3.)

DESCRIPTION.—Caulis crassus, fuscus, longiusculus. Folia magna, circa 12 cm. longa, 4 cm. lata, anguste obovato-spathulata, acuta, glabra, subtus glandulis immersis viridibus longissimis confertissimis notata, margine ciliis hyalinis gracilibus basi latis erectis vel reflexis ornata.

HABITAT.—Gran Canaria: Bco. Umbrada at Tenteniguada, 960 metres, one plant.

The leaves are less spathulate than in *undulatum,* and nearly as large, very different from the strap-shaped ones of *caespitosum,* whose influence appears especially in the crowded long glands on the under side of the leaf; the length of the leaves and the very long glands exclude the small-leaved *spathulatum* as a possible parent—it also possesses immersed glands, but they are very short and few.

The other Aeonia in the vicinity were *Mauriqueorum* and *spathulatum.*

Ae. canariense (Linn.) W. & B.

Ae. canariense, the Teneriffe representative of the *canariense* complex, is confined to that island. The Gran Canaria and Palma forms have already been separated from it as *Ae. virgineum* W. & B. and *Ae. palmense* Webb. The Hierro plant seems to agree with the last-named. The Gomera plant, which, as regards its growth-form and leaf-characters in particular, is the most distinct of all, has been hitherto called *canariense*: I have recently distinguished it as *Ae. subplanum* (Journ. of Bot. **66** 221)—see infra.

In exposure *Ae. canariense* sometimes grows as flat as *tabulaeforme,* with leaves often as red as *virgineum*; but normally the leaves are soft green and suberect.

Common on the northern, rare on the southern side of the island, but abundant in Anaga (60–1,050 metres, mostly over 600 metres), and about Masca, 600–900 metres. It flourishes in deep shade as well as in full sun, on rocks, walls, earthy slopes, in woods, and occasionally on roofs.

Ae. canariense × **cuneatum** Praeger hybr. nov.
(Plate IX, fig. 4.)

DESCRIPTION. — Rosulae plurimae, crateriformes. Folia spathulata, inter parentes media, pulchre viridia, glabra, ciliata, ciliis pectinatis vel

pubescentibus. Inflorescentia dense glanduloso-pubescens. Flores pallide sulfurei. Petala 7 mm. longa.

The characters of the hybrid can be appreciated only in comparison with the form and habit of each parent as it prevailed in the vicinity. *Ae. canariense* grew in flat or flattish rosettes, bright green, unbranched or slightly branched, with flowers of the usual very pale colour. *Ae. cuneatum* formed large patches with cup-shaped rosettes, leaves very glaucous, and rich yellow flowers. Two hybrid forms were found. The first (to which the description above refers) was identical in habit with *cuneatum,* but the glabrous leaves were of the bright-green colour of *canariense* with the ciliation of *cuneatum* or of *canariense* or of both mixed, or ciliae stunted or absent (often two or more of these variants on the same leaf), and the inflorescence was as densely glandular-pubescent as in *canariense* (more so than in *cuneatum*). The flowers were in tint just intermediate, as was the length of the petals, which near the base were pale and linear as in *canariense,* not narrowed and bright yellow as in *cuneatum.*

The second form was rather nearer *canariense*—rosettes flattish and mostly single, habit and leaf-colour of *canariense,* leaves glabrous or lightly pubescent, with margins on which the pilosity of *canariense* was dense or weak, and was mixed with more or less of the strong ciliation of *cuneatum.* No flowers seen.

HABITAT.—Teneriffe. Both forms grew with the parents above the 30-foot waterfall at 700 metres on the most easterly branch of the Bco. Tajodio stream above Sta. Cruz, in woods. Both forms were variable as regards the characters quoted, especially as to the ciliation of the leaves (see figures).

Ae. Castello-Paivae (Bolle) Christ.

Gomera: widespread and abundant; its compact glaucous bushes form a notable feature of the vegetation of the rocks, slopes, and dry-built walls. On roofs at Valle Hermoso, 180 metres. On palm trunks up to 6 metres above the ground in the same valley.

Ae. Castello-Paivae × subplanum Praeger nom. nov.

(Plate IX, fig. 5.)

1925. *Sempervivum Castello-Paivae × canariense* Praeger in Trans. Bot. Soc. Edinb. **29** 200 (name without description).

DESCRIPTION. — Inter parentes valde media. Caulis erectus, 7 mm. crassus, ramis paucis patentibus. Rosula densa, subplana. Folia 5–8 cm. longa, 3–4 cm. lata, glabra, pulchre viridia, spathulata, ciliis brevibus, crassis, obtusis, distantibus, pilis minutis glanduloso-pubescentibus intermixtis. Inflorescentia 30 cm. longa, 22 cm. lata, laxa, conica, glanduloso-pubescens. Flores 8-meri, aperte campanulati. Calyx 5 mm. longus,

glanduloso-pubescens, laciniis deltoideo-lanceolatis, acutis. Petala linearilanceolata, acuminata, 9–10 mm. longa, pallide flavo-viridia, dorso margineque glanduloso-pubescentia. Fl. May.

HABITAT.—Gomera: about the Degollada de San Sebastian and Hermigua, five times found, in each case an isolated single plant. The five plants were practically identical, and evidently arose independently as first crosses. Both parents grew near by in all instances, the only other Aeonia in the vicinity being *gomerense* and *viscatum*. The plant flowered at Glasnevin in 1925, and produced seed in abundance. The offspring, now three years old, is uniform in character, and identical with the parent.

Ae. Castello-Paivae × **viscatum** Praeger comb. nov.

(Plate X, fig. 6.)

1925. *Sempervivum Castello-Paivae* × *viscatum* Praeger in Trans. Bot. Soc. Edinb. **29** 200 (name without description).

DESCRIPTION. — *Ae. Castello-Paivae* persimilis, sed minus robusta, *S. viscato* altior, ramosior. Folia intermedia, viridia, nec glauca, subviscata, utrinque minutissime glanduloso-pubescentia, nec glabra, margine minute glanduloso-pubescentia.

The plant looks like a smallish green *Castello-Paivae,* but the fine glandular-pubescence, exactly matching that of *viscatum,* and its stickiness, betray its other parent. The leaves are without distinct ciliae, as in *viscatum*—merely finely pubescent.

HABITAT.—Gomera: a large patch with the two parents below the high waterfall two kilometres south-west of Hermigua. The only other Aeonium in the vicinity was *holochrysum.*

Ae. ciliatum (Willd.) Webb & Berth.

1809. *Sempervivum ciliatum* Willdenow Enum. Plant. Hort. Reg. Berol. 508. (Not *S. ciliatum* Gilibert Fl. Lituan. (1782), nor of some others.)

Teneriffe and Palma. Often a puzzling plant on Teneriffe, since it hybridizes freely with *Ae. urbicum* (see infra); this is especially the case in the Anaga region, where *urbicum* grows in a form which in any case has leaves closely resembling those of *ciliatum* in their green, not glaucous, colour. The Palma *ciliatum* comes near to *urbicum,* being larger and in some areas usually unbranched; but true *urbicum* appears to be absent from that island. The Palma form crosses freely with *palmense,* the Palma representative of the *canariense* group (see infra): but no corresponding cross between *ciliatum* and true *canariense* was observed on Teneriffe.

This is the plant commonly known as *Sempervivum ciliatum,* but Willdenow's name is antedated by that of Gilibert (l.c.), who applied the

name *ciliatum* to a *tectorum* form. Under Aeonium the name *ciliatum* stands, but if the plant is placed under Sempervivum I suggest the name *S. Willdenowii.*

Ae. ciliatum × **Haworthii** Praeger hybr. nov.

(Plate X, fig. 7.)

DESCRIPTION. — Inter parentes media. Fruticulosa, semipedalis vel ultra. Caulis ramosus, ramis subtortuosis, subgracilibus, ut in *Ae. Haworthii.* Folia intermedia, oblanceolato-spathulata, vel spathulata, subpetiolata, viridia, glabra, 5–7 cm. longa, 2·5 cm. lata, apice rubra, rosulis laxiusculis aggregata. Rami floriferi et inflorescentiae *Haworthii* similes. Flores flavescenti-albi, petalis margine paullo serrato-ciliatis. Stamina et carpella subpubescentia. Fl. May–June.

HABITAT.—Teneriffe: with the parents on Montaña de Taco near Los Silos, one plant. Other species present—*urbicum, canariense, sedifolium.* A plant of distinct appearance, differing from *Haworthii* × *urbicum* with which it grows in its more branched habit, smaller green (not glaucous) leaves, &c.

The flowers are as large as those of *Haworthii*; but the petals more expanded. The rosettes are many-leaved, much more so than in *Haworthii.*

Ae. ciliatum × **holochrysum** Praeger hybr. nov.

(Plate X, fig. 9.)

DESCRIPTION. — Caulis *holochryso* similis, pedalis vel ultra, parce ramosus. Folia inter parentes media, *ciliato* angustiora *holochryso* breviora et crassiora, saturate viridia, oblongo-spathulata, rubromarginata, *ciliato* minus spathulata.

The plant looks much like *holochrysum,* but the leaves have the dark green colour and red edge of *ciliatum,* and are 3–4 mm. thick as in that species, not 1·5 mm. thick as in *holochrysum.*

HABITAT.—Both old and young plants, with the parents, on the Bco. Angustias, La Palma.

Although *holochrysum* is a much earlier flowerer than *ciliatum,* this cross is quite possible, owing to the way *holochrysum* lingers on in bloom. On Palma I saw flowers of it several weeks after *ciliatum* had begun blooming.

Ae. ciliatum × **nobile** Praeger hybr. nov.

(Plate XI, fig. 11.)

DESCRIPTION. — Inter parentes media. Caulis crassissimus (2·5 cm. diametro), ultra pedalis, adhuc simplex. Rosula permagna, subplana. Folia glabra, crassissima (medio ad 10 mm., margine 5 mm.), saturate viridia, 15 cm. longa, 7 cm. lata, spathulata, apice rotundata, apiculo breve,

depresso, basi attenuata, margine roseo, ciliato, ciliis distantibus, brevibus, conicis, patentibus, hyalinis, pubescentia minutissima intermixtis.

This plant looked like an overgrown *ciliatum*, but the leaves were far more solid than in that plant, especially at the margins (fig. 11A), and approached the unique massiveness characteristic of *nobile*; the leaf-margins were very instructive, showing clearly the influence of both parents. The colour of the leaves was the dark rather bluish green of *ciliatum*, not the yellowish hue of *nobile*.

Along with several plants of this type, which I take to be a first cross, were others more nearly approaching one or other parent, but also displaying intermediate characters.

HABITAT.—Palma: with the parents on rocks in Bco. de los Gomeros. The only other Aeonium present was *holochrysum*.

Ae. ciliatum × palmense Praeger nom. nov.

(Plate X, fig. 8.)

1925. *Sempervivum Christii × "urbicum"* Praeger in Trans. Bot. Soc. Edinb. **29** 200 (name without description).

DESCRIPTION. — Inter parentes pulchre media. Saepe monocarpica. Caulis brevis vel pedalis, ramis nullis vel paucis, brevibus, horizontalibus. Folia in rosula magna (15–20 cm. diametro) congesta, late spathulata, apiculata, carnosa, mollia, parte anteriore saepe rubescentia, utrinque glanduloso-pubescentia vel rarius glabra, margine serrato-ciliata ciliis robustis deltoideis procurvatis hyalinis, pubescentia intermixtis. Inflorescentia et flores inter parentes media, flores pallide lutei.

HABITAT. — Palma, frequent where the parents grow together. The hybrid mostly occurs as single plants, and with the intermediate plant others occur nearer to one or other parent, pointing to secondary crossing. At Bco. Angustias both old and young plants of identical character were seen together, suggesting that by self-pollination the characters of the first cross continue.

The inflorescence strongly recalls *palmense*, being glandular-pubescent, sticky, and balsamiferous even when the rosette is glabrous and odourless.

Ae. ciliatum × urbicum Praeger hybr. nov.

Where these two common plants grow together on Teneriffe, they hybridize freely, producing a series of forms which extends from one species to the other. At one end of the series we find *urbicum* with a tendency to branch, at the other *ciliatum* less branched and larger-leaved than normal. What may be taken to be the first cross is a plant fairly intermediate in all characters, branching sparingly, with leaves and inflorescence smaller than neighbouring *urbicum* and larger than the other parent.

Where only *urbicum* or *ciliatum* is present these intermediate forms do not occur. In critical floral characters the hybrids are intermediate.

Ae. urbicum also crosses with *Haworthii* and probably with *cuneatum*—see under those species.

Ae. cruentum W. & B.

Palma: chiefly in the south, extending as far north as Mazo on the east side of the island and El Paso on the west. Also Hierro.

After study of *cruentum* and *spathulatum* in all their known habitats, I cannot find that they are entitled to separate specific rank. Both vary to some extent, each in the direction of the other. I could find no constant differentiating character in the flowers: when they were mixed I was often unable to separate them; and the stem and leaf characters quoted by Webb and Berthelot cannot be relied on. *Ae. cruentum* is at best a variety of *spathulatum*, distinguished by its straighter more erect often longer branches; leaves more round-topped, more cuneate below, and rather thicker; plant much suffused with red in exposure.

Ae. cuneatum W. & B.

Teneriffe: Dr. Burchard told me that he had found this plant near the western end of the island (it had been known previously only from the Anaga area in the extreme east), so I was not surprised when I saw it in abundance in several places in the great wooded valley behind Los Silos, 750–1050 metres. Both here and at Anaga it may be found growing in woods in deep shade, among luxuriant ferns and Selaginella, as well as in exposed situations.

? Ae. cuneatum × urbicum.

Some of many plants of *Ae. urbicum* which grew with *canariense* and the hybrid between the last two in the Anaga woods (see under *canariense* × *cuneatum*) had distinctly yellowish flowers (not greenish-white) and lightly glandular-pubescent (not glabrous) inflorescence-branches, bracts and calices, pointing almost certainly to crossing between *urbicum* and one of these two yellow-flowered species, both of which bloom at the same time as *urbicum*. But with which? Probably with *cuneatum*, since the very pale flowers of *canariense* would hardly give so yellow a tint. The characters mentioned were noticed after I had left the spot, with only an inflorescence which was collected as *urbicum*, so presumably the vegetative parts resembled that species.

I publish this note to draw the attention of future botanical visitors to the probable occurrence of the cross.

Ae. cuneatum also crosses with *canariense*—see under the latter species.

Ae. glandulosum × glutinosum (R. P. Murray) Praeger.
(Plate X, fig. 10.)

1899. *Sempervivum glandulosum × glutinosum* R. P. Murray in Journ. of Bot. **37** 203.

DESCRIPTION.—Perennis. Caulis brevis, crassus (basi 2·5 cm. diametro), cicatricibus numerosis elongatis notatus. Rami pauci, breves, patentes. Folia laxe rosulata, 8–12 cm. longa, 4 cm. lata, spathulata vel oblanceolato-spathulata vel spathulato-rhomboidea, apice late cuneata, basi linearia, subsessilia, carnosissima, dura, glabra, ciliata, ciliis digitiformibus vel clavatis, pubescentia breve glandulosa intermixtis. Ramus floriferus crassus, erectus, 15–20 cm. altus, foliosus, foliis glabris decrescentibus margine ciliato, pubescente. Inflorescentia ut in *glanduloso*, 20–30 cm. lata, ramis horizontalibus, foliosis, glanduloso-pubescentibus, subviscosis, prope apicem in ramulos 2–4 breves floriferos divisis. Flores 9–10-meri, aurei, plani, 2 cm. diametro. Calyx 6 mm. longus, glanduloso-pubescens, laciniis late lanceolatis, acutis, 3 mm. longis. Petala 9 mm. longa, late lanceolata, acuta, dorso stria media viridescente percussa. Stamina 8 mm. longa, aurea, filamentis subulatis. Squamae nectariferae quadrato-cuneatae, emarginatae, ·8 mm. longae, 1·0 mm. latae, aureae. Ovaria ventricosa, 3·5 mm. longa, viridescenti-aurea, stylis 3·5 mm. longis. Fl. May–June.

HABITAT.—Madeira: near Funchal (Murray l.c.). At Seixal and at Levada de Sao Roque, with the parents (Père J. G. Costa). The plants from the two latter localities are very similar but not identical, that from Seixal having leaves rather nearer *glutinosum* in shape than the other.

I have to thank Senhor C. A. Menezes for living plants of this interesting hybrid from Père Costa's two stations: found in 1925. Being the only hybrid Sempervivum yet noticed on Madeira, I have given a somewhat full description. The hybrid in most respects fairly combines the more striking characters of its very distinct parents.

Murray's specimens of this hybrid (in Herb. Brit. Mus.) are dwarfed, and seem nearer to *glandulosum* than to *glutinosum*.

Ae. gomerense Praeger comb. nov.

1925. *Sempervivum gomerense* Praeger in Trans. Bot. Soc. Edinb. **29** 205.

Gomera: this species, which I recorded from a single spot at the Degollada de San Sebastian (l.c.), turned out in 1927 to be frequent about that pass, on both sides of the path, 550–950 metres, but mostly near the upper limit given, on very steep dangerous ground, facing towards San Sebastian.

Ae. Goochiae W. &. B.

Palma: chiefly in the north-east of the island, in the Santa Cruz and Los Sauces areas. In the west noted only in the Bco. de las Angustias, sparingly.

In the Bco. de los Sauces, at 450 metres, it grew under trees on the edge of the water-course among *Trichomanes radicans*! Also on trees at the same spot.

Ae. Goochiae × **palmense** Praeger hybr. nov.

(Plate XI, fig. 13.)

DESCRIPTION.—Inter parentes media. Suffruticulosa, pedalis, ramis paucis, gracilibus, pulchre brunneis, 4 mm. diametro, foliis emarcidis irregulariter vestitis. Folia laxe rosulata, forma et colore eis *Ae. palmensis* conformia sed minus glanduloso-pubescentia, viscosa ut in *Ae. Goochiae.*

HABITAT.—Palma: Bco. Quintero above Santa Cruz, one clump, with both parents. The other species occurring in the vicinity were *ciliatum* and *holochrysum.*

In *palmense* the bases of the old leaves are persistent, and clothe the stem densely. In *Goochiae* the whole leaf falls soon. The hybrid is just intermediate: the old leaf-bases remain attached, but rub off easily. The leaves are quite sticky as in *Goochiae,* not merely clammy as in *palmense*; in size they are like a very small *palmense.*

Ae. Haworthii W. & B.

Teneriffe: locally along the north coast. Rocks near Humboldt's Corner, and on cliffs and in barrancos from Garachico to Buenavista: near the latter place it descends to 60 metres, overlapping the maritime vegetation, and ascends to 820 metres. On roofs at Palmar.

Ae. Haworthii × **urbicum** Praeger hybr. nov.

(Plate XI, fig. 15.)

Where these two species grow together on Teneriffe, as in the Los Silos district, 150–600 metres, many intermediates may be found, clearly the result of crossing and re-crossing. (Where *Ae. ciliatum* is also present, as it sometimes is, the matter becomes complicated, and the analysis of intermediate plants impossible, since *Haworthii* and *ciliatum* also cross.) What would appear to be the first cross resembles a large *Haworthii,* much less branched than the type, with a thicker stem, larger longer leaves and a denser rosette, and larger inflorescence of greenish-white or pinkish-white flowers, devoid of the rather orange tinge which (at least in nature) characterizes *Haworthii.* In all the points in which the hybrid departs from *Haworthii* it approaches *urbicum.*

Ae. Haworthii crosses also with *ciliatum*—see under that species.

Ae. hierrense × **palmense** Praeger comb. nov.

(Plate XI, fig. 12.)

1925. *Sempervivum hierrense* × *palmense* Praeger in Trans. Bot. Soc. Edinb. **29** 200 (name without description).

DESCRIPTION. — Hapaxantha (vel rarius ramosa, perennis), erecta, bipedalis, inter parentes media. Caulis crassus, 2·5 cm. diametro, infra nudus. Folia in planta sterile in rosula magna congesta, intermedia, pulchre viridia, glabra vel minute pubescentia, ciliata, ciliis elongato-deltoideis basi pubescentibus, margine inter cilias pubescente. Inflorescentia forma intermedia, circa 25 cm. lata, *palmensi* latior, *hierrensi* angustior. Flores albescentes vel rubescentes vel flavescentes, forma et dimensionibus intermedii.

HABITAT.—Hierro: in the caldera above Valverde and in the adjoining barrancos, not infrequent, also at the base of the cliffs at the east end of El Golfo, abundant with both parents, and varying greatly towards one parent or towards the other.

West of Sabinosa in El Golfo, at the first great scree, at about 180–240 metres above sea, there is a wonderful array of hybrid forms, branched or unbranched, glabrous or pubescent, pink-flowered or yellow-flowered. One sees there what appears typical *hierrense* but with the yellow flowers of *palmense,* and what appears typical *palmense* but with the pink flowers of *hierrense.* A similar range of hybrids occurs in the barranco south of the caldera above Valverde.

The description is taken from plants which were fairly intermediate, and presumably represented first crosses. The only other species present was *Ae. valverdense*—see under *palmense* × *valverdense.*

A different and very distinct form from the barranco below Valverde, above the great waterfall, formed large flat patches with the appearance and colour of *palmense,* leaves only faintly pubescent, but old leaves not persistent; inflorescence taller than in *palmense,* flowers yellow.

In Dr. Burchard's garden at Orotava, Teneriffe, this plant formed a rosette a yard (90 cm.) across.

Ae. hierrense × **valverdense** Praeger comb. nov.

1925. *Sempervivum hierrense* × *valverdense* Praeger in Trans. Bot. Soc. Edinb. **29** 200 (name without description.)

The behaviour of *Ae. hierrense* in presence of *valverdense* on Hierro closely parallels that of *urbicum* in presence of *ciliatum* on Teneriffe. *Ae. hierrense,* which like *urbicum* is always unbranched and hapaxanthous, tends to become branched, sometimes in whorls as in *valverdense*: the rosettes become smaller, the leaves broader, less purple-glaucous, finely pubescent, and the flowers slightly larger, till we get plants quite intermediate between *hierrense* and *valverdense*; and the series continues till

pure *valverdense* is reached. Where *valverdense* is absent, which happens over wide areas, *hierrense* does not vary. The two species are closely related, and a formal description of the hybrid would not be distinctive: it is better to define it as being in almost all characters intermediate—that is, so far as those plants are concerned which may be assumed to belong to a first cross.

HIERRO: rocks above Puerto de Valverde; Bco. de Valverde; and barranco at El Pinar, 450 metres, abundant in all its variants, stems simple to candelabra-like.

Ae. holochrysum W. & B.

Rare on Hierro (Bco. de Valverde and RISCOS de Jinama) and on Gomera (near Hermigua and one plant at Valle Hermoso); abundant on Palma and Teneriffe. A winter flowerer (Jan.–Febr.), but lingers on, and at R. de Jinama was in full flower in middle of May—but that is a very late place.

I have not succeeded in discovering any character by which *holochrysum* and *Mauriqueorum* may be separated when not in flower. Coming back to Teneriffe after a fortnight on Gran Canaria, *holochrysum* looked a larger greener species; *Mauriqueorum* being smaller, and the leaf browner, and more frequently with a brown-purple median streak: grown in the greenhouse the latter mostly bore rather smaller narrower leaves. In flower also, the two are very similar, but *Mauriqueorum* can be distinguished by its *puberulous* (not glabrous) inflorescence and calyx, *short broad* calyx-segments (not lanceolate), and *much smaller scales* (5 mm. long and broad, instead of about twice those dimensions).

This species crosses with *Ae. ciliatum*—see under the latter.

Ae. Lindleyi W. & B.

Dr. Burchard reports having found this lately near the north end of La Palma. Previously it appeared to be endemic on Teneriffe.

Ae. Lindleyi × **tabulaeforme** Praeger hybr. nov.

(Plate XI, fig. 14.)

This is an interesting hybrid and a rather striking plant, for which unfortunately a definite station cannot be given. It was collected by Dr. Burchard on Teneriffe a few years ago, and transferred to his garden, but he cannot recall the locality. I have no doubt as to its parentage. The only other hybrid as yet recognized in which either of these characteristic Teneriffe endemics plays a part is *tabulaeforme* × *urbicum*, described below.

DESCRIPTION. — Suffruticulosa, holosericea. Caulis gracilis, 4 mm. diametro, 15–20 cm. altus. Rami pauci, graciles, patentes, nudi, apice

rosulas densas planas foliorum ferentes. Folia imbricata, 4–5 cm. longa, 2 5 cm. lata, rhomboideo-spathulata, longe petiolata, apice latissime cuneata, utrinque pubescentia, margine ciliata ciliis longis et ciliis brevibus glandulosis. Inflorescentia laxa, intermedia, flores pallide sulfurei, intermedii.

HABITAT.—Teneriffe, Dr. O. Burchard.

The rosettes recall those of *tabulaeforme,* but are much smaller and less dense. The ciliation of the leaves is interesting: the margin bears both long eglandular ciliae representing the very long ones of *tabulaeforme* reduced in length, and short glandular ones like those of the leaf-face, representing the very fine glandular-pubescence of *Lindleyi* somewhat enlarged. The inflorescence is straggling, flattish, with yellow flowers of intermediate colour and form.

Ae. Mauriqueorum Bolle.

This plant of Gran Canaria is very close to *Ae. holochrysum* of Teneriffe, &c.; Bolle in his description does not emphasize the distinguishing characters. I collected both in flower in January (*holochrysum* frequently), and found that the best characters are as under:—

Holochrysum.	Mauriqueorum.
Infl. branches, pedicels and calyx glabrous.	Infl. branches, pedicels and calyx puberulous.
Calyx cut $\frac{1}{3}$ way down into broad deltoid segments, as broad as long.	Calyx cut $\frac{1}{2}$ way down into lanceolate segments, half as broad as long.
Scales ·75 mm. long, 1·25 mm. broad.	Scales ·5 mm. long, ·5 mm. broad.

Forms huge tangled often pendent masses on cliffs as at Tenteniguada, up to 3 metres long and 2 metres broad. See also on roofs and occasionally on trees.

It crosses with *Ae. caespitosum*—see under that species.

Ae. nobile Praeger comb. nov.

1925. *Sempervivum nobile* Praeger in Trans. Bot. Soc. Edinb. **29** 208.

Palma: This fine plant proves to be locally abundant on the island. The two original stations were revisited—the names of these barrancos are Bco. Seco and Bco. de los Gomeros. In the former station, about 60 metres above the road, a line of cliff is tenanted by this plant in thousands, to the exclusion of most other vegetation, and it extends up the barranco for some distance. In Bco. Gomeros it is spreading along the rocks beside the new road. Near Santa Cruz, on the high cliffs south of the tunnel, there is another enormous colony. Here the plant displays strongly its preference for a southern aspect — a very unusual thing among Semperviva especially at low levels. It is confined to those parts of the cliff which face SE.: here it is immensely abundant and *Ae.*

palmense very rare. On the portions of the cliff which face E. or NE., on the other hand, *Ae. palmense* occurs in great profusion and *nobile* is absent. Lines could be drawn vertically up the cliff between the *nobile* areas and the *palmense* areas. On the west side of the island one plant was seen in the crater of the Montaña del Rey between Fuencaliente and Los Llanos, and in the Bco. des Angustias it proved locally frequent along the stream, on rocks facing S., 240–300 metres.

The plant resembles at a distance *Ae. palmense*. When I first saw it, indeed, Dr. Burchard, who was with me as guide and courier, and who had a good knowledge of the local Semperviva, took it to be that species, and discouraged me from climbing the rocks to obtain specimens. It was only when I brought a plant down to the road below that he recognized it as something unfamiliar. But it can with a little experience be distinguished at a distance by its single rosette and the yellow colour of the leaves. In all these stations no sign of flower was seen (in February), and very few old inflorescences (of the past three years). Apparently it is very long-lived.

This is a very massive plant. The stem of a large specimen measured 18 cm. in circumference; its leaves were 30 cm. long, 20 cm. broad, 12 mm. thick; three of them weighed over 2 lb. 5 oz. (600 grammes). An old inflorescence measured two feet across its flattish top, and bore the remains of about 50,000 flowers. In cultivation the plant flowered first at Edinburgh in 1927, but I missed seeing it, as I was in the Canaries at the time. Dr. Burchard has since obtained flowers (in June 1928 in the original station), and has described them and published a photograph (Fedde Repertorium **25** (1928) 51, tab. xliii). The flowers are of dark red, a colour unique among the Canarian Semperviva.

Ae. nobile hybridizes with *ciliatum* (see under that species).

Ae. palmense × **valverdense** Praeger nom. nov.

(Plate XII, fig. 16.)

1925. *Sempervivum valverdense* × *canariense* Praeger in Trans. Bot. Soc. Edinb. **29** 200 (name without description).

Ae. palmense and *Ae. hierrense* are locally abundant on Hierro, and constantly grow together; when this is the case, hybrids are frequent. *Ae. valverdense* is more local; when it joins the other two, hybrids may be found which are clearly *palmense* × *valverdense* (being intermediate in most characters), though in some cases it is difficult to discriminate them from the closely allied *palmense* × *hierrense*, and more difficult to put the differences into words, as habit and colour of the hybrids and of the parents, and other less tangible features of the personality of each—if one may so express it—become important. The main differences between *valverdense* and *hierrense* are the branched habit, smaller finely pubescent

(not glabrous) leaves, and larger flowers of the former; and though branching and pubescence also belong to the other parent *palmense,* it is nevertheless mainly these differences, carried into the two hybrids, which help to distinguish them. The *valverdense* characters which are carried into this hybrid and separate it from *hierrense* × *palmense* are the roughish surface of the leaves, which are of distinctly paler colour than in the other hybrid, the tendency to droop and to twist of the older leaves (very characteristic of *valverdense*), and the less dense rosettes.

Ae. palmense also crosses with *ciliatum* and with *Goochiae*—see under those species.

Ae. percarneum (Murray) Pitard and Proust.

This is the only species of the *urbicum* group found on Gran Canaria, though no less than four occur on Teneriffe. I have no doubt that the Gran Canaria records of *ciliatum* (Webb & Berthelot, &c.) belong here. All the other Gran Canaria Aeonia are yellow-flowered.

Ae. percarneum × **undulatum** Praeger hybr. nov.

(Plate XII, fig. 17.)

DESCRIPTION. — Caulis erectus, crassus, adhuc simplex et semipedalis. Folia in rosulam densam terminalem congesta, oblanceolato-spathulata, in parte superiore angustiora quam in *virgineo,* in parte inferiore latiora quam in *undulato,* 12–15 cm. longa, 5 cm. lata, apice late cuneata vel rotundata, apiculata, versus basem attenuata, glabra, margine ciliata, ciliis patentibus vel suberectis, magus approximatis atque gracilioribus quam in *undulato.*

HABITAT.—Gran Canaria: a single plant growing among *undulatum* in the Bco. de los Tilos, above the road, with plenty of *percarneum* all around.

The other species in the vicinity are *Mauriqueorum* and *virgineum.* The former was considered as a possible parent, but careful comparison *on the ground* left no doubt in my mind as to the parentage.

Ae. percarneum × **virgineum** Praeger hybr. nov.

(Plate XII, fig. 19.)

DESCRIPTION. — Inter parentes media. Suffruticulosa. Caulis brevis, erectus, ramosus. Rami patentes, breves, parte inferiore foliis emarcidis subdeciduis vestiti. Folia pallide viridia (ut in *virgineo*), minute atque sparse pubescentia, dorso purpureo-lineata (ut in *percarneo*), margine rubescente (ut in *percarneo*), ciliata, ciliis brevibus obtusis (ut in *percarneo*) pubescentia (ut in *virgineo*) intermixtis.

HABITAT.—Gran Canaria: Cuesta de Silva, in a valley on the east side of the road with both parents, frequent; also in the barranco east of Cuesta de Silva, near the road bridge.

Fairly intermediate. The fine thin pubescence of the leaves is half way between the felt of *virgineum* and the smooth surface of *percarneum*, and the scarcely persistent leaves are intermediate between the deciduous ones of *percarneum* and the long-persistent ones of *virgineum*. The only other Aeonium present was *Mauriqueorum*.

Ae. percarneum crosses also with *caespitosum*—see under that species.

Ae. Saundersii Bolle.

Gomera: the plant is not entirely confined to the Bco. de la Laja, as would appear from published records. It grows also in the main valley towards the Degollada de San Sebastian, on rocks over the stream at 420–500 metres. This plant smells of balsam, like most of the glandular-pubescent Semperviva.

Ae. Saundersii × **subplanum** Praeger nom. nov.

(Plate XII, fig. 20.)

1925. *Sempervivum Saundersii* × *canariense* Praeger in Trans. Bot. Soc. Edinb. **29** 200 (name without description).

DESCRIPTION. — Herbaceo-suffruticosa, ramosa. Rami breves, subgraciles, foliis emarcidis brunneis vestiti. Rosulae terminales, apertae, subdensae, 5–8 cm. diametro. Folia suberecta, pulchre viridia, 3–4 cm. longa, 2–3 cm. lata, obovato-spathulata, subsessilia, subviscida, glanduloso-pubescentia, apice late cuneata, margine glanduloso-pubescentia. Inflorescentia intermedia, flores intermedii.

HABITAT.—Gomera: on rocks beside the stream in Barranco de la Laja, 240 metres elevation, one large patch, growing near the parents. Other species present—*Castello-Paivae, decorum.*

The plant has none of the miniature tree-like growth of *Saundersii*, but forms a low mound, eventually almost shrubby. The dead brown leaves which clothe the stem are easily detached (unlike the persistent blackish ones of *subplanum*: those of *Saundersii* are not persistent). In cultivation the rosettes and leaves become of nearly twice the dimensions given. The leaves never form a closed bud as in *Saundersii*, but are much more erect than in *subplanum*. The flowering branch is about twice as long as in *Saundersii*, with about four shortish branches. Flowers as large as in *Saundersii*, petals only about 10–11 (as in the *canariense* section). Sepals lanceolate. Petals oblanceolate.

Ae. sedifolium (Webb) Pitard and Proust.

Teneriffe.—In some quantity about Masca. Elsewhere (Proc. R.I. Acad. **38** B 11 (1928)) I have shown the identity of this interesting species with *Ae. Masferreri* Hillebrand.

Ae. Smithii (Sims) W. & B.

Teneriffe: Bco. Añavingo and El Valle above Güimar, 600–1,800 metres. Frequent about Vilaflor, 1,500–1,800 metres, mostly growing half-smothered in pine needles on ledges of rock.

Ae. Smithii × **spathulatum** Praeger nom. nov.
(Plate XIII.)

1903. *Sempervivum Smithii* × *strepsicladum* Bornmüller in Bot. Jahrb. **33** 432 (name without description).

S. barbatum × *Smithii* R. P. Murray in Herb. Brit. Mus.

This is the only hybrid Sempervivum which was definitely on record from the Canary Islands when I visited them in 1924, Bornmüller having reported it (l.c.) as found on Teneriffe by R. P. Murray. Murray's specimens, from Vilaflor, are in the British Museum. I collected it at what was no doubt Murray's station—in the barranco a few hundred yards above the two great specimens of *Pinus canariensis* which every visitor to Vilaflor goes to see (Pl. XIII, fig. 21): and also a quite different form of it above the water gallery in the barranco in El Valle above Güimar, in both cases with the parents, no other species of Aeonium being present (Pl. XIII, fig. 22). Possibly one is *Smithii* ♂ × *spathulatum* ♀, and the other *Smithii* ♀ × *spathulatum* ♂. The Vilaflor plant is more intermediate between the parents, and I take it as type.

DESCRIPTION.—Fruticulus erectus pauciramosus, pedalis. Rami erecti, 4–5 mm. crassi, glabri (nec hirsuti), in parte superiore foliosi. Folia rhomboideo-spathulata vel spathulata, 5–6 mm. longa, 2 mm. lata, pagina superiore undulosa, lucida, pagina inferiore glandulis immersis viridibus denique purpureis notata, utrinque sparse et breviter glanduloso-pubescentia, margine mammillato-ciliata, mammilis pellucidis praecipue versus apicem, ciliis glandulosis praecipue versus basem ornata. Rami floriferi 4–5 cm. longi, perfoliosi. Inflorescentia pauciflora, inter parentes media. Flores intermedii. Fl. May.

Habit of *spathulatum*, but more vigorous. Rosettes larger and laxer, without the terminal closed bud of *spathulatum*. Glands on back of leaf as long as in *Smithii*, but much fewer, as in *spathulatum*.

The form at El Valle was a smaller more compact plant, nearer *spathulatum*. Leaves light green, but broader and more persistent in summer than in *spathulatum*, finely glandular-pubescent (as in *spath.*), not hairy, with beaded lightly ciliate margins; inflorescence like *spathulatum*, but the flowers large, nearly of the size of those of *Smithii*, and petals broader than in *spathulatum*.

The remarkable and characteristic coarse hairiness of the stem of *Smithii* is lost in both hybrids.

Ae. spathulatum (Hornem.) Praeger.

1819. *Sempervivum spathulatum* Hornemann Suppl. Hort. Hafniensis 60 (preface dated March 15, 1819).
1819. *S. lineolare* Haworth Suppl. Pl. Succ. (preface dated May, 1819).
1819. *S. barbatum* Chr. Smith ex Buch in Abhandl. Königl. Akad. Wissensch. Berlin, 1816–17 366 (name without description); and ex Otto in Horae Phys. Berol. 37 (1820) (non Webb & Berth. Phyt. Canar. **1** 188 = *Ae. caespitosum* × *spathulatum*).
1832. *S. villosum* Lindley Bot. Register 1553 (non Aiton).
1840. *Ae. strepsicladum* Webb & Berth. Phyt. Canar. **1** 187.

Teneriffe: frequent on the higher grounds about Güimar, Vilaflor, &c., 750–1,950 metres.

Gran Canaria: refound at Tenteniguada, where it was collected by Bourgeau in April, 1846 (Pl. Canar. 440). I saw it there in a number of stations—in the centre of the valley on stone-heaps, walls, and buildings, 850–950 metres; abundant on the three great stacks known as the Roques Grandes, 1,200–1,500 metres: and at two spots in the Bco. Umbrada, at 1,080 and 1,350 metres. The Gran Canaria plant is identical in all particulars with that of Teneriffe.

Ae. spathulatum crosses with *Ae. Smithii* (see under that species); and its garden hybrid with *caespitosum* is perhaps the commonest Sempervivum in cultivation, under the name of *barbatum*. This hybrid is the *Ae. barbatum* of Webb and Berthelot, not of Chr. Smith; Smith's plant is the present species.

var. **cruentum** (W. & B.) Praeger comb. nov.

Ae. cruentum W. & B. seems best treated as a variety of this species—see under *cruentum, supra.*

Ae. subplanum Praeger.

1888. *Aeonium canariense* Webb ex Christ in Bot. Jahrb. **9** 111 et auct. aliorum quoad plantam gomerensem.
1928. *Ae. subplanum* Praeger in Journ. of Bot. **66** 221.

This, the Gomera representative of the *canariense* complex, is also the most easily recognized, on account of its flat *tabulaeforme*-like mostly single rosettes, and its leaves much narrower below and broader above than its allies; they are linear or nearly so in the lower half or two-thirds, and expand abruptly into a transversely elliptical blade—not longitudinally elliptical as in *canariense, palmense,* and *virgineum.*

Ae. subplanum × **viscatum** Praeger hybr. nov.

(Plate XII, fig. 18.)

DESCRIPTION. — Inter parentes media. Subherbacea. Caulis brevis, ramis subhorizontalibus denique decumbentibus. Rosulae densae, sub-

planae. Folia spathulata, 7 cm. longa, 2·5 cm. lata, mollia, carnosa, viscosa, saturate viridia, apice obtuse apiculata, basi pallida, attenuata, utrinque breviter glanduloso-pubescentia, supra convexa, subtus plana.

A very distinct-looking plant half the size of *subplanum*. Rosettes up to 15 cm. across, dark dull green, quite sticky.

HABITAT.—Gomera: Degollada de San Sebastian, 540 metres, one plant. Other Aeonia present—*Castello-Paivae, gomerense.*

Ae. subplanum also crosses with *Castello-Paivae*—see under that species.

Ae. tabulaeforme (Haw.) W. & B.

Teneriffe: from 30 metres above sea at Garachico and 90 metres at Taganana and below Santa Urzula to 810 metres behind Los Silos and 840 metres above Carrisal; on rocks, grassy slopes, and occasionally on roofs. Young plants are quite coarsely hairy on the face and back of the leaves: this character disappears while the plant is still young, and only the long ciliae remain.

Ae. tabulaeforme × **urbicum** Praeger hybr. nov.

(Plate XIV, fig. 23.)

DESCRIPTION. — Caulis brevis subgracilis ut in *tabulaeforme.* Rosula plana, densissima, 22 cm. diametro. Folia imbricata, circa 7 cm. longa, 3 cm. lata, glabra, petiolata. Petiolus circa 3 cm. longus, compressus, utrinque convexus. Lamina transverse elliptica vel obovata, apice apiculata, basi subtruncata, margine ciliis triangularibus vel elongatis irregularibus basi viridibus confertis obsita, pilis brevibus hyalinis irregulariter intermixtis.

This plant has the flattest and densest rosette of any Aeonium except *tabulaeforme* itself, but the influence of the other parent is very marked in the smooth shining dark green leaves with a trace of red margin, and in the curious ciliation, in which the robust *urbicum* ciliae are intermixed with others approaching the long needle-like ones of *tabulaeforme,* and also very short slender ones.

A hybrid between *tabulaeforme* and *Lindleyi* is described under the former species.

Ae. urbicum (C. Sm.) W. & B.

This plant is variable as regards the colour of its leaves and flowers. About Laguna (the type locality) and Anaga, in the east of Teneriffe, the leaves are quite green with a red edge, closely resembling in colour those of *ciliatum,* which grows with it and hybridizes with it. About Villa Orotava on the other hand a fine glaucous-leaved form prevails. In most other places the leaf-colour is intermediate. The flowers of both the Laguna and Orotava forms are greenish white, while about Los Silos, Arico, and other places in the west they are pink.

Down to 15 metres above sea at Garachico and 60 metres at Buenavista, overlapping the maritime vegetation.

Leaves of seedlings have a brownish median stripe, as in many other species.

In some plants which were not yet showing sign of flowering, eight constrictions due to the advent of the annual resting period could be counted.

The La Palma records appear to all belong to *Ae. ciliatum.*

Ae. urbicum crosses freely on Teneriffe with *ciliatum* and *Haworthii*; also with *tabulaeforme* and possibly with *cuneatum* — see under these species.

Ae. valverdense Praeger comb. nov.

1925. *Sempervivum valverdense* Praeger in Trans. Bot. Soc. Edinb. **29** 215.

This species hybridizes with *Ae. hierrense* and with *Ae. palmense*—see under those species.

Ae. virgineum W. & B.

For *Ae. virgineum* × *percarneum* see under the latter species.

Ae. viscatum Webb.

Gomera: apparently local. Abundant in the San Sebastian and Hermigua areas, but in Valle Hermoso seen only about El Roque. The plant smells of balsam. A fasciate specimen was found near Agulo, which maintains its character.

Ae. viscatum crosses with *subplanum* and with *Castello-Paivae* — see under those species.

GREENOVIA Webb & Berth.

G. Aizoon Bolle.

Teneriffe: frequent on the hills and in the barrancos above Güimar, on rocks, 750–1,950 metres. Recognizable at once from *G. aurea* which accompanies it by its smaller rosettes in dense clusters, dark green in colour, *leaves densely glandular-pubescent* and smaller inflorescences.

G. Aizoon × **aurea** Praeger hybr. nov.

(Plate XIV, fig. 24.)

DESCRIPTION. — Inter parentes media. Rosula saepe unica, *Aizoonte* major, c. 10 cm. diametro, folia latiora, glauca ut in *aurea* vel saturate viridia (ut in *Aizoonte*) vel intermedia, utrinque plus minus glanduloso-pubescentia, juniora *Aizoonte* erectiora. Ramus floriferus c. 20–25 cm. altus, foliis saturate viridibus, glanduloso-pubescentibus, inflorescentia ramis circa 8; rami alterni, dichotomi, 5–10 cm. longi, bracteis multis parvis lanceolatis, ultimis elongato-deltoideis. Flores circa 20-meri, 15 mm.

diametro. Petala oblanceolata, basi attenuata. Caulis floriferus, rami, folia caulina, et calyx dense glanduloso-pubescentes, viscosi, saturate virides, ut in *Aizoonte*. Fl. May.

I saw the two species growing together in four places altogether, in the Güimar area of Teneriffe, 750–1,950 metres, and in each place the hybrid occurred with the parents, even in one spot where only two plants of *Aizoon* were present. In El Valle and elsewhere the hybrid varied considerably, from *aurea* slightly pubescent to *Aizoon* showing traces of *aurea* in its single rosettes (the form of *aurea* here is often unbranched) or glaucescent larger leaves, or larger flowering parts: pointing to secondary crossing.

G. aurea (C. Sm.) W. & B.

Confined I believe to Hierro, Gomera, Teneriffe, and Gran Canaria, being abundant on the two last-named. The Palma plant, observed in many places, was in all cases *diplocycla*, which appears also to be the prevailing plant on Gomera: my Gomera *aurea* came from the Degollada de San Sebastian, where it grew with *diplocycla*. The Hierro record rests on Bornmüller's record ("f. typica"—Bot. Jahrb. **33** 431) and my own observations—see under *G. polypharmica*, infra.

In some places the rosettes are almost invariably single, in others the plant is much branched, forming dense tufts. The leaf-margin is cartilaginous and normally somewhat erose and without the minute glandular ciliae that are characteristic of *G. diplocycla*; but examination in a number of stations showed that such ciliae are occasionally present, rather sparsely distributed along the leaf-edge; these are not more frequent in seedlings than in mature plants. Seedlings have sometimes *papillose* edges; and the first 3 or 4 pairs of leaves are opposite.

The plant crosses freely with *G. Aizoon*—see under that species.

G. diplocycla Webb.

This is the only Greenovia of La Palma and the prevailing one of Gomera, on both of which islands it is locally abundant; of many hundreds of Greenoviae examined on Palma, all were *diplocycla*. It is distinguished from *aurea* by its unbranched habit, usually ciliate leaves, stem-leaves usually forming a cylinder (not a cone), and about 20-parted flowers 15 mm. across (not 25–30-parted flowers about 20 mm. across), with broader petals. But both species vary more or less as regards all these characters, and no one of them can be absolutely relied on: in combination they can be used with safety. Of thousands of plants of *diplocycla* observed, only one was branched; it bore two short offsets.

The Hierro record, which is new, rests on specimens which I collected in 1927 in Bco. de Valverde near the head of the town, which have now flowered. This is probably Webb's *G. ferrea* (see under that name, *infra*).

G. dodrentalis (Willd.) Webb.

1809. *Sempervivum dodrentale* Willdenow Enum. Hort. Berol. 508.
1859. *Greenovia dodrentalis* Webb ex Bolle in Bonplandia **7** 242.
1859. *G. gracilis* Bolle l.c.

This interesting little Greenovia (better known as *G. gracilis*) proves to be not so very rare on Teneriffe (its only habitat) as was supposed. The oldest station, Barranco de Martianez (Buch) has never been confirmed, and we were left with a single station, Barranco Tajodio (Bolle), where it still grows (see Praeger in Trans. Bot. Soc. Edinb. **29** 215). I reported (l.c.) that Dr. Burchard had found a station for it in the west of the island. I discovered this station independently in 1927; it is rather inaccurately described in my paper (l. c.). It is on the southern side of the pass from Buenavista to Carrisal, 850 metres elevation, by the roadside. Two additional stations were also found, one at the east end of Teneriffe, one at the west: namely, on three rocky peaks between Bco. Seco and Bco. Bufadero near Santa Cruz, 630–720 metres, very abundant; and on the great cliffs south-east of the village of Masca, about 600 metres, in profusion.

The flower-stems and branches are rose red. In 1927 the first flower opened (Bco. Tajodio, much its lowest station) on February 1; by the end of May even in its highest stations it was in full summer condition, the rosettes tightly shut and enclosed in dead leaves.

Greenovia dodrentalis × **Aeonium Haworthii** Praeger hybr. nov.

(Plate XIV, fig. 25.)

DESCRIPTION.—Habitu *G. dodrentalis*, caulis brevis, subgracilis, ramosus, infra nudus, ramis patentibus brevibus. Rosulae complanato-sphaeroideae, subdensae, 6–8 cm. diametro, foliis juvenilibus erectis vel suberectis. Rosularum folia sessilia, glabra, pulchre viridia, obovato-spathulata, 4–5 cm. longa, 1·5–2·5 cm. lata, carnosa, margine cartilaginea, albida, erosissima et subciliata pseudo-ciliis crassis obtusis hyalinis irregularibus, pilis brevibus glandulosis rarius intermixtis. Rami floriferi 30–40 cm. longi, dense foliosi; folia inferiora 4 cm. longa, 2·5 cm. lata, sessilia, quadrato-spathulata, apiculata, carnosissima, pulchre viridia, glabra, margine cartilaginea, ciliato-erosa; folia ultima late lanceolata, 1·5 cm. longa, 5 cm. lata, utrinque breviter pilosa, margine hyalina, fimbriata. Inflorescentia 10–15 cm. longa, 10–12 cm. lata, ramis 7–8 suberectis, glanduloso-pubescentibus, bracteatis, bracteis glanduloso-pubescentibus, ultimis elongato-deltoideis. Pedicelli 2–3 mm. longi. Alabastra ovoidea. Flores 2 cm. diametro, 12–14-meri, pallide lutei. Calyx 5 mm. longus, glanduloso-pubescens, laciniis anguste lanceolatis, acutis, 2·5 mm. longis. Petala 1 cm. longa, lineari-lanceolata, acuta, dorso pallidiora, glanduloso-pubescentia, margine ciliata. Stamina flava. Carpella viridescenti-flava,

intus glanduloso-pubescentia. Squamae nectariferae nullae. Fl. Spring.

In the Introduction, I have referred to this plant, which arose from seed of *G. dodrentalis* gathered by Dr. Burchard near Carrisal in N.W. Teneriffe. By a process of exclusion, its parentage seems about as certain as that of any hybrid can be which is not produced experimentally by crossing, with due scientific precautions.

The flowers fade with age to a whitish yellow. The young petals bear on the outside a trace of the rosy flush characteristic of the pale yellow flowers of *Haworthii*. The rosettes are twice the size of those of *dodrentalis*, the leaves greener and cuspidate, the stem longer, and the inflorescence and flowers much more of the type of *Haworthii*, though the absence of scales brings one back to Greenovia. The leaf-margins, where the strong tooth-like ciliation of *Haworthii* wars with the smooth cartilaginous minutely glandular-pubescent margin of *dodrentalis*, are the most striking feature of the plant.

Greenovia dodrentalis × Aeonium ? spathulatum Praeger hybr. nov.
(Plate XV, fig. 26.)

DESCRIPTION.—Subcaespitosa. Caulis gracilis, brevissimus, ramosissimus, rosulae 3–4 cm. diametro, aperta, subplana. Folia pulchre viridia, obovato-spathulata, carnosa, 2–2 5 cm. longa, 1–1 5 cm. lata, apiculata, glabra, margine viridia, vix cartilaginea, erosissima, globulis pellucidis irregulariter dispersis ornata.

This plant is referred to in the Introduction, *supra*, as having arisen with the foregoing hybrid in a batch of seedlings raised from seed of *dodrentalis* collected by Dr. Burchard near Carrisal in NW. Teneriffe. Though it has grown rapidly it has not yet flowered with me: but the hyaline beading on the leaf-edge, coupled with the reduced size and brilliant green colour of the leaves, points almost indubitably to *Ae. spathulatum* as the male parent. The green leaf-margin with greenish pellucid mammillae especially recalls that species.

G. rupifraga Webb.

I have to withdraw my previous remarks (Trans. Bot. Soc. Edinb. **29** 215) regarding this species. The plant found was one of the many forms of *G. Aizoon* × *aurea*. Webb's *G. rupifraga* I believe to have been a strong form of *aurea* (see Praeger in Proc. R.I. Acad. **28 B** 18).

Greenovia ferrea Webb.

1888. *Greenovia ferrea* Webb ex Christ in Bot. Jahrb. **9** 114.
1888. *Sempervivum ferreum* Christ l.c. **161.**

Greenovia polypharmica Webb.

1888. *Greenovia polypharmica* Webb ex Christ in Bot. Jahrb. **9** 114.
1888. *Sempervivum polypharmicum* Christ l.c. **161.**

These two Greenoviae, both confined to Hierro, and the only Greenoviae recorded by Webb as occurring on that island, would appear to be distinct from each other, to judge from the descriptions of the two as made by the same botanist: but whether either or both are distinct from *G. aurea* or *G. diplocycla* (the former occupying Gran Canaria, Teneriffe, Gomera, and Hierro, and the latter Gomera, Hierro, and Palma) is difficult to decide. Both were published by Christ from Webb's incomplete posthumous "Synopsis"; but that work bears clear evidence of being rather in the nature of jottings than of considered opinions,[4] and these names may have been bestowed temporarily on plants which Bourgeau's dried specimens (from which they were described) led Webb at the time to believe distinct. Bornmüller, who collected on Hierro, found at Risco de Jinama (the station for *polypharmica*), only *G. aurea* "f. *typica*" (Bot. Jahrb. 33 431). R. P. Murray's experience was the same. In Herb. Brit. Mus. a specimen of his bears the label *S. aureum* C. Sm., Vuelte de Ximimar, R.P.M. "From the locality, this must be the plant called *G. polypharmica,* but I cannot see how it can be distinguished from *aureum.*" I searched widely over El Golfo (where R. de Jinama is situate), seeing only one species, which occurs in abundance and seemed typical *aurea* (I did not know *diplocycla* at the time (which also occurs on Hierro), and specimens brought home have not flowered yet).

Comparing *polypharmica* with *ferrea,* Webb says "praecedenti [*G. ferrea*] omnibus partibus minor, foliorum, paniculae et ovariorum forma diversa." This would make *ferrea* larger than *aurea,* if *polypharmica* be the latter species, so on that assumption *ferrea* could not be *diplocycla.* The differences between the two according to Webb's descriptions appear as follows:—

G. ferrea.	G. polypharmica.
L. broad, flabellate.	L. flabellate-rhomboid.
Cauline l. ovate-orbicular.	Cauline l. spathulate-oblong.
Stem glabrescent.	*Stem pilose-glandular.*
Pan. subthyrsoid, br. ascending.	Pan. depressed, br. short ascending.
Carpels densely glandular.	*Carpels densely papillose.*
	"Differs from ferrea in all parts smaller and in the shape of leaves, panicle and ovaries."

[4] The whole style of the work suggests this—its irregularities, redundancies, and omissions. Of ten Semperviva there described as new, only three (*Ae. virgineum, Ae. palmense,* and *Petrophyes pallens*) would appear to be valid species. The remaining seven (*A. immaculatum, Ae. Bentejui, Ae. macrolepum, Ae. Youngianum, G. ferrea, G. polypharmica, G. rupifraga*) would seem all to be referable to previously described species. This and other obvious faults are so out of keeping with the care and accuracy displayed in Webb's published work that they leave little doubt in my mind as to the nature of the "Synopsis."

Of these characters, the differences of stem and carpels suggest *two* species, and neither agrees very well with *aurea*; *ferrea* seems to come very near *diplocycla,* but that species is *smaller* in flower than *aurea,* to which alone the description of *polypharmica* might apply, whereas Webb states that *ferrea* is *larger* in all parts than *polypharmica.* Nevertheless, I am inclined to think that neither of the Hierro species, when fully known, will stand, and that Murray, Bornmüller and I overlooked no plant when we found *aurea* alone at R. de Jinama: *ferrea* is probably *diplocycla.* I searched Bco. de Valverde, the station for *ferrea,* from 750 metres to sea-level, finding a Greenovia at only one spot, on a rock opposite the upper end of the town: this has now flowered with me, and is certainly *diplocycla*! *G. aurea* and *G. diplocycla* both vary much in size, shape of leaf, and size of flower, and descriptions drawn up from one or few dried specimens are of questionable value in defining species in this genus. There are no specimens of either *ferrea* or *polypharmica* in the Webb herbarium in Florence.

MONANTHES Haworth.

M. anagensis Praeger.

1925. *Monanthes anagensis* Praeger in Trans. Bot. Soc. Edinb. **29** 216.

Teneriffe.—This plant occurs in great profusion along the ridge of the Anaga Mountains, 600–990 metres, on rocks, and was seen covering a thatched roof there. One lowland station was also noted—at the base of the Roque des Animas at Taganana, 90 metres above sea.

The plant was collected by Bourgeau (Plant. Canarienses, 1855, an unnumbered sheet in Herb. Edinb.), who named it "*P. agriostaphis* Webb, var." His station is "rochers de la Cumbre de las Mercedes," that is, the west end of the Anaga ridge.

M. anagensis × laxiflora Praeger hybr. nov.

(Plate XV, fig. 27.)

DESCRIPTION.—Inter parentes media. Suffruticulosa, sed *M. anagensem* plerumque minor. Folia alterna (ut in *anagense*) raro opposita (ut in *laxiflora*), longe elliptica vel lineari-elliptica, breviora quam in *anagense,* longiora quam in *laxiflora,* viridia vel purpurascentia, subteretia, supra planiuscula. Flores intermedii.

M. anagensis and *M. laxiflora* are both abundant along the ridge of Anaga on Teneriffe (about 900 metres), and with them various intermediates occur, clearly the result of crossing and re-crossing. What may be taken as the type of the hybrid, the first cross, is fairly intermediate save in the arrangement of the leaves, where one parent or other must be followed, and the alternate arrangement found in *anagensis* generally prevails.

The figure shows a cross with the habit of *anagensis* but leaves opposite as in *laxiflora,* and another nearer *laxiflora* but with leaves usually alternate as in *anagensis.*

M. brachycaulon (W. & B.) Lowe.

Confined, I believe, to Teneriffe and Gran Canaria, in many parts of which it is extremely abundant. I saw no trace of it on any of the other islands. It is true that Pitard and Proust record a new variety of it from Gomera:—

"Var. γ *Gomerae* Pitard Pl. Canarienses no. 85. Très distincte du type, cette variété, qui pourrait être élevée à la dignité de sous-espèce, s'en sépare par sa souche à peine renflée, ses feuilles plus étroites (2 mm. au lieu de 4 mm.), ses inflorescences à pédoncules filiformes bien plus nombreuses et plus ramifiées, enfin ses fleurs de moitié plus petites. GOMERA: Barranco de la Conception, près San Sebastian."

I was not able to visit this station, but I saw *M. brachycaulon* nowhere on the island, while *M. pallens* was abundant in many places. Except for the size of the flowers (which is usually about the same in the two species) the description above fits *M. pallens* very well, regarding which the authors state that they know neither the plant nor its description. I feel little doubt that their plant was a small-flowered form of *pallens.* The size of the flowers in this genus is not a reliable character.

M. brachycaulon varies much in colour of leaf and flower. On Gran Canaria the plant is often deep purple, with reddish flowers, and among these and elsewhere one finds an occasional plant with bright green leaves and yellow flowers. This remark applies to f. *ramosa* also.

f. **ramosa.**

DESCRIPTION.—Stem producing radiating horizontal perennial branches, up to 2 cm. long, at first slender and leafy, in older plants bare, and rather thick, producing at their apices leaf-rosettes and lateral flowering shoots similar to those borne by the parent stem. In strong plants the secondary rosettes themselves produce similar perennial branches: and occasionally the process is repeated a third time.

A single plant of this striking variety may bear as many as 40 (but mostly 5–20) rosettes each with its ring of flowering branches, forming a flat patch half a foot across. Occasionally roots are produced from a secondary rosette, and its stem then becomes bulbous as in the parent rosette.

HABITAT.—Teneriffe: above Los Silos. Gran Canaria: Bco. de la Virgen, and about Tenteniguada, where a very vigorous form is abundant.

This form in some way resembles *brachycaulon* × *laxiflora,* but the latter lacks the compound-stellate arrangement of the branches, which are simply branched and somewhat tortuous.

Pitard and Proust (l.c.) published a second new variety:—"Var β. *Canariae* Pitard. Inflorescences pauciflores (3 à 5 fleurs) présentant à la base des pédicelles floraux, une rosette des longues feuilles (8 à 10 mm.) formant involucre et donnant à la plante un aspect particulier. GRAN-CANARIA: San Mateo (900 m.)." But the characters given fall within the normal range of variation of this variable species, and intermediate forms are frequent.

f. **fasciata.**

Fasciate forms resembling a small *Sedum reflexum* f. *monstrosum* were found on Gran Canaria at Tenteniguada, Buen Lugar, and Bco. de los Tilos.

The species ranges from 60 to 150 metres and is in full flower in April. Mostly occurs on vertical rocks and walls, but was seen covering a palm trunk in the Caldera de Bandama on Gran Canaria.

M. brachycaulon × **laxiflora** Praeger.

(Plate XV, fig. 28.)

1859. *Petrophyes tilophila* Bolle in Bonplandia **7** 245.
1888. *Monanthes tilophilum* Christ in Bot. Jahrb. **9** 162.
1928. *M. brachycaulon* × *laxiflora* Praeger in Proc. R. Irish Acad. **38** B 19.

The opinion that I expressed (l.c.) that Bolle's *P. tilophila* is this hybrid is since confirmed by the examination of a co-type of Bolle's plant in Bourgeau's exsiccata in the Webb herbarium at Florence. This specimen (labelled *P. muralis*) is identical with my plant from Bco. de los Tilos (Bourgeau's original locality for the plant) and elsewhere.

DESCRIPTION.—Ramosus, ramis foliosis e basi repente adscendentibus vel erectis. Caudex non bolboideus. Folia sparsa vel subrosulata, alterna, plurima, oblanceolata vel obovata, basi cuneata vel rhomboideo-elliptica, purpurea, magnitudine inter parentes media, purpurascentia, 9–12 mm. longa, 4–6 mm. lata, 2–4 mm. crassa, supra plana vel concava, subtus convexa, apice obtusa vel subobtusa. Ramuli floriferi unici, terminales, omnino foliosi (ut in *lax.*), vel 2–6, axillares, parte inferiore nudi (ut in *brach.*). Racemi 4–6-flori, simplices, nudi. Flores intermedii. Fl. April–May.

HABITAT.—Gran Canaria, Teneriffe, in several places on each island, with the parents.

The hybrid is variable, since the parents are also so. The Gran Canaria plant (Bolle's *tilophila*), to which the above description applies, has for parents the very robust form of *brachycaulon* characteristic of that island—in some cases probably f. *ramosa*—and also a robust form of *laxiflora*. The hybrid is correspondingly robust, and forms a vigorous clump or mat. On Teneriffe, in presence of smaller and normal forms of the parents, the hybrid also is a smaller neater plant. On both islands plants may be found bearing

both the axillary flowering shoots of *brachycaulon* with a dense subrosette of leaves, and the terminal almost leafless ones of *laxiflora*. But neither the bulbous rootstock of *brachycaulon* nor the opposite arrangement of the leaves of *laxiflora* appears to be carried into the hybrid.

Forms nearer one or other parent are not infrequent, pointing to secondary crossing.

M. brachycaulon × **pallens** Praeger hybr. nov.

(Plate XVI, fig. 30.)

DESCRIPTION. — Caulis bolboideus vel cylindricus, brevis, simplex. Rosula unica, densitate et colore inter parentes media. Folia magnitudine et forma intermedia. Rami floriferi axillares ut in parentibus. Flores intermedii.

This Teneriffe hybrid assumes two forms according to the form of *M. pallens* prevailing. On the Anaga mountains we get *brachycaulon* × *pallens typica,* rather large and dark purplish green in colour, with leaves 1 5 cm. long. It is this form which is figured. About Casa Blanca, on the other hand, the *pallens* parent is var. *silensis* and the hybrid is more compact and grey in colour, with leaves 1 cm. long, more tapering and less spathulate. In both cases the hybrid is just intermediate between the parents.

M. brachycaulon × **polyphylla** Praeger hybr. nov.

(Plate XV, fig. 29.)

DESCRIPTION. — Caulis gracilis, breviter repens, ramosissimus, ramis apicibus erectis dense foliosis (sed minus dense quam in *polyphylla*). Folia brevia, spathulata, apice rotundata, basi brevissime subpetiolata, sparse papillosa, viridia, nec rubescentia nec cinerascentia ut in *polyphyllo*. Rami floriferi, ut in *polyphyllo,* breves, ex centro rosularum, irregulariter ramosi, efoliosi, 5–10-flori, pedicellis longis. Flores intermedii.

HABITAT.—Teneriffe: cliffs above La Galeta beyond Garachico, with the parents. Also present—*M. laxiflora, M. icterica.*

The hybrid is a very distinct and pleasing little plant, forming a mat or little mound rather like a green, lax, broad-leaved *polyphylla.*

Strong rosettes bear both leafless terminal flowering shoots as in *polyphylla* and lateral ones with a group of leaves as in *brachycaulon.*

M. icterica (Webb) Praeger comb. nov.

1859. *Petrophyes icterica* Webb ex Bolle in Bonplandia **7** 244.
1908. *Aichryson Mollii* Pitard in Pitard and Proust Iles Canar. 189.

This, the sole annual species of Monanthes, is on record only from the island of Gomera, about the Degollada de San Sebastian. I saw it there in abundance in 1927, from 390 to 900 metres, and also at Valle Hermoso—

near El Roque at 420–600 metres, and in the valley bottom above the village at 300 metres.

On Teneriffe it proved frequent along the range of cliffs from Garachico to Buenavista, 150–300 metres. It is a very inconspicuous plant, but it favours especially little steeply sloping earthy patches, and one soon gets to know exactly where to look for it. The flowers are sometimes of a dirty greenish-yellow colour (whence its name), sometimes of a brownish or reddish hue, caused by an admixture of reddish purple.

I have shown elsewhere (Proc. R.I. Acad. **28** B 14) the identity of this plant with *Aichryson Mollii* Pitard, from Agulo, which lies between the two Gomera stations quoted above.

M. laxiflora (DC.) Bolle.

Gomera, Teneriffe, Gran Canaria, Fuerteventura, Lanzarote. One of the most widely distributed of the whole Sempervivum group on the Canary Islands, making its absence from Palma and Hierro the more striking; I saw no trace of it on those western islands.[5] Down to 90 metres at Taganana on Teneriffe, but prefers an altitude of 600–900 metres, where it is sometimes very abundant. This is the only Monanthes which I saw on the eastern islands of Fuerteventura and Lanzarote (the only one recorded is the elusive *M. microbotrys* on Fuerteventura, of which more later). In the latter island I found *laxiflora* (a curious small form) on Pico de la Zarza, 780 metres (also the only station of *microbotrys*), and on the NW. cliffs of Monte Cardon; on Lanzarote it is frequent in the northern part.

A very variable plant, in exposure dwarf and creeping, with short ascending tortuous silvery branches and grey almost globular scaly leaves, in shade with lax elongate stems and green lanceolate leaves, in other places suberect and bushy. But these differences are not always merely the result of habitat, for at the baths in the barranco below Firgas on Gran Canaria a small erect form grows beside another which hangs in pendant tresses a foot long. Flowers mostly purplish, but a greenish-yellow form was seen on Gomera near the Degollada.

Bornmüller (in Fedde Repertorium **3** 26) distinguishes two forms, *α genuina* with racemes, pedicels and usually calyx densely glandular-pubescent: and *β. eglandulosa* Bornm. var. nov., with these parts quite glabrous (hab. Anaga on Teneriffe, with the former variety). Of many plants examined by me on the five islands named above, the most densely hairy were from Anaga, and they were exceptional. The majority were

[5] Knoche (Vagandı Mos **1** 114) records *M. laxıflora* (under the name *P. agrıostaphyes* [sic]) from the Caldereta south of Sta. Cruz on Palma; but his book contaıns so many mısprints and misstatements that one is left doubtful: I did not see it in the Caldereta (*M. polyphylla*, not mentioned by him, is frequent there), nor elsewhere on that ısland.

nearly without hairs; only one (from Gran Canaria) was completely glabrous.

M. laxiflora was seen on tree-trunks 6 or 7 metres above the ground below Hermita Carmen on Teneriffe, but characteristically it is saxicole, like all the Monanthes.

f. **minor** Praeger.

DESCRIPTION.—Subshrubby, much smaller in all its parts, branches erect, tortuous, leaves egg-shaped, of $\frac{2}{3}$ the dimensions ($\frac{1}{3}$ the bulk) of those of the type, hairs of calyx and pedicels unusually long.

HABITAT.—Gran Canaria: Bco. de la Virgen, Cuesta de Silva. Teneriffe: Casa Blanca. Gomera: Degollada de San Sebastian, Agulo, Valle Hermosa. Fuerteventura: Pico de la Zarza.

Very distinct-looking when characteristic, but connected by intermediates with the type. It keeps constant in cultivation, unlike the very large form f. *major* (with hanging stem 30 cm. long and leaves up to 2·5 cm. long, as in Bco. de la Virgin on Gran Canaria), which reverts to type.

With reference to *M. microbotrys* Bolle and Webb, found by Bolle on Pico de la Zarza, I have given my reasons elsewhere (Proc. R. I. Acad. **28** B 12) for regarding it as a form or hybrid of *laxiflora*.

f. **foliis aureis**.

A young plant found at Degollada de San Sebastian, Gomera, with leaves wholly yellow or mottled yellow and green, has retained this character. The young leaves are all pale yellow: some of them retain this colour, while others turn full green. Variegation is extremely rare in the Sempervivum group, the only other instances I know being *Aichryson tortuosum* and *Aeonium arboreum*.

M. laxiflora × **pallens** Praeger hybr. nov.

(Plate XVI, fig. 32.)

DESCRIPTION. — Inter parentes media. Caulis decumbens vel repens, ramosus, ramis multis, adscendentibus vel erectis, 10–12 cm. altis, parte inferiore simplicibus vel ramosis, parte superiore racemos graciles terminales ebracteatos ferentibus. Folia sessilia, conferta, spathulato-oblanceolata, apice late cuneata nonnunquam subapiculata, 8–12 mm. longa, 4–5 mm. lata, 3–4 mm. crassa, margine integra vel papillosa. Racemi 1–6-flori. Flores 7–8-meri. Calyx sparse hirsutus, 3·5 mm. longus. Petala glabra, 5 mm. longa. Ovaria papillosa. Fl. May–June.

The form described is from Gomera, where I found it above Hermigua and near Agulo, with the parents, the only other Monanthes in the vicinity being *polyphylla*. But the hybrid is variable, like its parents. Near the Roque del Inglese on the Anaga ridge on Teneriffe it grows as a smaller,

laxer, but more shrubby plant, more purple in colour, with a different appearance but no essential differences. This is the form which is figured. The only other Monanthes present there was *anagensis*. Above Casa Blanca on Teneriffe the hybrid grows abundantly, quite grey in colour like the form of *pallens* (var. *silensis*) which occurs there, and looks much like a small grey *laxiflora*.

M. laxiflora crosses also with *anagensis* and with *brachycaulon*—see *ante*.

M. muralis (Webb) Christ.

On record only from the island of Hierro. It is of frequent occurrence also on Palma. I found it at Fuencaliente, the southern extremity of the island, in 1924, and in 1927 traced it northward along the east coast to Mazo, and along the west coast to El Paso and the Barranco de los Angustias.

See also under *M. subcrassicaulis, infra.*

M. pallens (Webb) Christ.

Teneriffe, Gomera, Hierro. On Teneriffe it is a puzzling plant, as it varies between wide extremes. On one hand we have the form so abundant in the Anaga region (and to which the Gomera and Hierro plants usually approach or conform), which is the type. It has rather large rosettes, pale green, dark green, or purplish, and 3–5 cm. across. On the other hand there is the plant of western Teneriffe, as about Los Silos, which is so different as to deserve a varietal name.

var. **silensis** Praeger var. nov.

DESCRIPTION.—Rosulis parvis glaucis convexis dense imbricatis, 1–2 cm. diametro, eis *M. polyphylli* similibus.

The rosettes are quite like those of *polyphylla*, for a form of which I first mistook the plant: but even when it forms a little clump, the rosettes will be found to have each its abbreviate thickened erect rootstock, while *M. polyphylla* is creeping and slender-stemmed.

In their hybrids these two forms carry their distinctive characters with them—see under *brachycaulon* × *pallens* and *laxiflora* × *pallens*.

f. **ramosa**.

While the typical or Anaga form is unbranched, forming slowly a cylindrical stout stem (stout, that is, in reference to the small size of the plant) which may attain a length of several centimetres, var. *silensis*, while typically also unbranched, assumes occasionally a much-branched form, with numerous axillary branches bearing, in lieu of ephemeral flower-shoots, perennial leaf rosettes. At first I suspected this to indicate hybridity, but the plants in other respects conform entirely to *pallens*. This f. *ramosa* is not infrequent with typical var. *silensis* above Casa Blanca on Teneriffe.

M. pallens × polyphylla Praeger hybr. nov.

(Plate XVI, fig. 31.)

DESCRIPTION.—Inter parentes media. Caulis brevis, minus repens et minus ramosus quam in *polyphyllo*, rosulis eis *S. pallentis* conformibus sed minoribus, planiusculis, aggregatis.

Quite intermediate in character, preserving but in a restricted way the creeping branching stem of *polyphylla*—not the unbranched short erect stem of *pallens*; but having the glaucous rosettes and leaves of *pallens* var. *silensis*. Easily confused with the f. *ramosa* of the last-named, as the appearance of the two is very similar: but on examination the tuft is found to be produced by axillary branching from a single central rosette in the latter case, while in *pallens × polyphylla* it is produced by the branching of shortly creeping stems, as in *polyphylla*.

HABITAT. — Teneriffe: rocks above Casa Blanca, with the parents. *M. laxiflora* and *M. subcrassicaulis* were also in the vicinity.

M. polyphylla Haw.

Teneriffe! Gran Canaria! Palma! It has been reported elsewhere, as from Gomera by myself (Trans. Bot. Soc. Edinb. **29** 217), but such records belong to *pallens* or *subcrassicaulis*. One of the most constant in character of all the Monanthes, but *pallens* and *subcrassicaulis* may mimic it to some extent, *pallens* by the dense convex rosettes of var. *silensis*, *subcrassicaulis* by tending towards a branched prostrate stem.

M. polyphylla × subcrassicaulis Praeger hybr. nov.

(Plate XVI, fig. 33.)

DESCRIPTION.—Caulis repens ut in *polyphyllo* sed crassior et laxiore ramosus, ramis adscendentibus ramulos multos emittentibus. Folia inter parentes media, obovata, brevissime petiolata, 12–15 mm. longa, 5–6 mm. lata. Rami floriferi ex centro rosularum, breves ut in *polyphyllo*.

HABITAT.—Gomera: Valle Hermoso, with the parents.

As in the case of others of these rather difficult hybrids, it is not easy to express in words the distinct appearance of this plant; even when on the ground the parentage of the hybrid is clear, when viewed in relation to the possible parents growing on the island—*icterica, laxiflora, pallens, polyphylla, subcrassicaulis*. The present hybrid had just the dark purplish-green tint of *subcrassicaulis*.

M. polyphylla also crosses with *brachycaulon*—see under that species.

M. subcrassicaulis (Kuntze) Praeger comb. nov.

1891. *Sempervivum Monanthes* Aiton *β subcrassicaulis* Kuntze Revisio Gen. Plant. **1** 231 (not *Petrophyes muralis* Webb subsp. *P. subcrassicaulis* Bornmüller in Bot. Jahrb. **33** 432 = *Monanthes muralis* Christ).

Kuntze's description is most inadequate:—"Caules ramosi crassiusculi 2–4 cm. alti." (This is in contrast to var. *a filicaulis* (=*M. polyphylla* s.s.)—"caules (rhizomata) subterranei filiformes"), but having collected extensively on Palma (whence Kuntze records both plants), I feel little doubt as to its application; and Kuntze's plant appears well entitled to specific rank.

M. subcrassicaulis comes nearest to *M. polyphylla*, which is the only species with which it can be confused. It differs from the latter in its looser growth, scarcely creeping habit with longer erect branches (never forming a mat), shorter and less densely imbricated leaves (and consequently elongate and narrower rosettes), longer and more branched flower-stems with shorter hairs (which do not exceed the diameter of the branch which bears them), smaller flowers, shorter hairs on calyx and corolla, and shorter stouter ovaries. It differs from *muralis* especially in its non-shrubby habit; also in its much longer leaves, hairy petals, &c.

In view of the brevity of Kuntze's diagnosis, I append a description of the plant.

Herba humilis, caespitosa, glabra, lucida, saturate viridis. Radices fibratae. Caules ramosi, parte inferiore decumbentes vel repentes, nudi, parte superiore adscendentes vel erecti, 1–2 cm. longi, foliosi. Folia dense imbricata apice ramorum rosulata, sessilia, cuneata vel late clavata, glabra, lucida, plus minusve papillosa, apice truncata vel depresso-apiculata, parte inferiore attenuata, pallida, basi purpurea, subteretia vel supra plana, 10–12 mm. longa, 2·5 mm. lata, circa 1·5 mm. crassa. Folia inferiora saturate purpurascentia. Ramuli floriferi 1–3 ex apice rosularum, nudi, hirti, filiformes, 3–4 cm. alti, irregulariter ramosi, 1–5-flori. Pedicelli 1–1·5 cm. longi. Alabastra oblate sphaeroidea. Flores 7–8-meri. Calyx hirtus, rubro-lineatus, 3 mm. longus, segmentis late lanceolatis subacutis 2·5 mm. longis. Petala lineari-deltoidea, acuta, hirta, 3·5 mm. longa. Stamina epipetala 3·5 mm., episepala 3 mm. longa, filamentis filiformibus, antheris subglobosis purpureis. Squamae nectariferae obcordatae, emarginatae, apice retusae, basi subsessiles, 1·5 mm. longae, 2 mm. latae. Carpella 2 mm. longa, ovariis purpureo-lineatis, 1·25 mm. longis, stylis ·75 mm. longis. Fl. Maio-Junio. (Descriptio ex planta culta.)

HABITAT.—Canary Islands: Gomera, Palma, Teneriffe, on rocks.

Bornmüller (Bot. Jahrbücher **33** (1903), 432) transferred Kuntze's variety to *M. muralis* as a subspecies:—"Die Unterart unterscheidet sich vom typischen kleinstrauchigen *P. muralis*, mit dem sie die gleiche Rosette gemein hat, durch rasigen Wuchs (subterrane Verzweigung) und grössere Blüten." His station is "La Palma: ad muros prope El Paso vulgare, c. 400 m." I searched at El Paso (on the western side of Palma), but did not find anywhere there the plant which I take to be Kuntze's *subcrassicaulis* (which is frequent on the *eastern* side of Palma); but I found

abundance of *M. muralis* of a rather lax procumbent form (typical *muralis* is frequent on Palma, though not recorded). This peculiar habit is due, I found, merely to its growing there in dry-built walls, in the crevices of which it roots far in where there is soil, and straggles out towards the light. In cultivation it assumes the normal erect shrubby habit of *muralis*. I have no doubt this is Bornmüller's *subcrassicaulis*—but not Kuntze's.

M. subcrassicaulis was seen in a number of stations on Palma and Gomera, and about Los Silos and along the Anaga watershed on Teneriffe; 150–900 metres.

DESCRIPTION OF PLATES.

All figures natural size except where stated.

Plate IX.

FIG.

1. *Aeonium caespitosum* × *Mauriqueorum* hybr. nov.
2. *Ae. caespitosum* × *percarneum* hybr. nov.
3. *Ae. caespitosum* × *undulatum* hybr. nov.
4. *Ae. canariense* × *cuneatum* hybr. nov.
5. *Ae. Castello-Paivae* × *subplanum* nom. nov.

Plate X.

6. *Ae. Castello-Paivae* × *viscatum* comb. nov. Leaf × 1, flower × 3.
7. *Ae. ciliatum* × *Haworthii* hybr. nov.
8. *Ae. ciliatum* × *palmense* nom. nov.
9. *Ae. ciliatum* × *holochrysum* hybr. nov.
10. *Ae. glandulosum* × *glutinosum* comb. nov.

Plate XI.

11. *Ae. ciliatum* × *nobile* hybr. nov. *a*, cross-section of leaf, × 1.
12. *Ae. hierrense* × *palmense* comb. nov.
13. *Ae. Goochiae* × *palmense* hybr. nov.
14. *Ae. Lindleyi* × *tabulaeforme* hybr. nov.
15. *Ae. Haworthii* × *urbicum* hybr. nov.

Plate XII.

16. *Ae. palmense* × *valverdense* nom. nov.
17. *Ae. percarneum* × *undulatum* hybr. nov.
18. *Ae. subplanum* × *viscatum* hybr. nov.
19. *Ae. percarneum* × *virgineum* hybr. nov.
20. *Ae. Saundersii* × *subplanum* nom. nov. Leaf × 1, small rosette × 1, flower × 2.

PLATE XIII.

Ae. Smithii × *spathulatum.*

21. Form from Vilaflor, × 1.
22. Form from El Valle, × 1; flower × 3.

PLATE XIV.

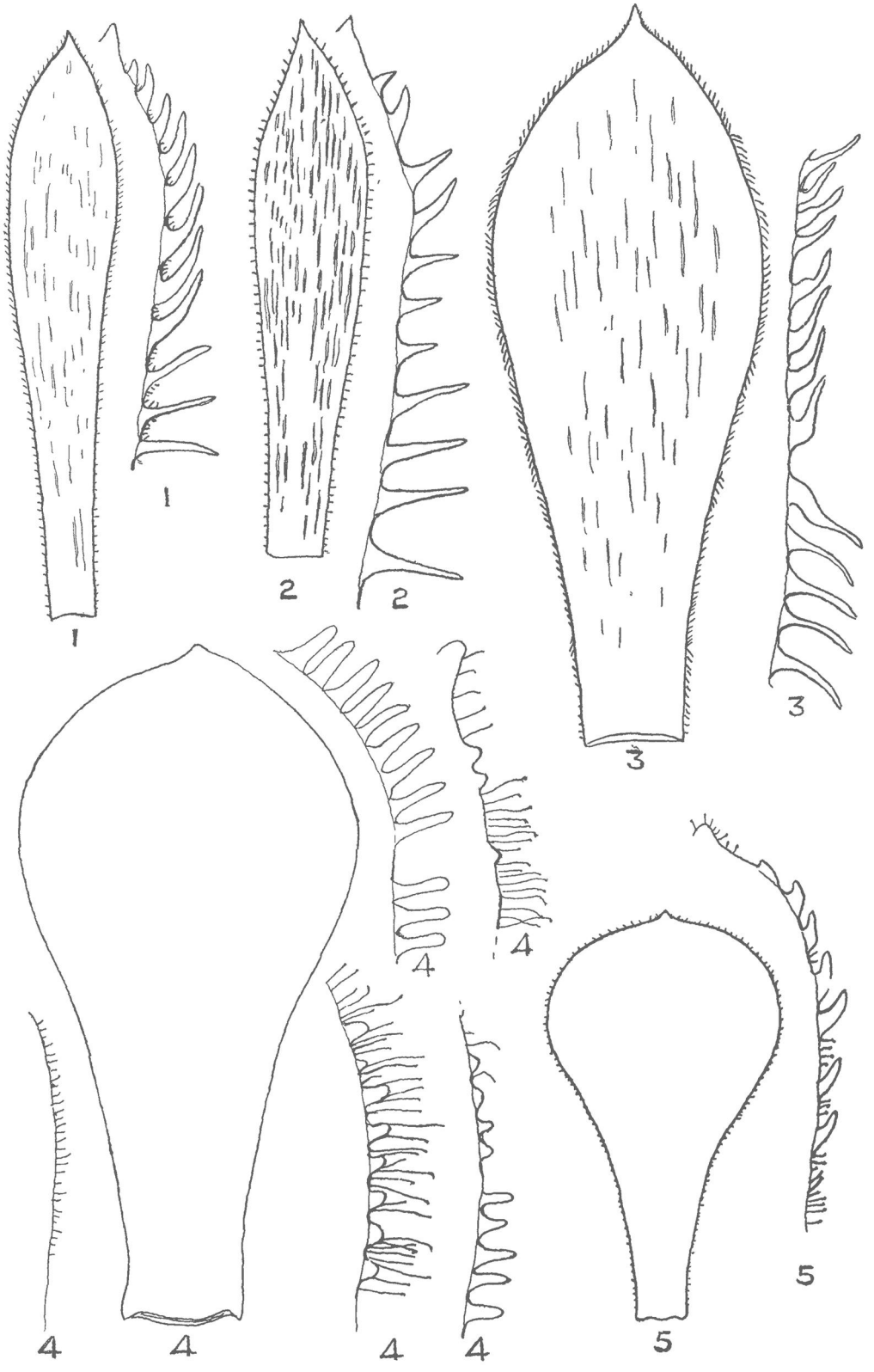
23. *Ae. tabulaeforme* × *urbicum* hybr. nov.
24. *Greenovia Aizoon* × *aurea* hybr. nov.
25. *G. dodrentalis* × *Ae. Haworthii* hybr. nov. Plant, leaf, and branch of inflorescence × 1; flower and bud, × 3; details of flower, × 6; *a*, leaf-margins enlarged.

PLATE XV.

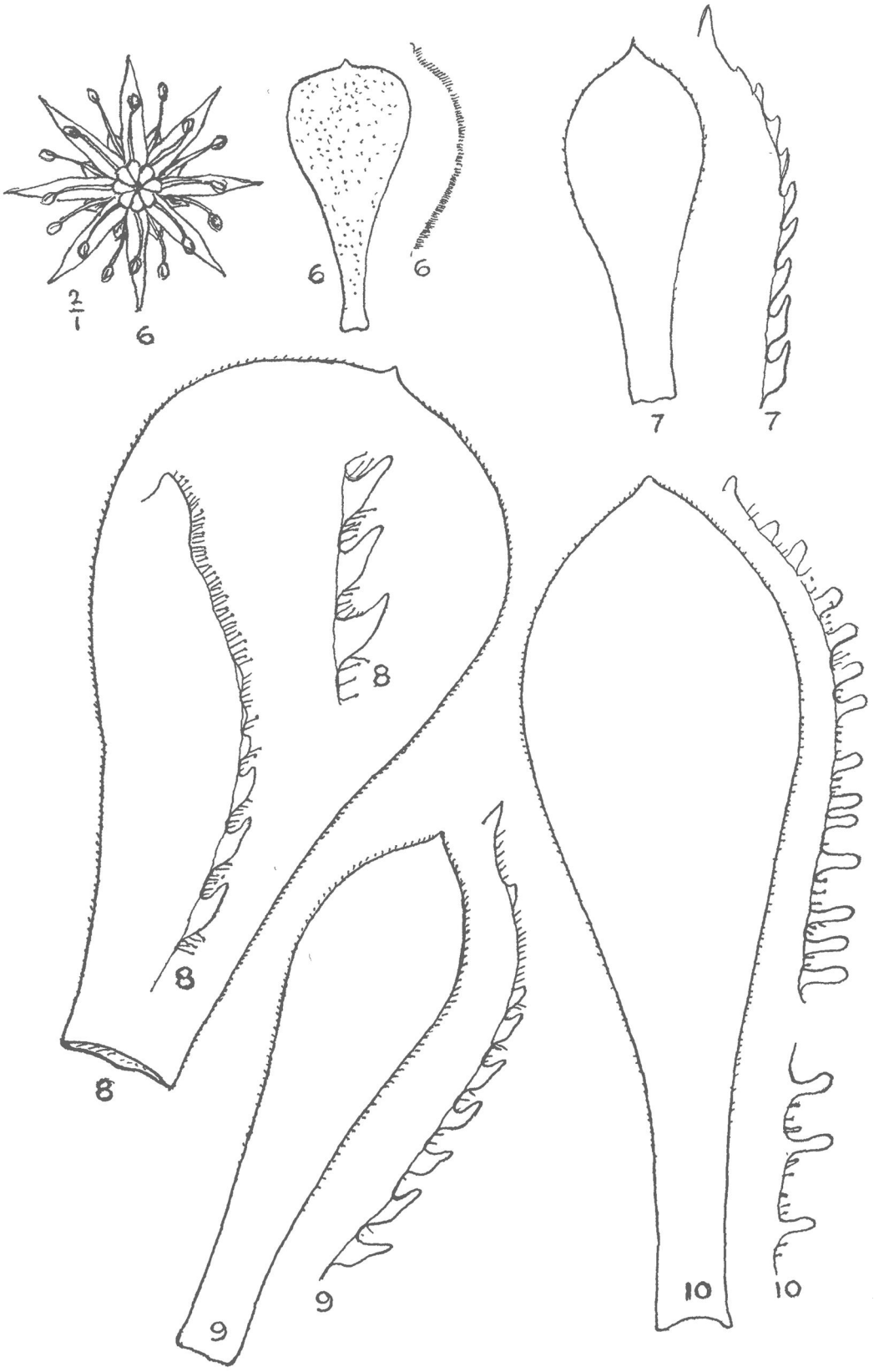
26. *G. dodrentalis* × *Ae.* ? *spathulatum* hybr. nov. Plant and leaf, × 1; leaf-margins enlarged.
27. *Monanthes anagensis* × *laxiflora* hybr. nov.
28. *M. brachycaulon* × *laxiflora.*
29. *M. brachycaulon* × *polyphylla* hybr. nov.

PLATE XVI.

30. *M. brachycaulon* × *pallens* hybr. nov.
31. *M. pallens* × *polyphylla* hybr. nov.
32. *M. laxiflora* × *pallens* hybr. nov.
33. *M. polyphylla* × *subcrassicaulis* hybr. nov.



PRAEGER—SEMPERVIVA OF CANARY ISLANDS.



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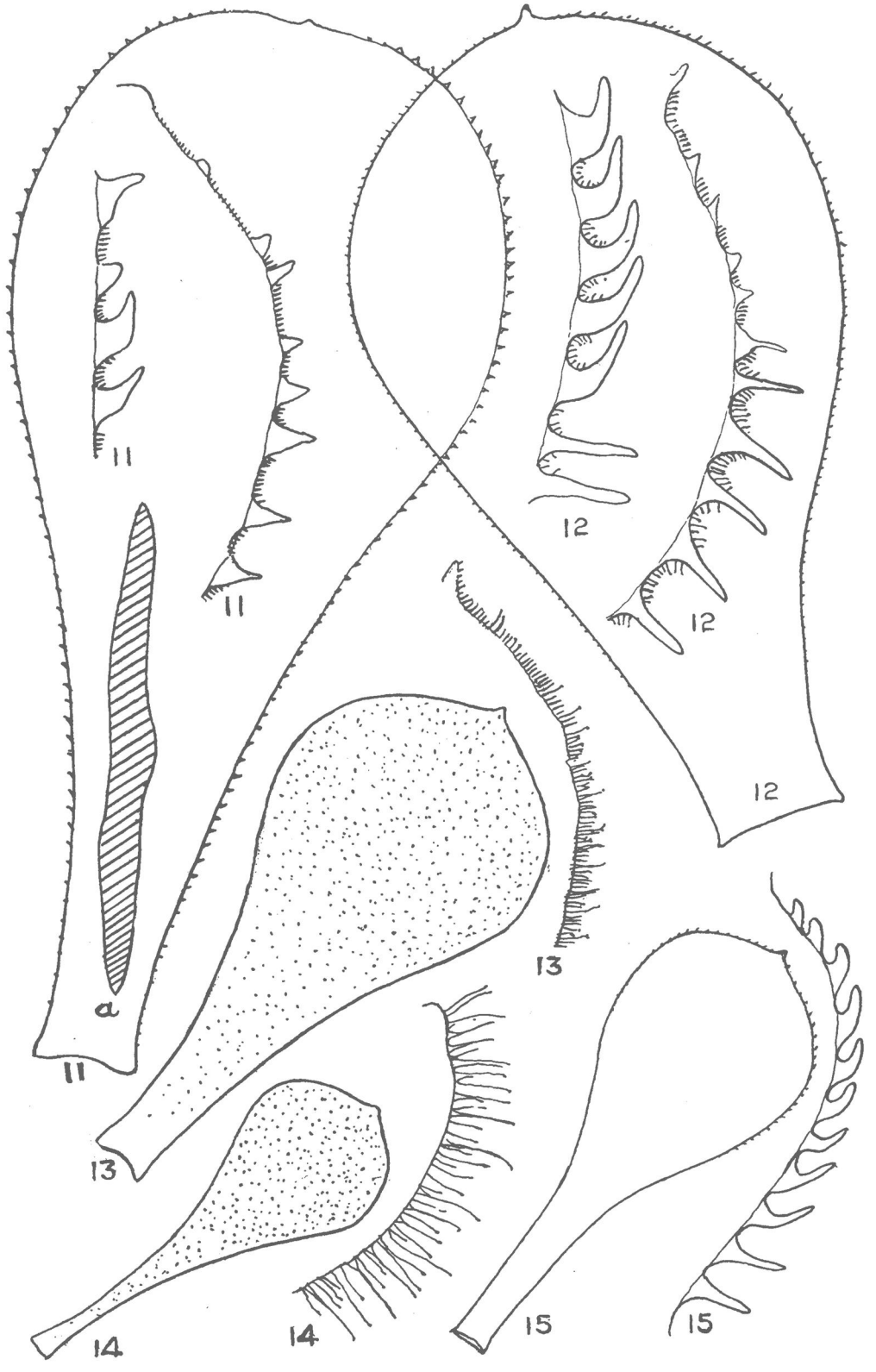

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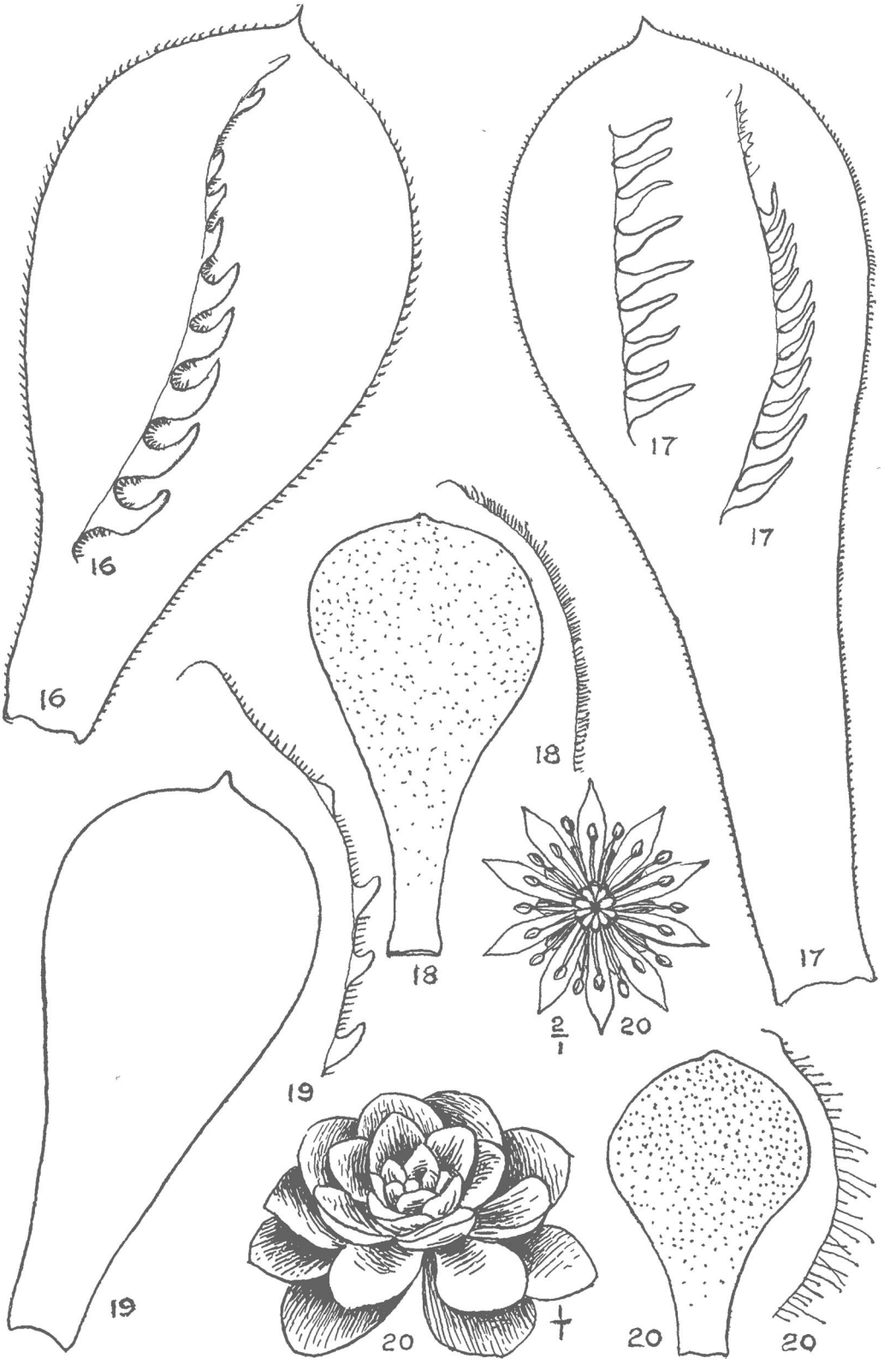

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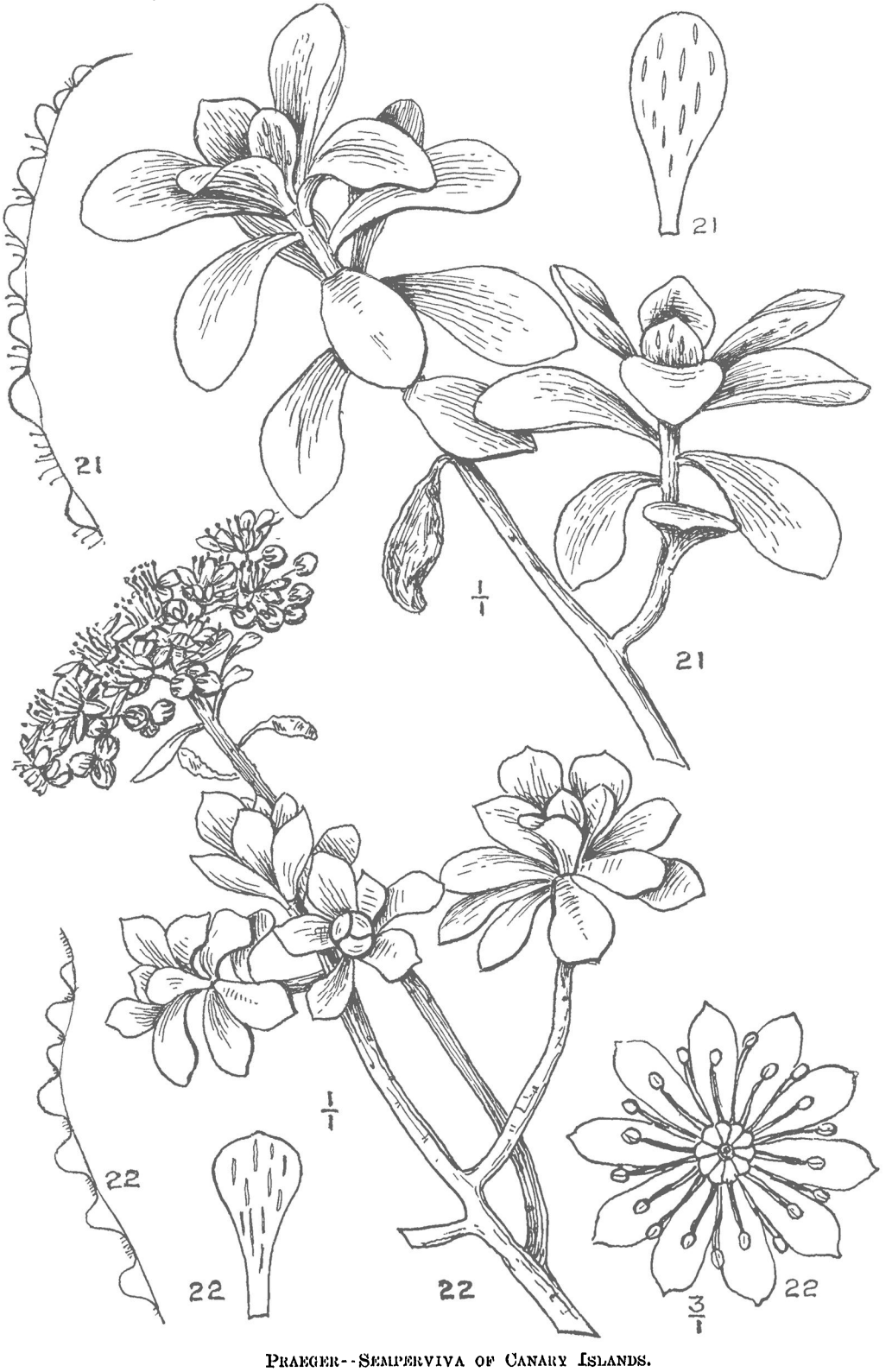

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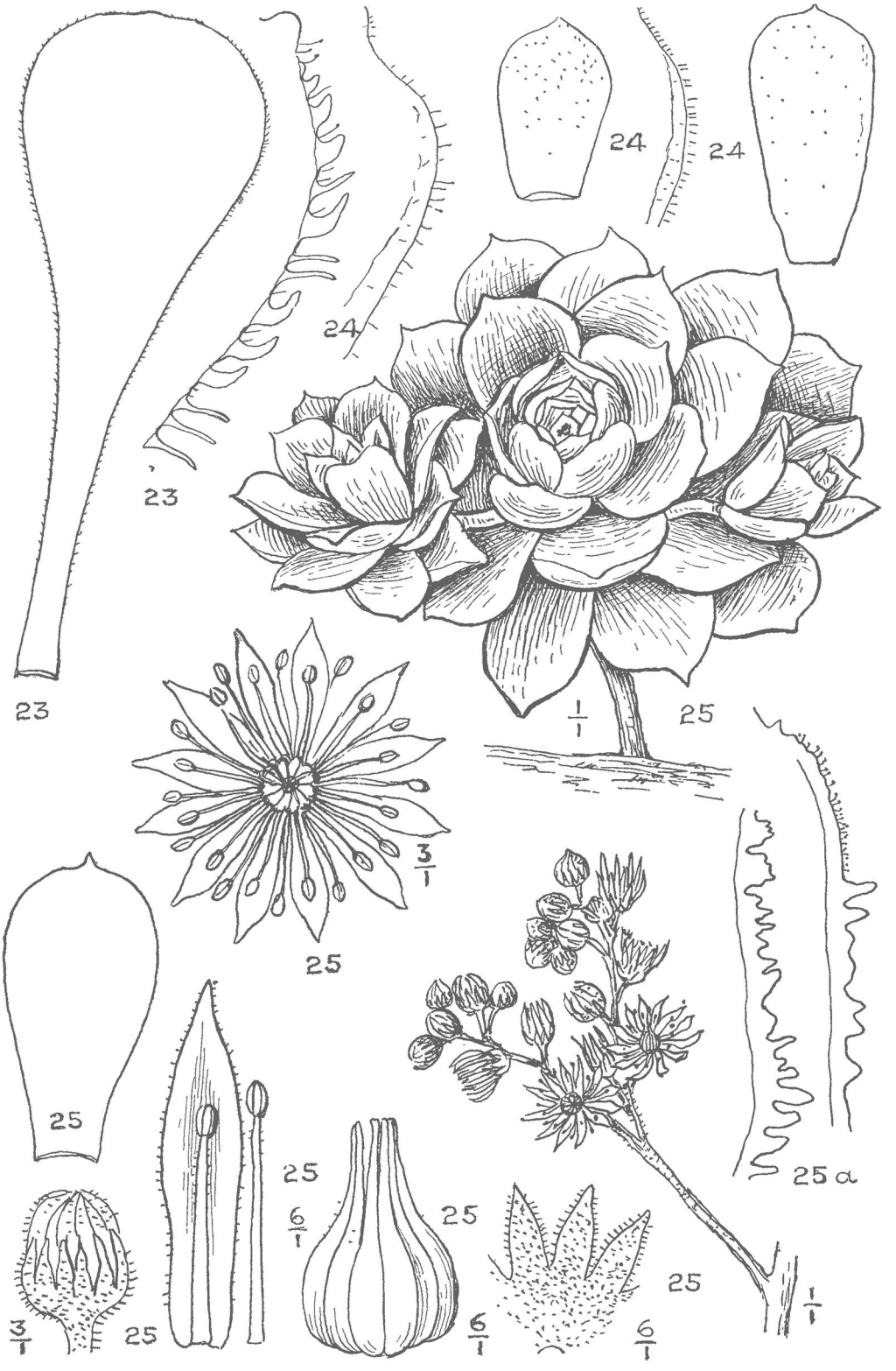

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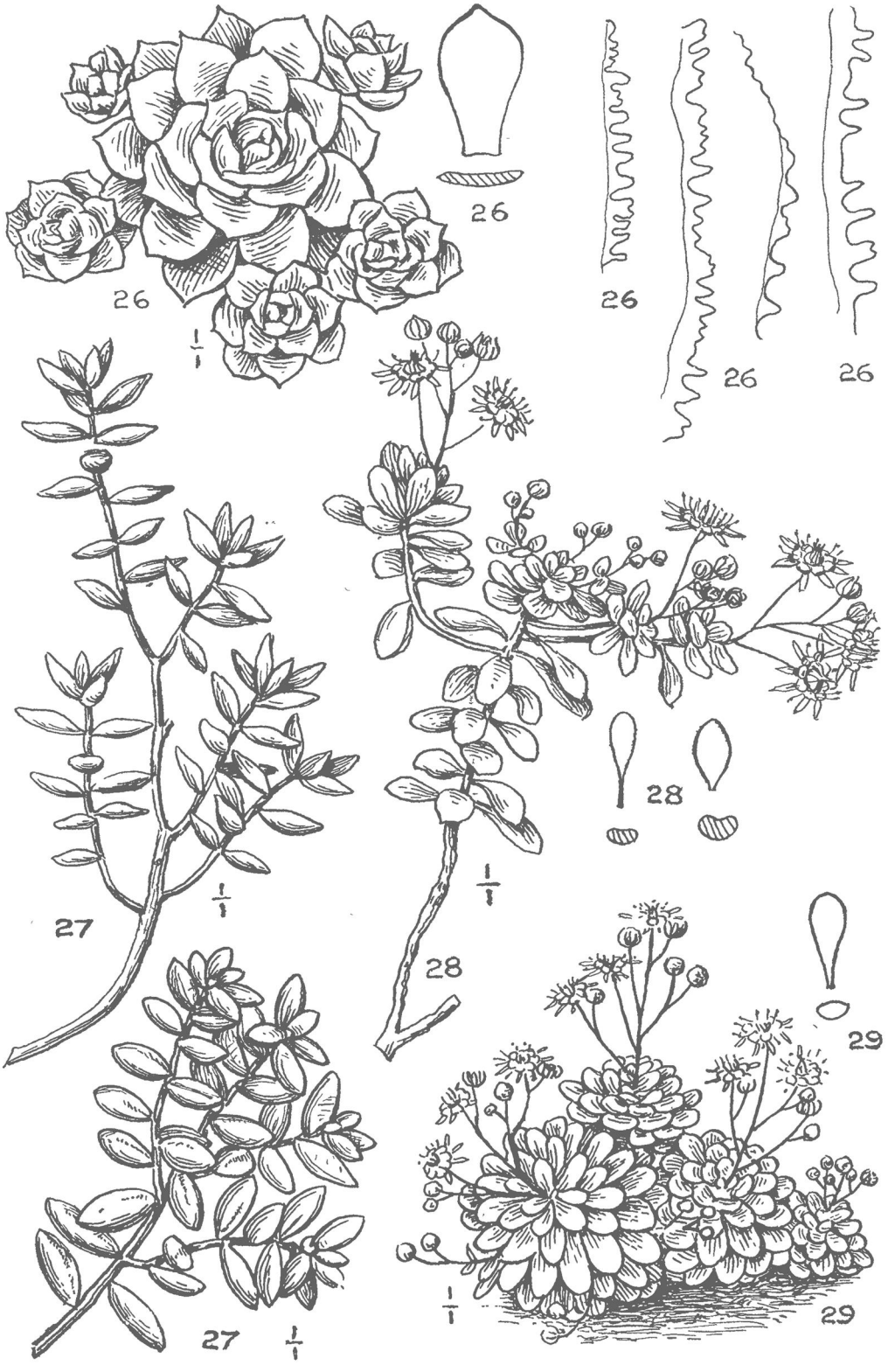

TRAEGER—SEMPERVIVA OF CANARY ISLANDS.

PRAEGER—SEMPERVIVA OF CANARY ISLANDS.