NUMERICAL STUDIES OF LEAF ARCHITECTURE OF DICOTYLEDONS : SAURAUIA (ACTINIDIACEAE) AS A TEST CASE

by

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VOLUME II (containing appendices)

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APPENDIX 1

CONDITIONAL BINOMIAL PROBABILITY FUNCTIONS

1. OTUs range over a fixed number of states.

s = number of states of character.

s_i = number of states that OTUs can possess.

m = order of a match so that m equals number of states that are matched.

Probability of a particular match of two OTUs (j, k) is

$$P_{(j=k)} = \frac{F_{im}}{\sum_{0}^{s} F_i}$$

where F_{im} is the frequency of a particular match and $\sum_{0}^{s} F_i$ is the sum frequency of each possible match.

The simplest case of a fixed range is when each OTU can be scored on a single state. For $s_i = 1$,

$$F_{im} = F_i (0 \leqslant m \leqslant s_i)$$

$$F_i (m=0) = s(s-1)$$

$$F_{i(0<m\leqslant s_i)} = s$$

$$\sum_{0}^{s_i} F_i = s^2$$

This can be generalised for $0 \leqslant s_i \leqslant s$ to

$$F_{i(m=0)} = s_i \geqslant 1 \left[(s-2s_i+1)(s-2s_i+2) \right] \quad \ldots \text{eqn.1}$$

$$F_{i(0<m\leqslant s_i)} = 2(s-2s_i+m+1) \quad \ldots \text{eqn.2}$$

$$F_{i(m=s_i)} = s_i \leqslant s \left[s-s_i+1 \right] \quad \ldots \text{eqn.3}$$

$$\sum_{0}^{s_i} F_i = (s-s_i+1)^2 \quad \ldots \text{eqn.4}$$

Where frequencies are represented in a matrix of s x m values, eqn.1 computes the left vertical column of 0 matches, eqn.2 the "body" of the matrix, eqn.3 the right hand diagonal of maximum matches and eqn.4 the sum of frequencies across all m.

2. OTUs range over any number of states to a maximum, s-r. This model does not account for the condition where not all OTUs in a set exhibit the same range. Thus where OTUs can possess any number of states in the range 1 - s, a second set of functions can be derived.

$$F_{i(m=0)} = \frac{2.(s+2)!}{4!(s-2)!} \qquad \ldots \text{eqn.5}$$

$$F_{i(0<m\leq s)} = \left[(s+1-m) + 2\sum_{s-m=1}^{s-m=s}(s+1-m)(s-m)\right] \qquad \ldots \text{eqn.6}$$

$$\sum_{0}^{s} F_i = (s-s_i+1)^2 \qquad \ldots \text{eqn.7}$$

Eqn.5 forms the left hand vertical of m = 0 values in an s x m matrix. The body of the matrix is computed from eqn.6 and matches of order m, from eqn.7. In the general case where OTUs have a range of states less than s, but can exhibit any number of states up to s_i where s_i equals s-r, with r representing the number of states less than s over which OTUs are free to range, then for $0 \leq r \leq s-1$

$$F_{i(m=0)} = \frac{(s+2)!}{12.(s-2)!} - \frac{(r+2)!}{6(r-2)!} + \sum_{s\leq 2r-2}\left[\frac{(2r-s+2)!}{12(2r-s-2)!}\right] \qquad \ldots \text{eqn.8}$$

$$F_{i(0<m\leq s)} = (s+1-m) + 2\left[\sum_{s-m=1}^{s-m=s}(s+1-m)(s-m)\right] - r(r+1)(s+1-m) \qquad \ldots \text{eqn.9}$$

$$F_{i(m=s-r)} = r+1 \qquad \ldots \text{eqn.10}$$

$$\sum_{0}^{s} F_i = \tfrac{1}{2}\left[(s-r)(s-1+r)\right]^2 \qquad \ldots \text{eqn.11}$$

3. OTUs with restraint on both maximum and minimum range of states. The final case not completely accounted for by the previous functions is where OTUs can possess a number of states, but where over the set of OTUs there are restrictions on both maximum and minimum numbers of states. For example in a character of 10 states, OTUs are found to range from 2 to 9 states, or 3 to 8 states etc. This range can be represented in the general case by $1+r \leqslant s_i \leqslant s-r$. To date, no general solution has been found for this condition. The number of functions required to fully define the matrix begins with 4 for r=1 and increases by 1 for every corresponding increase in r. It may be possible to find a solution by interpolating the previous functions, but considering the limited direct application of the binomial distribution to data used in this study the search for a solution has been abandoned.

APPENDIX 2

CONDITIONAL BINOMIAL PROBABILITY WHERE THE NUMBER OF EVENTS DIFFER IN TWO TRIALS

While investigating the general question of solutions to restricted binomial distributions a special case became evident. The binomial function can be used to compute the probability of obtaining correspondence between two independent trials. This can be stated for the case of interest as the probability of obtaining a certain number of successes in two independent trials where each event for each trial can have two conditions, heads and tails for throw of coins, presence/absence for ecological sampling etc. Where the number of events is s and the number of successes is n, the expression is

$$P(N=n) = \binom{s}{n} p^n \, q^{(s-n)}$$

Where a success is considered as two heads, presence scores etc. this becomes

$$P(N=n) = \binom{s}{n} .25^n \, .75^{(s-n)}$$

$$= \frac{3^{(s-n)} \, s!}{2^{2s} \, n! \, (s-n)!}$$

Where one trial is interrupted or the beginning or end of a trial differs from that of the other, such that the number of events in each trial differs by an amount d then a function can be described which will compute the unequal trial length binomial probability.

By generating all permutations for a set of s, n and d values it has been found that the frequency of particular events obeys the following relationship

$$F_n^s = 2^{d(d+1)} \, \frac{3^{(s-d-n)} (s-d)!}{(s-d-n)! \, n!}$$

The sum of all frequencies for a particular s is given by

$$\sum_{0}^{s} F_n^s = \sum_{0}^{d} \left[2^{d-2}(d-1).2^{2(s-d+1)}\ 2 \right]^{\frac{1}{2}}$$

Therefore the probability of a particular success of n over s and s-d trials is

$$P(N=n) = \frac{F_n^s}{\sum_{0}^{s} F_n^s}$$

P(N=n) values for d=0 are plotted in figures 96 and 97.

The relevance of this expression to measuring resemblance is that where the assumptions considered in appendix 1 do not have to be made and it is known that OTUs are constrained to a characteristic variability, the probability of a particular correspondence between OTUs can be computed. The meaning of constraint in the present sense is that when adequate sampling of populations of OTUs has been conducted and it is found that OTUs have the same or different within OTU variance for each character, then the OTUs within the sample are limited to those variances. This may be a result of genetically determined variability, or a set of heterogeneous, misidentified OTUs. The present set of curves can be used where the hypothesis of equal variance is justified. The full set of curves for d greater than zero can be generated with a simple computer program.

FIGURE 96. Probability values for I_D, the dissociation index. Labelled curves give the number of states (s) in each OTU, for d=0. To find the probability that two OTUs are the same, refer to the following figure.

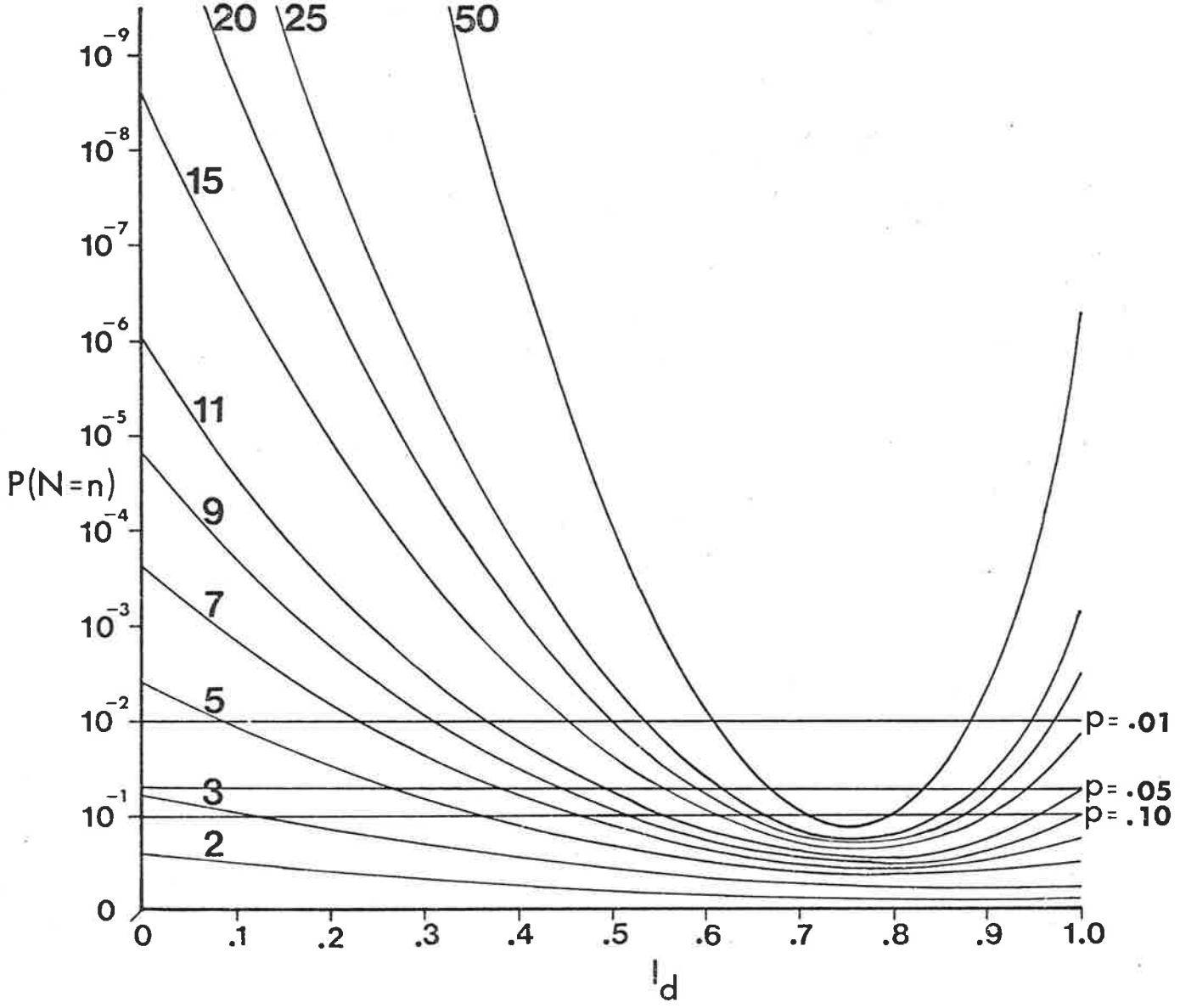
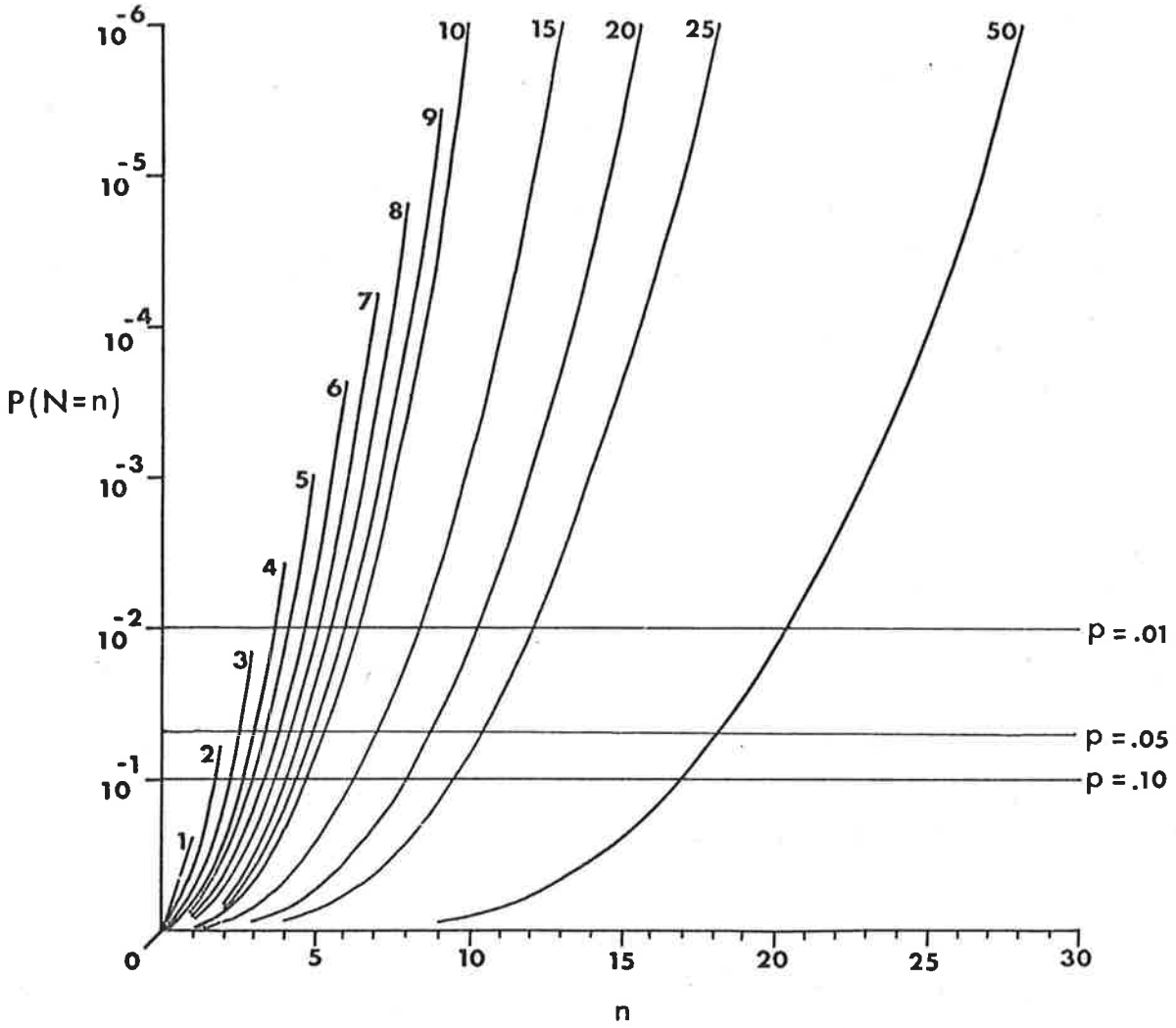

20
25
50
15
11
9
7
5
3
2
10^{-9}
10^{-8}
10^{-7}
10^{-6}
10^{-5}
10^{-4}
10^{-3}
10^{-2}
10^{-1}
0
P(N=n)
p= .01
p= .05
p= .10
0
.1
.2
.3
.4
.5
.6
.7
.8
.9
1.0
I_d

FIGURE 97. Cumulative probability curves for P(N=n) for d=0. Number on each curve give the number of events (s) in each trial. Horizontal axis is the number of successes (n). Critical probability levels are also marked. The curves give the probability of finding a pair of trials with more successes (n) than the pair in question. This is equivalent to the probability of finding a pair of OTUs more similar than the pair being tested. For further details see text.

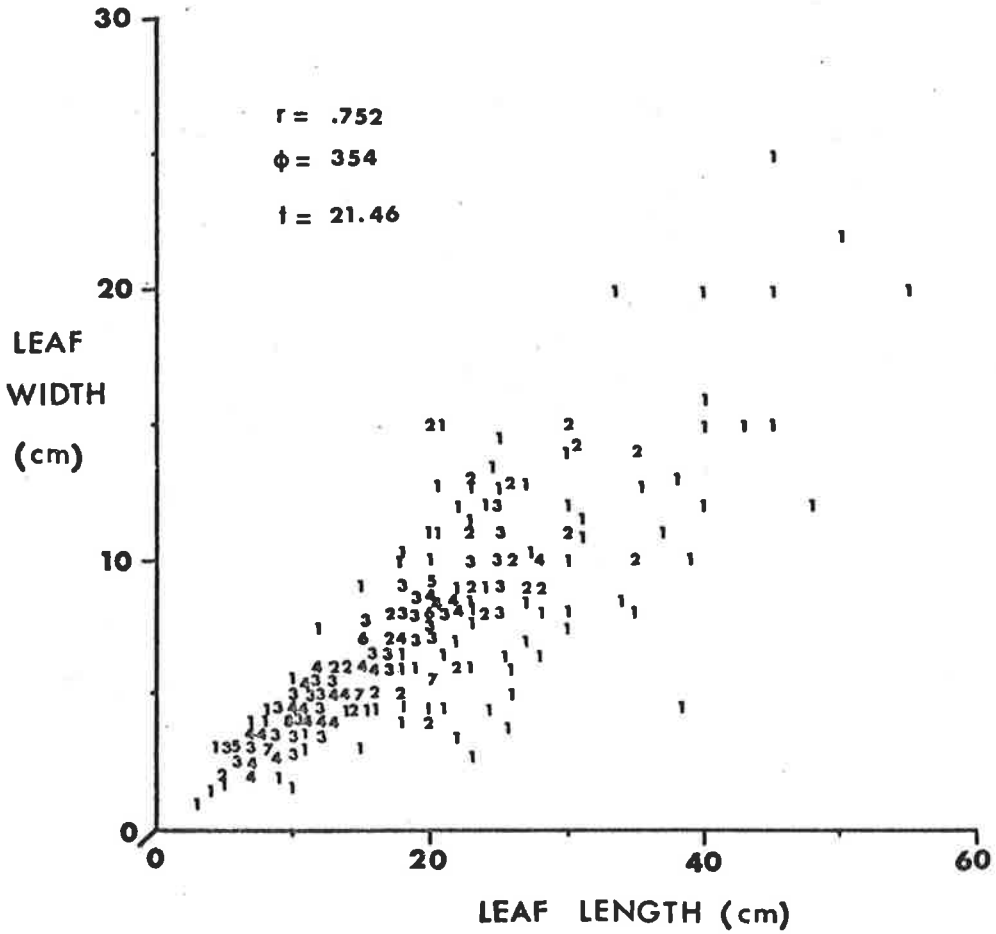

P(N=n)
10^-6
10^-5
10^-4
10^-3
10^-2
10^-1
0
5
10
15
20
25
30
n
1
2
3
4
5
6
7
8
9
10
15
20
25
50
p = .01
p = .05
p = .10

APPENDIX 3

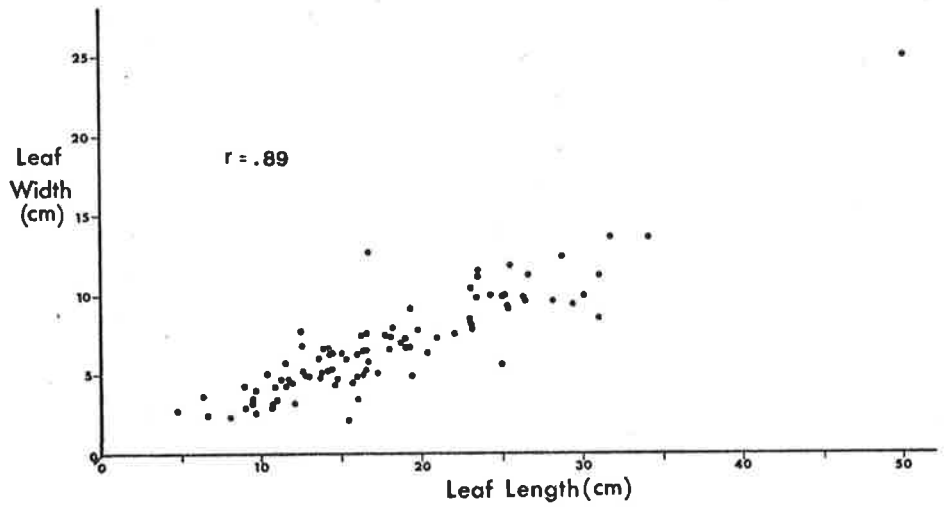
SCATTERGRAMS OF LEAF VARIABLES FOR SAURAUIA SPECIES

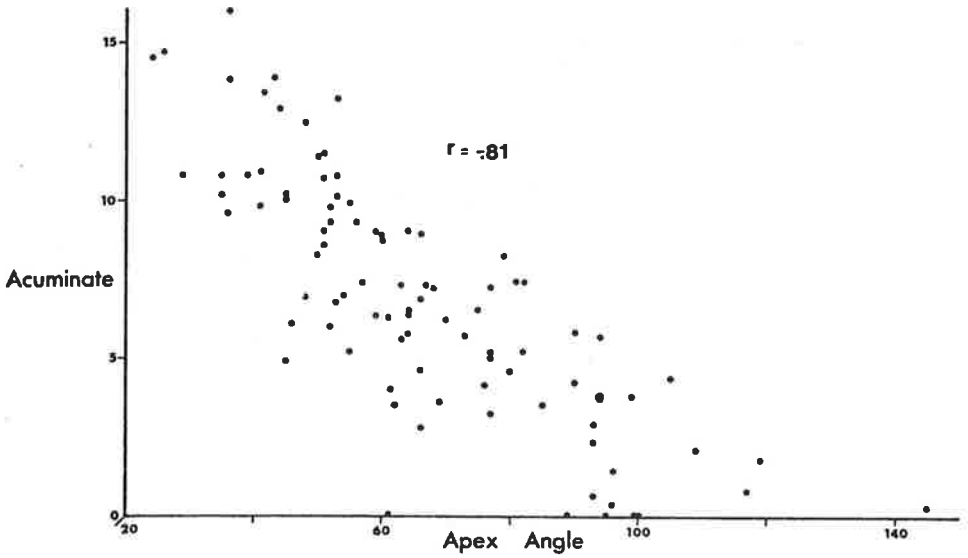
Figures 98 to 104 are bivariate scattergrams for Saurauia species on leaf data derived from type descriptions (fig. 98) and herbarium specimens for 12 leaf characters. Only plots with correlation coefficients greater than .48 have been plotted. For the sample of 92 species scored for leaf data from herbarium specimens a correlation coefficient of .26 is significant at the .05 level. Where plots show visually apparent linearity they have been included. As would be expected from analyses discussed in chapter 8 and appendix 4 there is a lack of clear clustering of species, and even the geographic ordination discussed in chapter 8 is not apparent. Figure 98, a plot of leaf length and width for type description data plotted for 193 species and including range limits (for 354 degrees of freedom), has been included for comparison with figure 99. Functional and geometrical reasons for correlations are discussed in chapter 5. Correlation coefficient values were computed using the PEARSCORR subroutine of SPSS.

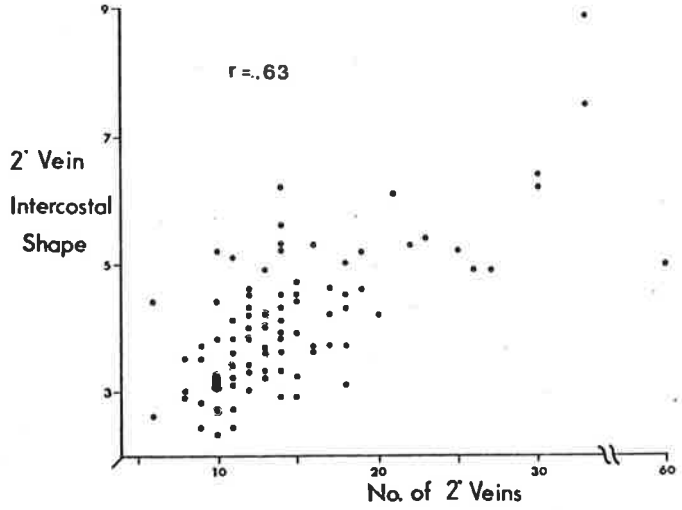
FIGURE 98. Bivariate scattergram for leaf characters plotted from data derived from type descriptions of 193 species of Saurauia. Numbered points refer to frequencies of coincident OTUs at each plotted value. Correlation coefficient (r), degrees of freedom (Ø) and t statistic are included on the figure.

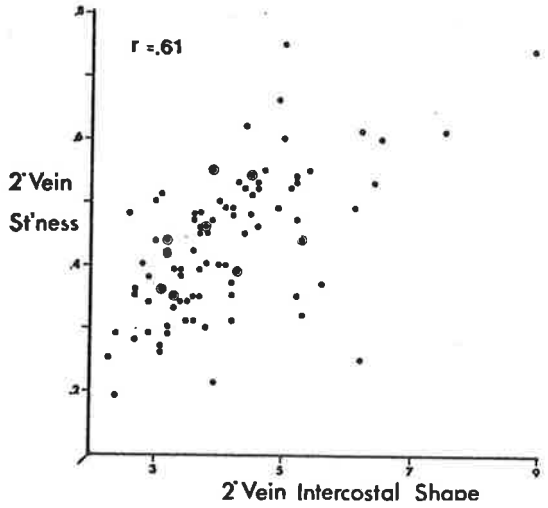

r = .752
ϕ = 354
t = 21.46
LEAF
WIDTH
(cm)
30
20
10
0
0
20
40
60
LEAF LENGTH (cm)

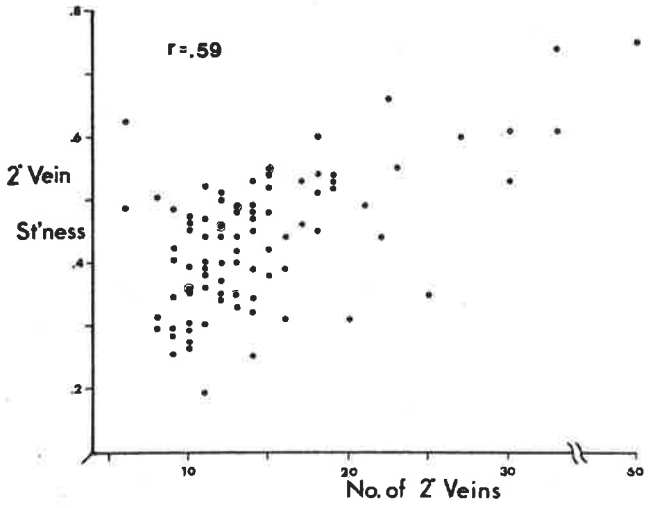
FIGURES 99 to 104. Scattergrams of leaf characters for SPECIMENS. Data from 92 Saurauia species scored from herbarium sheets. Correlation coefficient (r) given on each plot.

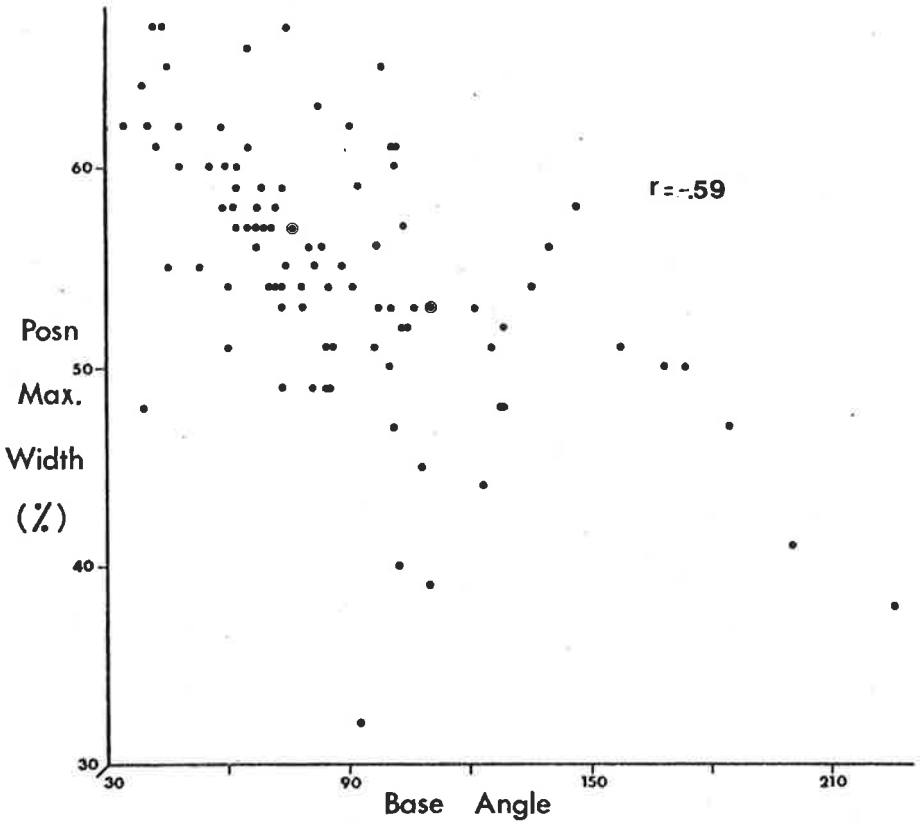

Leaf
Width
(cm)
r = .89
25
20
15
10
5
0
0
10
20
30
40
50
Leaf Length(cm)

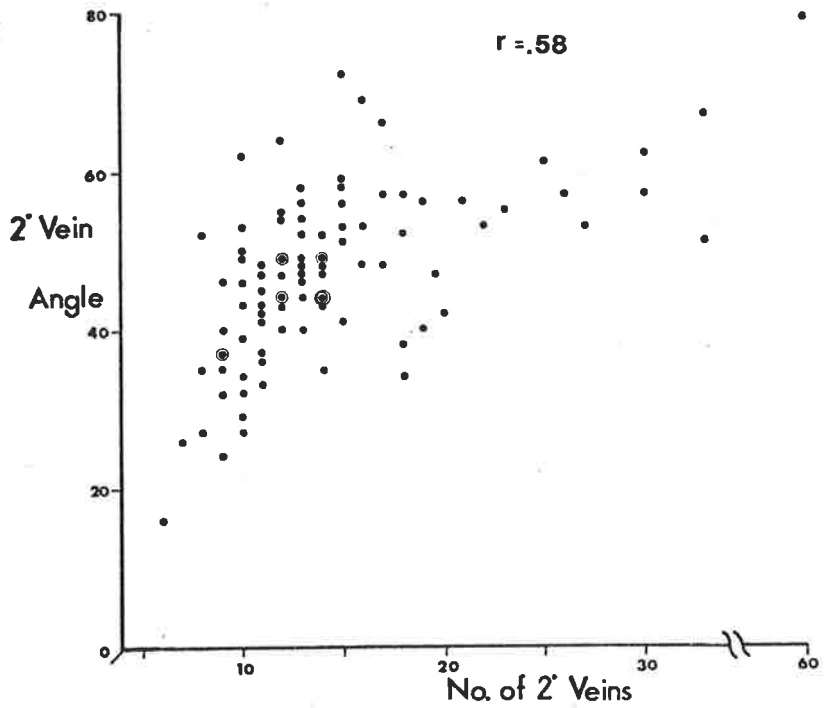

Acuminate
r = -.81
15
10
5
0
20
60
100
140
Apex Angle

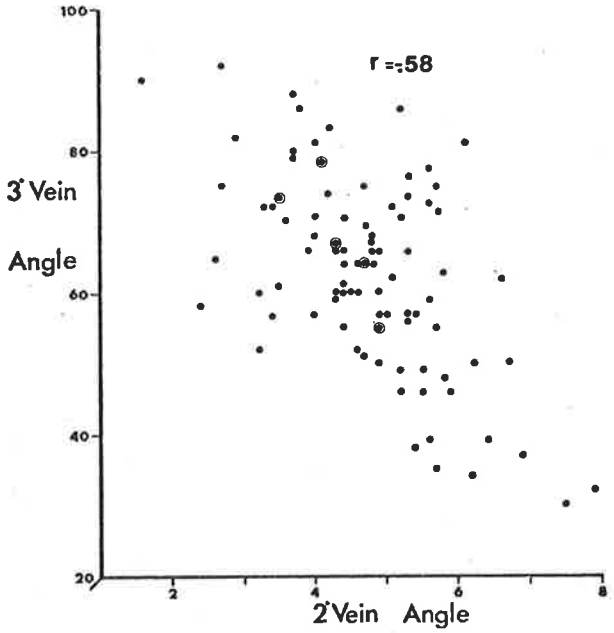

r =.63
2° Vein
Intercostal
Shape
No. of 2° Veins

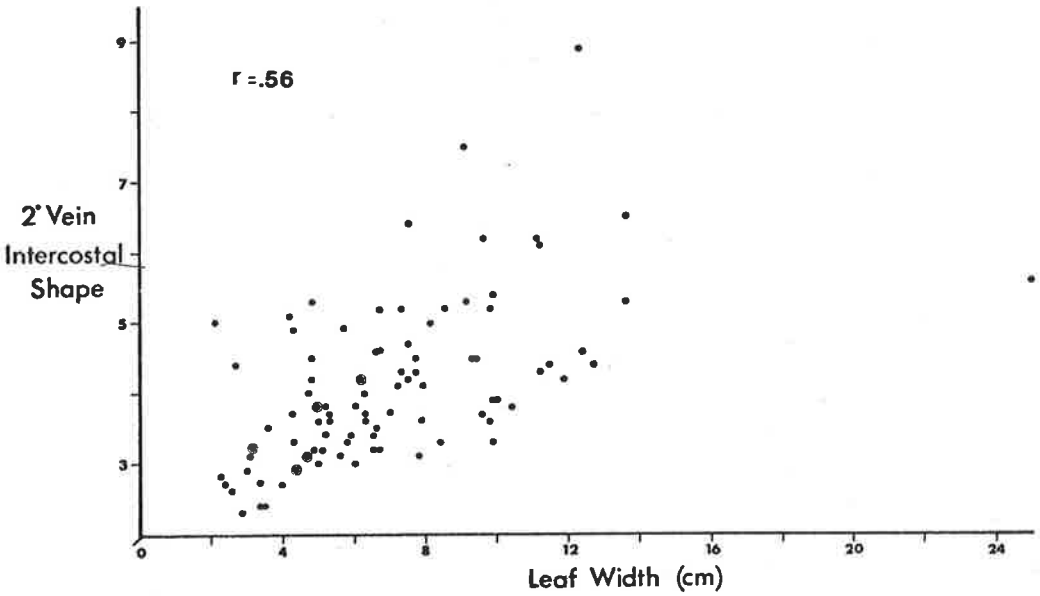

r =.61
2°Vein
St'ness
2°Vein Intercostal Shape

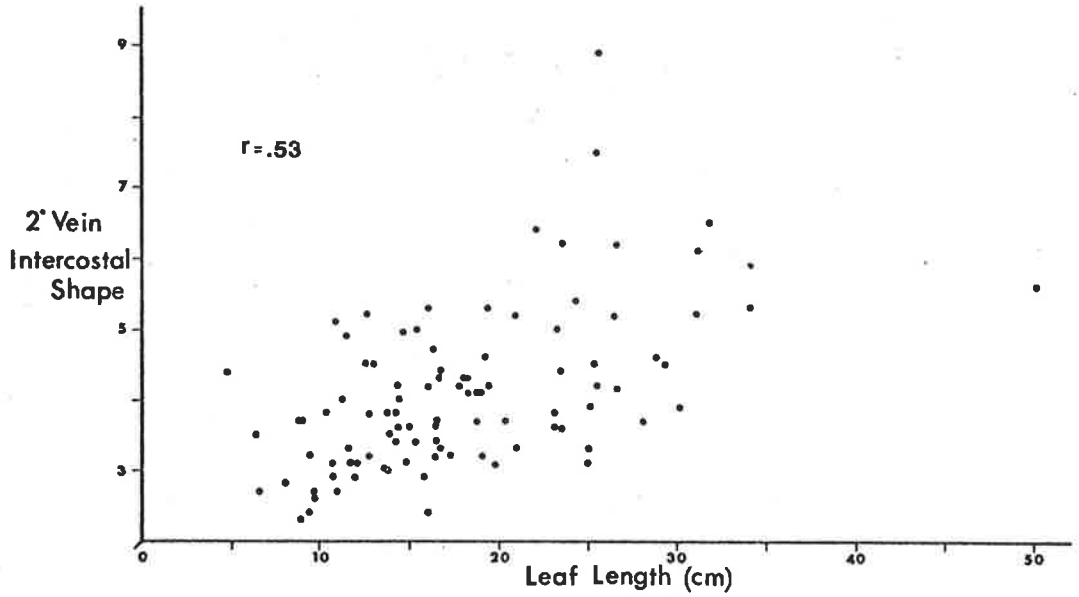

r=.59
2° Vein
St'ness
No. of 2° Veins

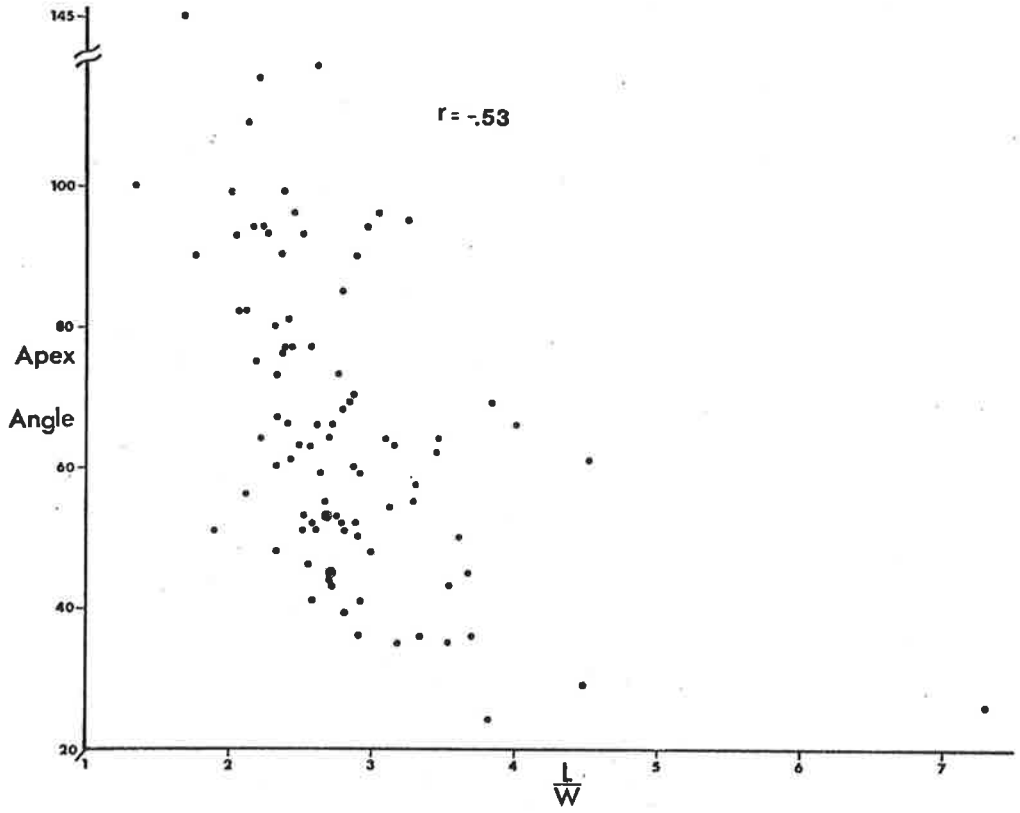

r = -.59
Posn
Max.
Width
(%)
60
50
40
30
30
90
150
210
Base Angle

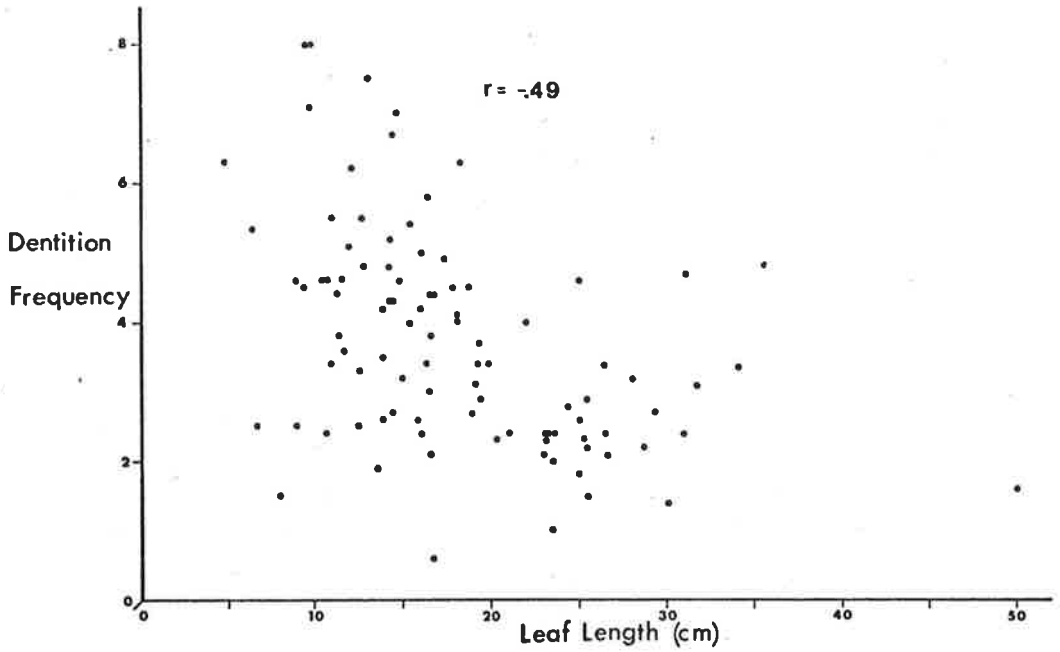

r = .58
2° Vein
Angle
80
60
40
20
0
10
20
30
60
No. of 2° Veins

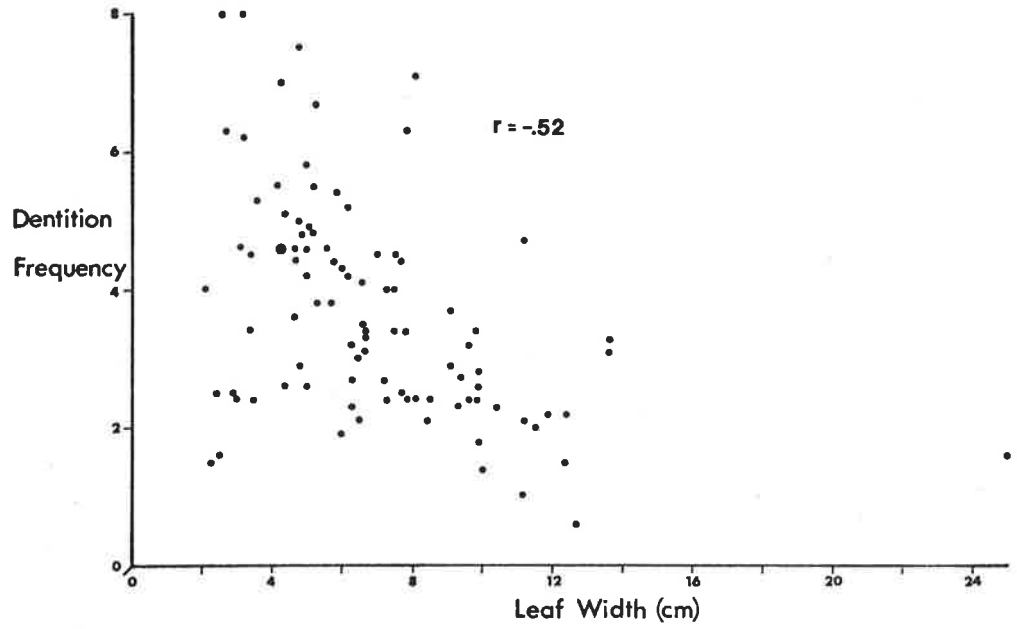

r =-.58
100
80
60
40
20
3° Vein
Angle
2
4
6
8
2° Vein Angle


r =.56
9
7
5
3
2° Vein
Intercostal
Shape
0
4
8
12
16
20
24
Leaf Width (cm)


r=.53
2° Vein
Intercostal
Shape
9
7
5
3
0
10
20
30
40
50
Leaf Length (cm)


r= -.53
Apex
Angle
145
100
80
60
40
20
1
2
3
4
5
6
7
L/W


r = -.49
Dentition
Frequency
0
2
4
6
8
0
10
20
30
40
50
Leaf Length (cm)


r = -.52
Dentition
Frequency
0
2
4
6
8
0
4
8
12
16
20
24
Leaf Width (cm)

APPENDIX 4

ALTERNATE STATISTICAL PROCEDURES FOR CLASSIFICATION

Many of the aspects of classification treated so far in this study by similarity or distance measures can be analysed by other statistical procedures. Relationships between OTUs, that is their arrangement in character space, can be assessed either by a principal component analysis or a correlation analysis. Their ordination into prior groups such as geographical regions can be tested with a discriminant analysis. Canonical correlation analysis can be used to test their general ordination by factors such as geography without defining arbitrary groups.

Analyses described in this section have all been performed using the SPSS package of statistical programs. The system used was SPSS-6000 version 7, implemented on a CYBER 173 computer.

Principal components analysis

Principal components analysis is in many respects similar to the factor analysis described in chapter 5, but is applied to OTUs as variables rather than characters as variables. Discussion of the underlying procedures of principal components analysis (PCA) are given in both the SPSS manual (Nie et al., 1975) and Sneath and Sokal (1973). PCA is a very commonly used ordination technique in numerical taxonony. Within SPSS there are many options available for producing the final output. These relate to methods of rotation of factor axes, choice of number of principal axes and the type of analysis used. This last relates to the fact that principal component analysis or the slightly different principal factor analysis (PFA) may be used. Finally there is a choice of an R or a Q analysis. In an R analysis the relationships between characters over a set of OTUs are studied.

In a Q analysis it is the relationship between OTUs over a character set that is being studied. An R analysis of characters has already been described in chapter 5, with regard to the choice of a character set. There are two different methods of conducting a Q analysis through SPSS. The first of these is to use the FACSCORE option which allows factor scores for each OTU on the first two principal factors to be calculated. The second method is to rotate the data matrix so that analysis is done on OTUs (columns) and characters (rows). This latter method suffers from non-normality of data. In general the assumption that characters are normally distributed over the set of OTUs can be made. However, if it is believed that OTUs can be distinguished on the set of characters, then the assumption that the OTUs are normally distributed over the characters cannot be made. Both methods of PCA, R analysis with factor scores or Q analysis with rotation of the original data matrix, can be treated as a PCA or as a PFA. The computational difference between these is whether the diagonal of the correlation matrix is unity or is replaced with some other set of values. Values that are generally used are the communalities, calculated from the unique variance of the variables. I have only used PCA in the strict sense. However, both R and Q analyses have been run.

To differentiate between the two different Q -PCAs that have been used they will be referred to alternatively as FACSCORE and rotated matrix PCA. The first is so called because it uses the FACSCORE option of SPSS to output factor score values of OTUs on the first two principal components. The second has been performed by a PCA on a rotated data matrix (OTUs in columns).

Initially PCAs were performed on the final set of 44 species defined in chapter 8 using both leaf data (SPECIMENS) and type

description data (TYPES). Figures 105 and 106 illustrate the ordination for both cases on FACSCORE. Species from outside the New Guinea-Solomon Islands-Fiji region are enclosed by dashed lines. The geographical influence on ordination first noticed in the analyses of similarity is also obvious here. The ordination of species into clusters is essentially the same here as for the resemblance analyses. That is, members of the generic sections Setosae and Squamulosae are closely clustered on both SPECIMENS and TYPES. These include Saurauia holotricha (HOLOT), S.bifida (BIFID), S.schumanniana (SCHUM), S.tafana (TAFA), S.rubrisquamata (RUBRI) and S.purgans (PURG). There is also consistent clustering of Ramiflorae species, notably S.bracteosa (BRACT), S.vulcani (VULCA), S.punduana (PUNDU) and S.malayana (MALAY).

Ordination of species on both TYPES and SPECIMENS are essentially the same using PCA, as they are with I_D and D_I. To test the stability of PCA, a rotated matrix PCA was run on the two sets of data (figs. 107, 108). In these cases axes are not labelled with numerical values as they are of unit length. That is, they account for the whole of the first two principal components. Once again geographical groups are delineated for clarity. The ordination is almost identical to that produced by FACSCORE. Clustering of species on leaf data (SPECIMENS) is improved. This can be explained by the distribution of OTUs across the character set. It has already been mentioned that the analysis using a rotated matrix is invalid where assumptions of normality cannot be made. I have overcome this to some extent by randomising the data using a method of generating equal frequency class intervals. The result is that although any one OTU will generally not be normally distributed across the character set, the whole set of OTUs is so distributed. The method of measuring this on leaf data was to standardise to a set number of intervals (7) and sum the scores on each character for each OTU. Summed scores were then plotted

FIGURE 105. Principal component analysis using FACSCORE run on SPECIMENS, RANVARS, MEANS for 44 species. Species are plotted on the first two components labelled as P.C.1 and P.C.2 in the figure. Species included in outlined areas are from geographical regions 1 to 4.

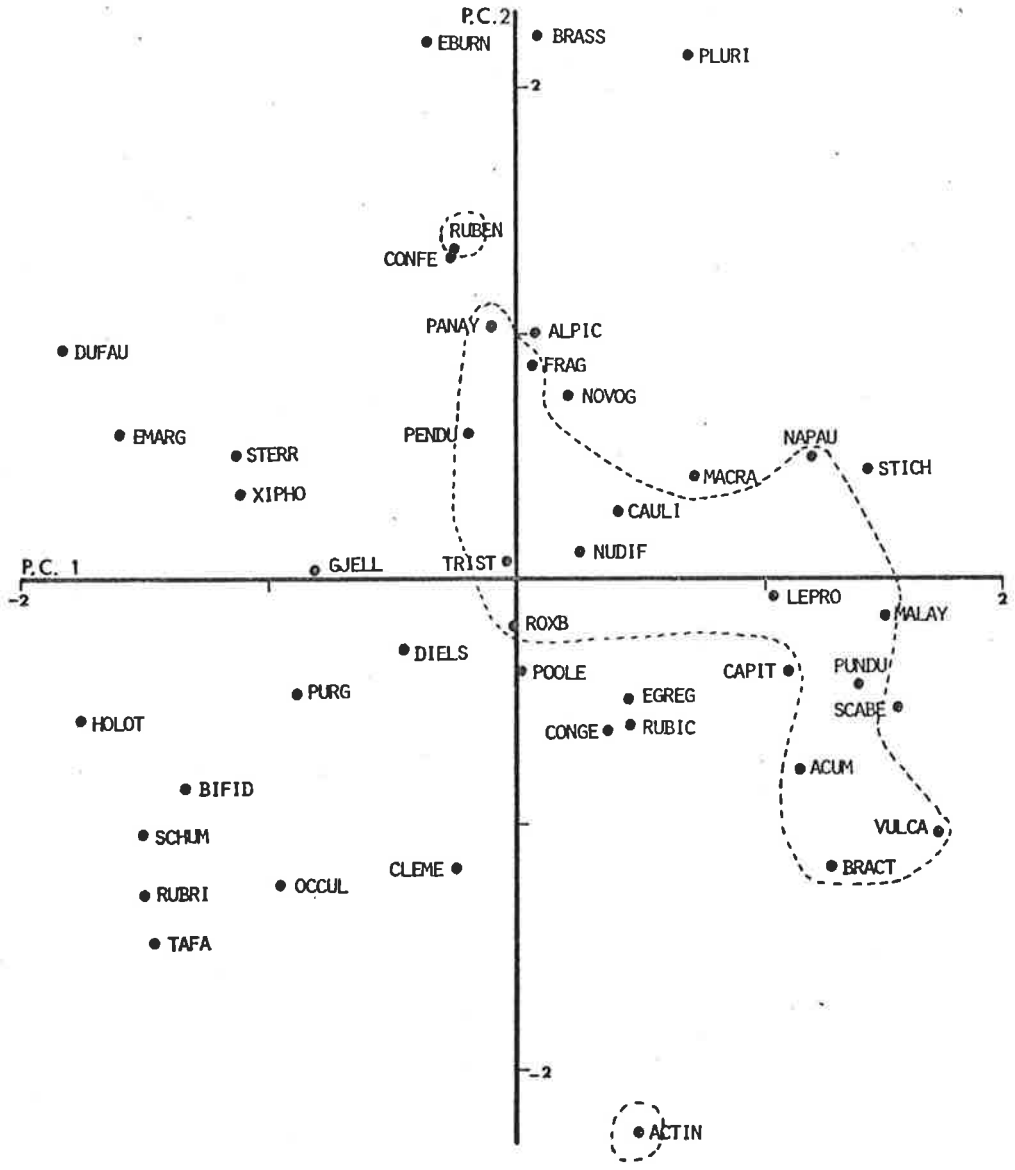

P.C.2
EBURN
BRASS
PLURI
2
RUBEN
CONFE
PANAY
ALPIC
DUFAU
FRAG
NOVOG
EMARG
STERR
PENDU
NAPAU
STICH
MACRA
XIPHO
CAULI
P.C. 1
GJELL
TRIST
NUDIF
-2
LEPRO
2
ROXB
MALAY
DIELS
POOLE
CAPIT
PUNDU
PURG
EGREG
SCABE
HOLOT
CONGE
RUBIC
ACUM
BIFID
VULCA
SCHUM
CLEME
BRACT
OCCUL
RUBRI
TAFA
-2
ACTIN

FIGURE 106. Principal component analysis using FACSCORE run on TYPES, RANVARS, MEANS for 44 species. Species are plotted on the first two principal components. Species included in outlined areas are from geographical regions 1 to 4.

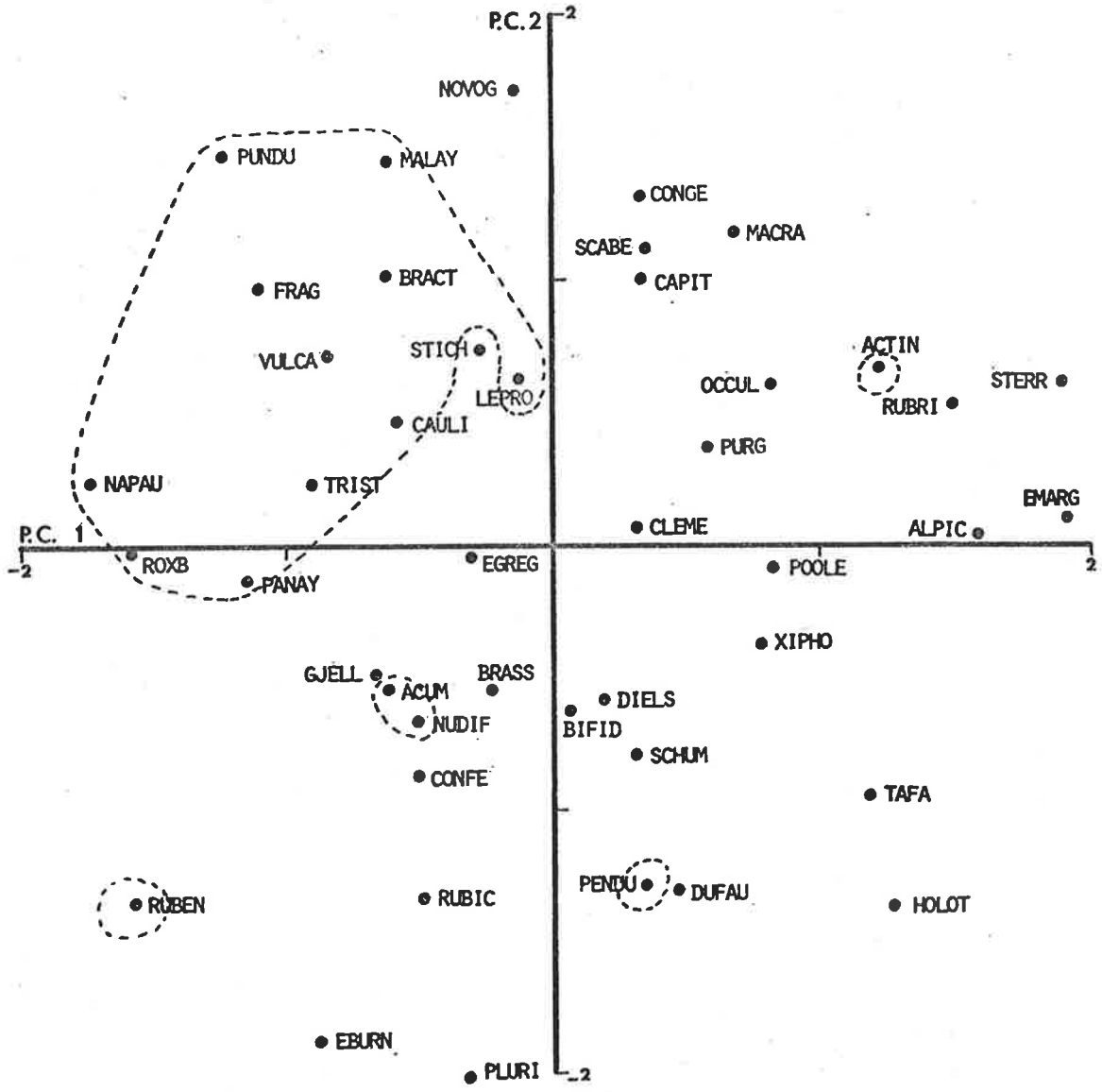

P.C. 2
2
NOVOG
PUNDU
MALAY
CONGE
MACRA
SCABE
CAPIT
FRAG
BRACT
ACTIN
VULCA
STICH
OCCUL
STERR
LEPRO
RUBRI
CAULI
PURG
NAPAU
TRIST
EMARG
P.C. 1
CLEME
ALPIC
-2
ROXB
1
EGREG
POOLE
2
PANAY
XIPHO
GJELL
BRASS
ACUM
DIELS
NUDIF
BIFID
SCHUM
CONFE
TAFA
PENDU
DUFAU
RUBEN
RUBIC
HOLOT
EBURN
PLURI
-2

FIGURE 107. Principal component analysis using a rotated data matrix, run on SPECIMENS, RANVARS, MEANS. Forty-four species plotted on the first two principal components. Species enclosed in outlined areas are from geographical regions 1 to 4.

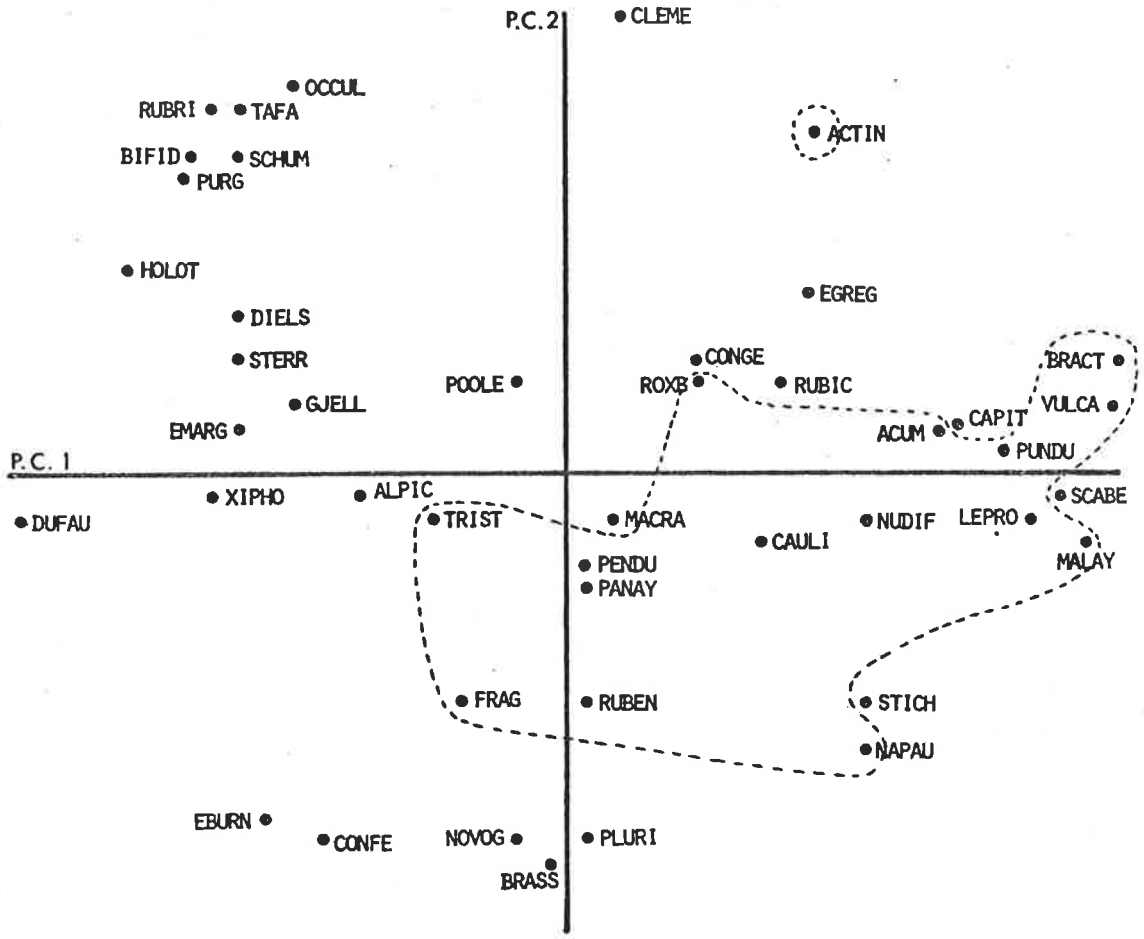
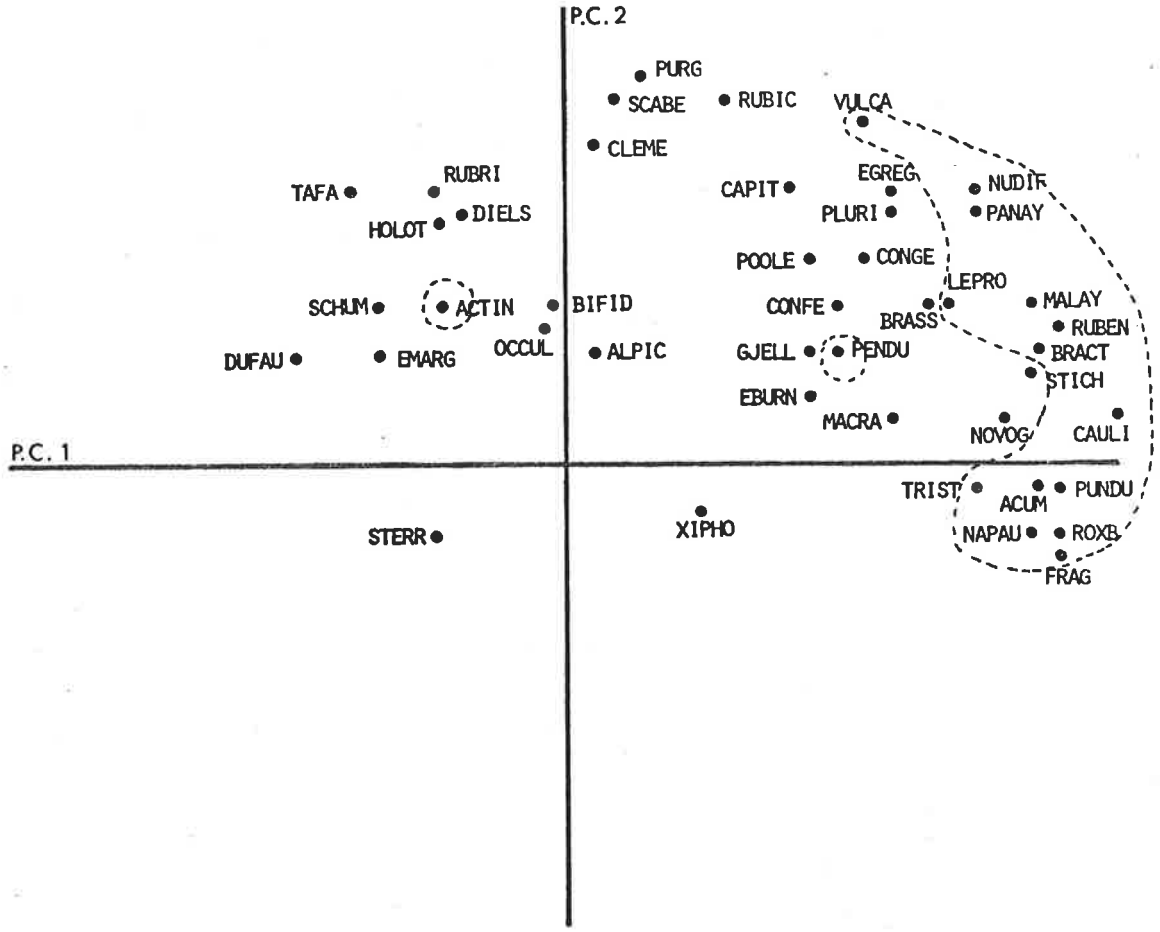

P.C. 2
P.C. 1
CLEME
OCCUL
RUBRI
TAFA
ACTIN
BIFID
SCHUM
PURG
HOLOT
EGREG
DIELS
STERR
CONGE
BRACT
POOLE
ROXB
RUBIC
GJELL
VULCA
CAPIT
EMARG
ACUM
PUNDU
XIPHO
ALPIC
SCABE
DUFAU
TRIST
MACRA
NUDIF
LEPRO
CAULI
MALAY
PENDU
PANAY
FRAG
RUBEN
STICH
NAPAU
EBURN
CONFE
NOVOG
PLURI
BRASS

FIGURE 108. Principal component analysis using a rotated data matrix, run on TYPES, RANVARS, MEAN. Forty-four species plotted on the first two principal components. Species enclosed in outlined areas are from geographical regions 1 to 4.


P.C. 2
P.C. 1
PURG
SCABE
RUBIC
VULCA
CLEME
TAFA
RUBRI
DIELS
HOLOT
CAPIT
EGREG
NUDIF
PLURI
PANAY
POOLE
CONGE
LEPRO
SCHUM
ACTIN
BIFID
CONFE
BRASS
MALAY
RUBEN
OCCUL
DUFAU
EMARG
ALPIC
GJELL
PENDU
BRACT
STICH
EBURN
MACRA
NOVOG
CAULI
TRIST
PUNDU
ACUM
STERR
XIPHO
NAPAU
ROXB
FRAG

on a frequency distribution and the distribution tested for normality. Distribution of character value sum was found to be significantly different from normal over the 332 specimens tested. However, the distribution was visually close to normality, differing only in some local peaks near the distribution centre and fitting it more closely in the tails. PCA, like many other statistical techniques for ordination, is not sensitive to deviations from normality. It was therefore considered that an analysis using the rotated data matrix could produce meaningful results.

Improved clustering of species on SPECIMENS using the rotated matrix PCA is a consequence of a consistent trend within the generic sections for species to have similar leaves. Thus members of the Setosae trend to consistently score at the opposite end of characters to Ramiflorae. This trend is in evidence in the placement of members of these groups at opposite sides of figure 107. Figures 107 and 108 are not exactly comparable to those of figures 105 and 106. This is because plots for FACSCORE were produced from only two principal factors and therefore summarise the full multi-dimensional situation in two dimensions. This means the whole of the variance is accounted for by the two factors. In plots from a rotated matrix PCA, five principal factors were chosen. Therefore the two dimensional plots do not contain all of the variance. This has been done to illustrate the difference between ordinations on SPECIMENS and TYPES. It has already been shown that the set of species is more homogeneous on type description data than it is on leaf data (p.227). This is important in assessing accuracy of 1st and 2nd nearest neighbour values as estimators of overall relationships between species. Leaf data produces a better estimate of overall relationships in reduced dimensions than type data. It could be expected that in a PCA, leaf data would

produce better separation of species on the first few dimensions than type data (fig. 108). A further difference between the SPECIMENS and TYPES plots is due to type description data distribution. Many characters were qualitative and included two binary characters. There was a range of character states from 2 to 8, and assumption of normality of OTUs across the characters could not be made. Thus although rotated matrix PCA was justifiable on SPECIMENS, its application to TYPES is suspect. Despite all differing statistical approaches there is a marked consistency in the ordination of species.

Correlation analysis

The Pearson product moment correlation coefficient was applied to the same data set as for PCA. This analysis was also available through SPSS. No plots are included here, but a frequency distribution for comparison with D_I values is illustrated in figure 109.

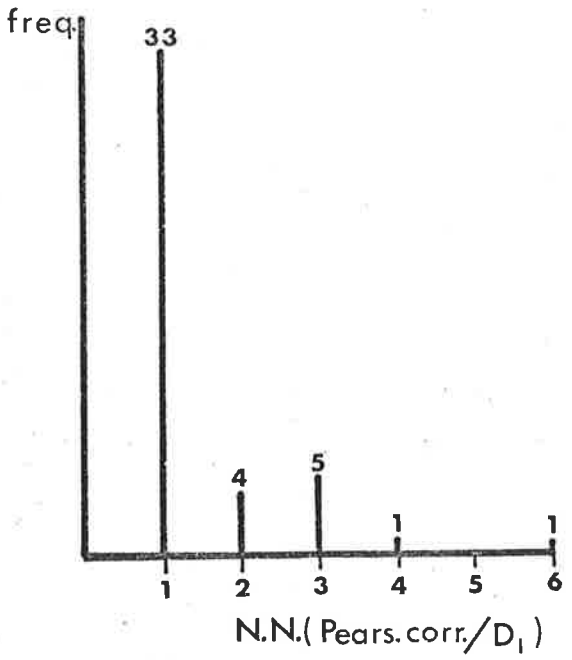


FIGURE 109. Relationship between nearest neighbour species computed from Pearson correlation coefficient and D_I. See text for details.

Pearson correlation values were used to determine nearest neighbours for each species based on leaf data. Frequencies of species with a particular nearest neighbour using D_I and Pearson correlation were compared. Usually nearest neighbour relationships were the same. However, sometimes the nearest neighbour of a species in terms of D_I was a higher order neighbour using Pearson and vice versa. The order of Pearson nearest neighbours on D_I are therefore plotted against frequency to obtain a measure of consistency of ordinations produced by the two approaches. It can be seen from figure 109 that there are close similarities between the two measures of resemblance, and so correlation analysis has not been taken any further. I expect the only difference between correlation values and D_I are related to the distribution of the data and to the Pearson correlation values not being linearly related to Euclidean distance measures. The influence of data distribution on correlation values is that correlation assumes an underlying bivariate normal distribution. This may not be a valid assumption and so standardisation of data is generally required. This has been achieved here with equal frequency class intervals. However, as frequencies in each class were not quite identical, correlation coefficient values are slightly inaccurate.

Discriminant analysis

Discriminant analysis is designed particularly for cases where there is prior grouping of OTUs and one wishes to place new OTUs in those groups on the basis of their character distributions. A discriminant variable which defines the groups is chosen and the probability of assignment of OTUs to the groups is computed. Where the grouping of OTUs is known beforehand, the degree to which OTUs are assigned to the group to which they actually belong is a measure of the discriminatory value of the variable. Assume one finds that an

OTU belongs to a particular group. However, the value of states of its characters corresponds most closely to the general trend for OTUs in another group. Then it will have a greater probability of belonging to that latter group than the one it is in. Maximising the overall correct assignment of OTUs to groups by measuring the probability of their inclusion in each group gives the best discriminatory variable. I have defined groups for each character by the character classes and run discriminant analyses using each character as a discriminating variable. By this means I hoped to find the best characters for identification purposes. Discriminant analyses were accomplished using the SPSS, DISCRIMINANT subroutine. The method used was a non-iterative procedure with probability of inclusion in groups set to the size of the group. This latter specification means that an OTU is more likely to be included in a large group than in a small one. The alternative is to have equal probability of inclusion in each group. This alternative was actually tested on the data and found to give poorer discrimination. Since the aim of the discriminant analysis was to maximise the probability of identification of OTUs to groups, the prior probabilities were set to size dependence. Iterative procedures were also tried and found to give virtually identical results but with a much greater utilisation of computing time.

High percentages of correct assignment were obtained using DISCRIMINANT on SPECIMENS, RANVARS, MEANS, for 44 species. The percentage correct assignments to groups defined for each character are given in Table 11.

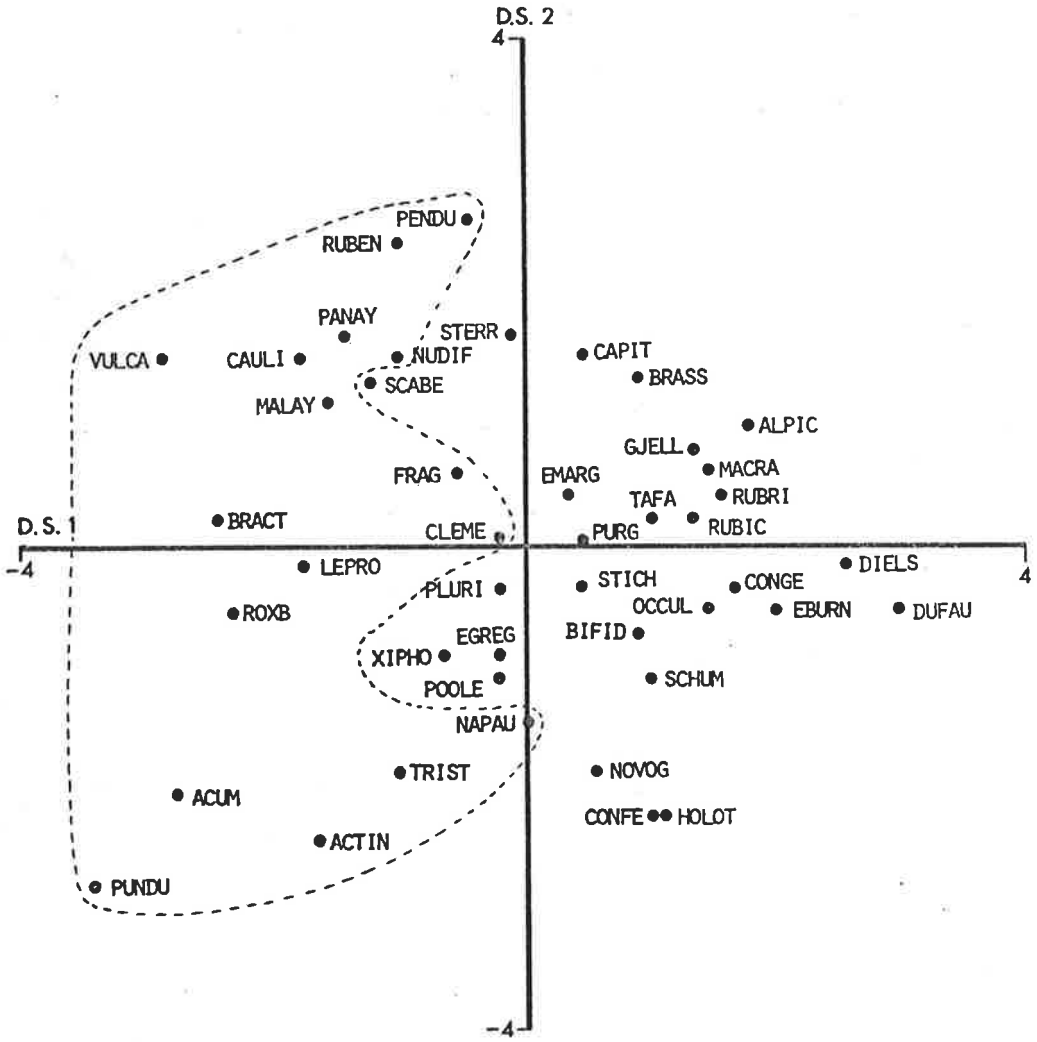
No.	Character	No. of groups	Percent correct assignment
A2	Leaf width	7	65.9
A3	Length to width ratio	7	72.7
A5	Base angle	7	65.9
A6	Position of max. width	7	72.5
A7	Percentage acuminate	7	65.9
A8	No. of 2° veins	7	79.5
A9	2° vein intercostal shape	7	77.3
A11	2° vein angle	7	68.2
A13	Dentition frequency	7	65.9
A14	Geographic region	6	77.3 (see fig. 110)

TABLE 11. Discriminant variables for SPECIMENS, RANVARS, MEANS. Alphanumeric numbers are character codes.

The best discriminatory variables are the number of 2° veins, 2° vein intercostal shape and geographical region. This last variable was expected considering the strong geographical ordination seen in similarity, distance and PCA plots. The secondary vein characters are also not surprising if one refers to their F-ratios and factor scores given in chapter 5. The plot of OTUs on discriminant scores for SPECIMENS grouped by geography is given in figure 110. Once again there is a strong ordination of species by generic section, and the primary division into two major geographic groups roughly bisects the plot. The actual number of groups is six, so that the area enclosed by the dashed line includes species from groups (regions) 1 to 4.

Discriminant functions used to plot figure 110 are only two of the five functions contributing to 95% of the variance. For example using geographical region (A14) as the discriminating variable, the third discriminant function still accounts for 13% of the variance. To better illustrate the relationships between OTUs on discriminant scores, stereo pairs have been plotted for the three best discriminating variables given in Table 11. The percent of variance accounted for

FIGURE 110. Discriminant analysis of SPECIMENS, RANVARS, MEANS using A14 (geographical region) as the discriminating variable. Of the 44 species, 77.3% are correctly assigned to their geographical region. Species plotted on scores for the first two discriminant functions.


D.S. 2
4
-4
D.S. 1
-4
4
PENDU
RUBEN
PANAY
STERR
VULCA
CAULI
NUDIF
SCABE
MALAY
FRAG
BRACT
CLEME
LEPRO
PLURI
ROXB
EGREG
XIPHO
POOLE
NAPAU
TRIST
ACUM
ACTIN
PUNDU
CAPIT
BRASS
ALPIC
GJELL
MACRA
EMARG
TAFA
RUBRI
RUBIC
PURG
DIELS
STICH
CONGE
OCCUL
EBURN
DUFAU
BIFID
SCHUM
NOVOG
CONFE
HOLOT

by each of the first five functions for each character is given below.

Character	Discriminant functions	1	2	3	4	5
A2	Leaf width	72.0	12.9	8.0	4.0	2.4
A3	Length to width	67.2	15.6	9.3	5.2	2.3
A5	Base angle	68.9	13.3	8.1	5.2	3.8
A6	Position of max. width	56.5	21.5	14.3	4.2	3.5
A7	Percentage acuminate	55.5	23.4	11.4	6.9	2.3
A8	No. of 2° veins	83.7	7.2	6.3	2.5	.2
A9	2° vein intercostal shape	63.6	14.2	11.7	8.6	1.8
A11	2° vein angle	67.8	15.1	6.9	5.3	3.9
A13	Dentition frequency	49.3	27.4	11.4	6.5	3.9
A14	Geographic region	46.8	30.5	13.4	6.4	2.9

From the above it is apparent that the third and higher functions for the variables A6, A7, A9, A13 and A14 still account for more than 10% of the variance. In three dimensional plots of variables A8, A9 and A14, discriminant axes are plotted at the same length. Remember however that the length of each axis is proportional to the variance that each function represents. Thus a separation between two OTUs on the third function is less important than the same separation on the first. In plots of OTUs on their discriminant scores for the first three functions (figs. 111-113), OTUs are represented by dots and group centroids are represented by open diamonds. The degree of separation of centroids is a measure of how reliably OTUs will be assigned to groups by the discriminant functions. In figure 113 the two horizontal axes for discriminant function one (d.s.1) and discriminant function two (d.s.2) are the same as the axes for figure 110.

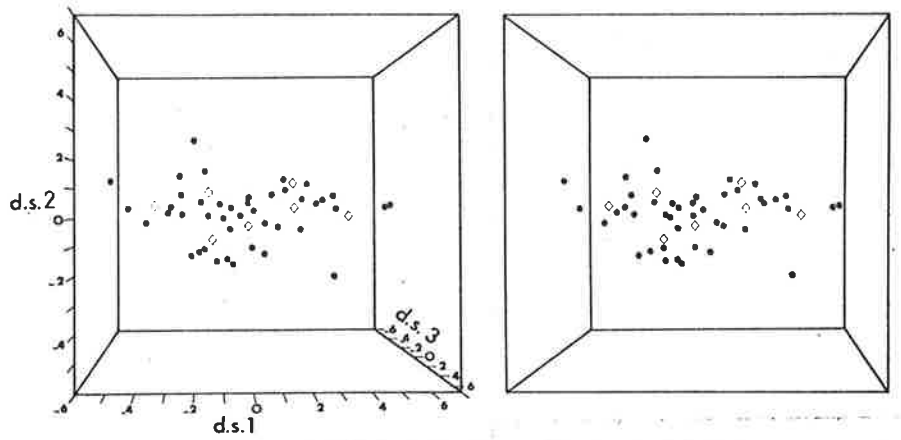
Because three variables (A8, A9 and A14) are the best discriminators, I decided to test the effect of having only those variables. All the other characters were excluded from the data set to see what reliability of classification could be achieved with a reduced set.

Stereograms of 44 Saurauia species scores for leaf data and plotted on discriminant scores for the first three discriminant functions. In all plots OTUs are represented by dots and group centroids are shown as diamonds.

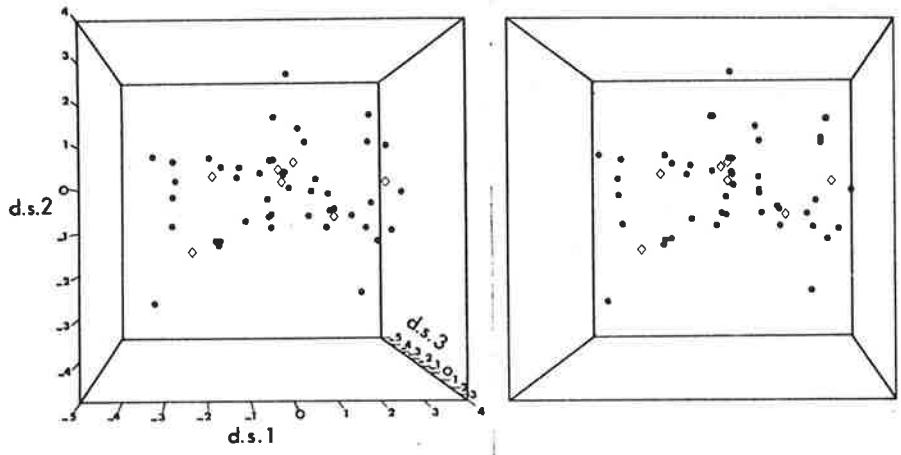
FIGURE 111. Discriminant scores for OTUs using leaf character A8 (no. of 2° veins) as the discriminating variable. Groups are defined by class intervals.

FIGURE 112. Plot of OTUs using A9 (2° vein intercostal shape) as the discriminating variable. Groups defined by class intervals.

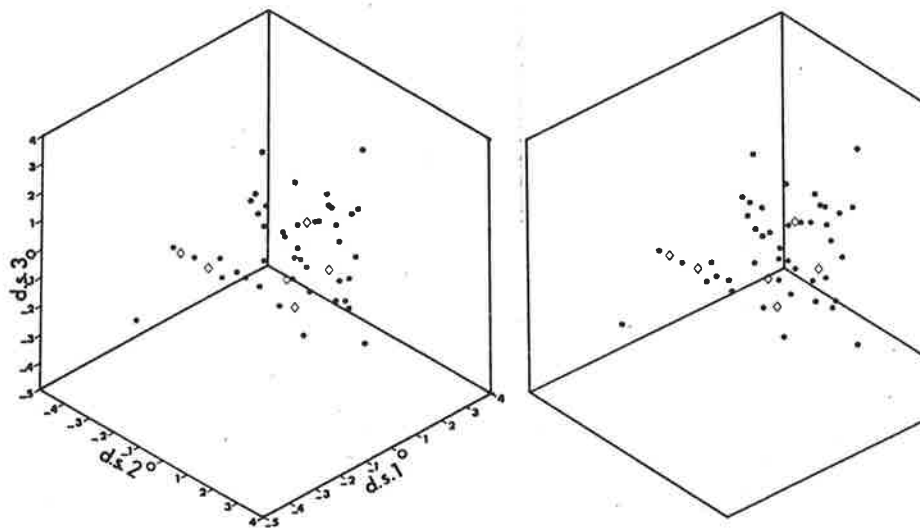
FIGURE 113. Plot of OTUs using A14 (geographical region) as the discriminating variable. Groups defined by the six regions.



111



112



113

The percentage of correct assignment with the three variables fell to only 40.9%. Sequentially adding in the next best variables, and rerunning the analysis at each step showed that the degree of correct assignment increased slowly to the maximum achieved with the whole set of nine characters. No one character could be considered to be worth excluding. This indicates that elimination of characters described in chapter 5 had been an efficient procedure.

Discriminant analyses were run on type data as well. In most cases the degree of correct assignment was found to be lower than that for leaf data. Lower percentages of correct assignment were also observed with increased numbers of OTUs. Discriminant analyses on 332 specimens generally gave about 20% lower correct assignment for each variable.

Because discriminant analysis in general was found not to produce very useful results for classificatory purposes, details for other analyses conducted on various sets of OTUs will not be considered here. However, I will discuss some of the better discriminant variables as applied to the set of 193 species scored for type data. These variables may be of use in the ultimate classifications of Saurauia.

The best character in terms of species being correctly assigned to groups was the character(number of styles). Maximum correct assignment with this character was found when it was used as a two state character. The two states included those species with 3 or 4 styles and those species with 5 or more. In this case 72.4% of the 193 species were correctly classified. This suggests that division of Saurauia into two groups based on style number may be meaningful. Further discussion of this is given in chapter 10. The second best discriminating variable was once again a two state character, ovary

indument. This character was divided into the two states, glabrous and tomentose, based on type descriptions. It was found that descriptions were generally not reliable enough to further subdivide the state, tomentose. On the set of 193 species 60.4% were correctly assigned to the groups defined by this variable. The third and last variable to be considered was sepal exterior surface indument. This was divided into 5 states (p.215). Of the 193 species 51.9% were correctly assigned to the five groups. All other discriminating variables achieved less than 50% correct assignment, and so will not be considered here.

The value of running discriminant analyses has been that it has demonstrated a number of characters which appear to reflect real taxonomic groups within the genus. Such features as the number of 2° veins, 2° vein intercostal shape, number of styles and ovary indument may prove of value in the ultimate taxonomic revision of the genus.

Canonical correlation analysis

Much evidence presented here has suggested that a number of environmental and morphological factors can be used to produce an ordination of species. Canonical correlation analysis is in effect a method of assessing correlation between one set of variables and another over a set of OTUs. It is possible to test whether general leaf size and shape features are correlated. It can also be used to test the correlation between morphological and environmental parameters.

Canonical correlation analysis using the CANCORR subroutine of SPSS was performed on 332 specimens of Saurauia. Specimens rather than species were used to maximise any correlations. Such correlations are often greater within species than between species. To check this

analysis, the CANCORR was run again using 44 species scored for leaf data and found to be essentially the same, except that observed correlations were not significant because of the reduced sample size.

Canonical correlation was first performed on two groups of characters. The first of them defines leaf shape and size - namely base angle, length to width ratio, position of maximum width, percentage acuminate and leaf width. The second group contained three secondary venation features. Canonical correlation between the two groups was found to be .828, which was very significant at the .01 level. This could be expected from simple bivariate correlations. It does suggest that an analysis of leaf architecture might be performed with a fairly high degree of reliability on a small number of carefully chosen metric characters. However, such an approach would lose some of the stability inherent in a larger character set. Several other combinations of leaf characters were compared by this method but none produced such high correlation. Finally it was decided to compare general leaf features to the geographical variable. Such a comparison becomes a simple bivariate correlation when each leaf character is compared individually with geography. Characters used were number of secondary veins, 2° vein intercostal shape and length to width ratio, since they had been the best discriminating variables. Canonical correlation between these and geography was only .35. It must be realised that a canonical correlation assumes that characters are metric, which the character of (geographical regions) is not. Therefore the scattergram of OTUs plotted on geographic region against the three leaf characters grouped was inspected to see if there was any preferential clustering of OTUs in a non-linear fashion which canonical correlation would not detect. None was obvious, so a final analysis was run using single leaf characters against geography for

332 specimens of Saurauia. Canonical correlations for each of these are listed below.

	Character	Canonical correlation	Significance
A2	Leaf width	-.3214	.00001
A3	Length to width	-.0226	.341
A5	Base angle	-.2224	.00002
A6	Position of max. width	.1868	.00031
A7	Percent acuminate	-.0587	.143
A8	No. 2° veins	-.2387	.00001
A9	2° vein intercostal shape	-.0448	.208
A11	2° vein angle	-.2314	.00001
A13	Dentition frequency	.3012	.00001

The general meaning of these correlations is that most of the characters decrease in value from India through Malaysia and Indonesia to New Guinea. Exceptions to this are characters A6 and A13. As geographic regions are not arranged as a simple linear metric character, it is necessary to examine each region for clustering of OTUs. Since the plots produced for the analysis are defined in terms of discrete groups, many OTUs are coincident. Therefore frequency plots for each correlation analysis have been produced. To facilitate their interpretation stereo pairs have been plotted for the most significant (figs.114-119).

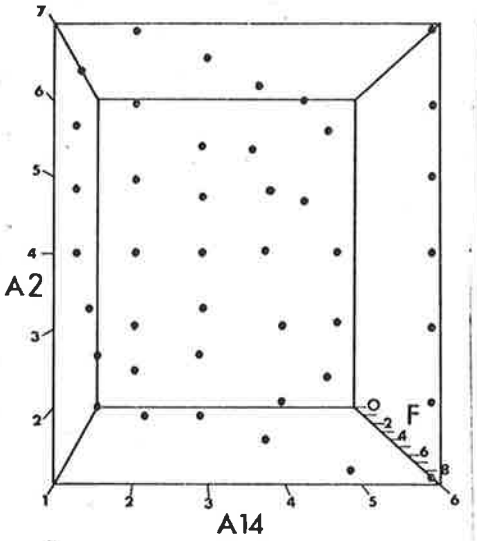
The most significant correlation was between leaf length and geography (fig.114). It can be seen that the correlation is due to a lack of narrow leaves in regions 1, 2 and 3. Presence of leaves of all widths in region 6 means that this correlation has little classificatory value. Figure 115 demonstrates correlation between geography and base angle. In this case there are some clearer clusters, with few leaves with narrow bases occurring in region 1 and in region 3 and few with broad bases in region 5. Figure 116 illustrates the correlation between geography and the position of maximum width. This

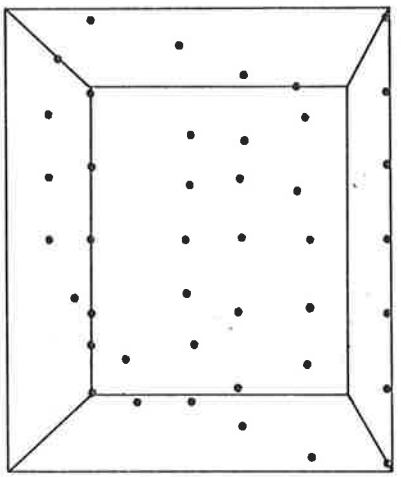
FIGURES 114-119. Bivariate histograms plotted as stereo pairs to illustrate the trend surface of leaf characters against geography.

FIGURE 114. Leaf width (A2) plotted against geographic region (A14) for 332 specimens of Saurauia with frequencies of coincident points (F). More than 9 coincident points are truncated to nine by limitations of the computer program used to generate the base plots from which the stereo pairs have been produced.

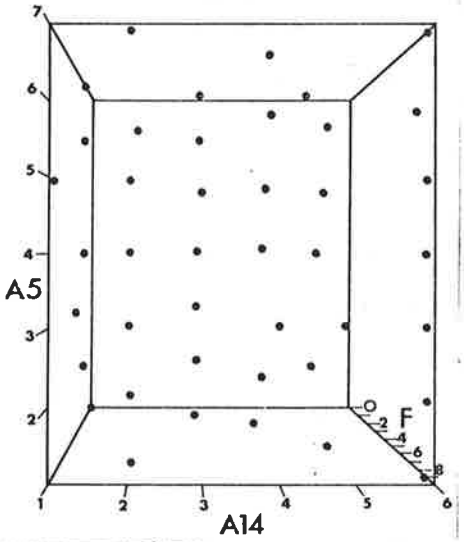
FIGURE 115. Leaf base angle (A5) plotted against geography (A14) for the same data set as in figure 114.

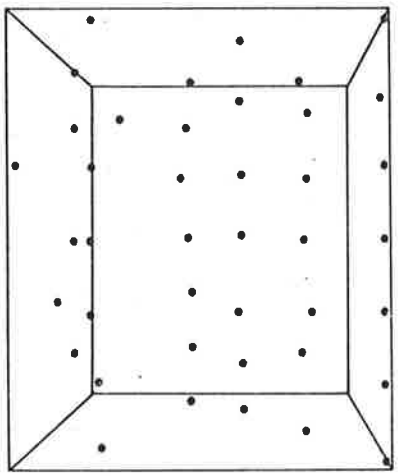
FIGURE 116. Position of maximum width (A6) plotted against geography (A14) as for previous two figures.



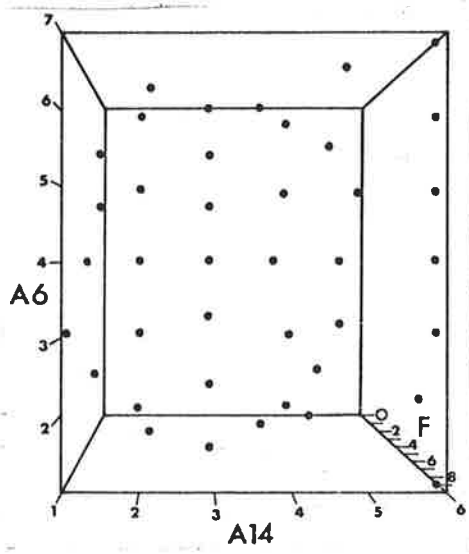


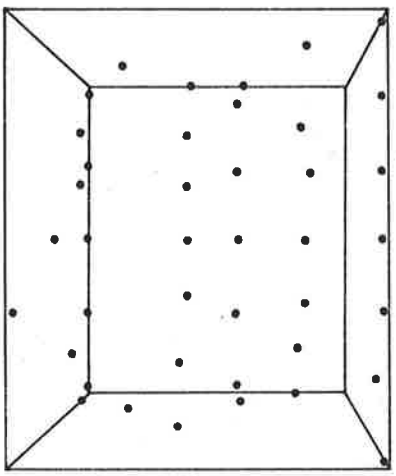
114





115



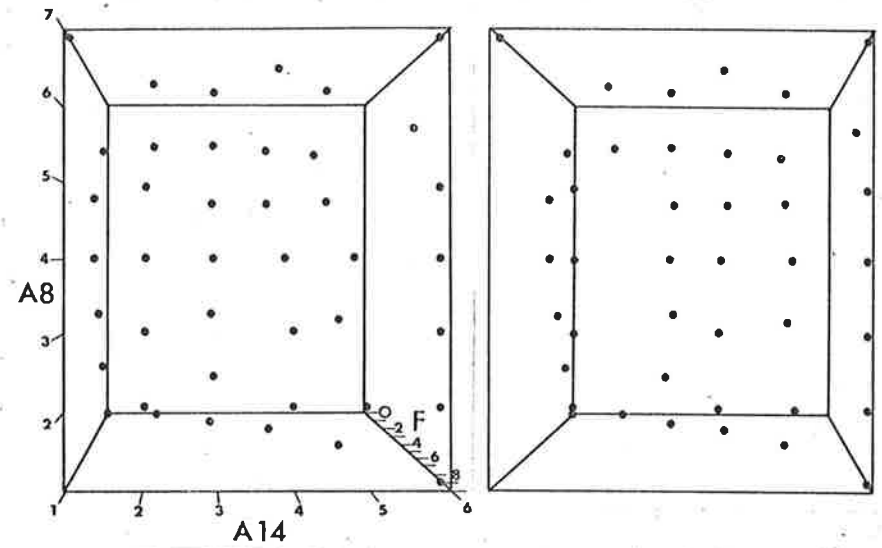


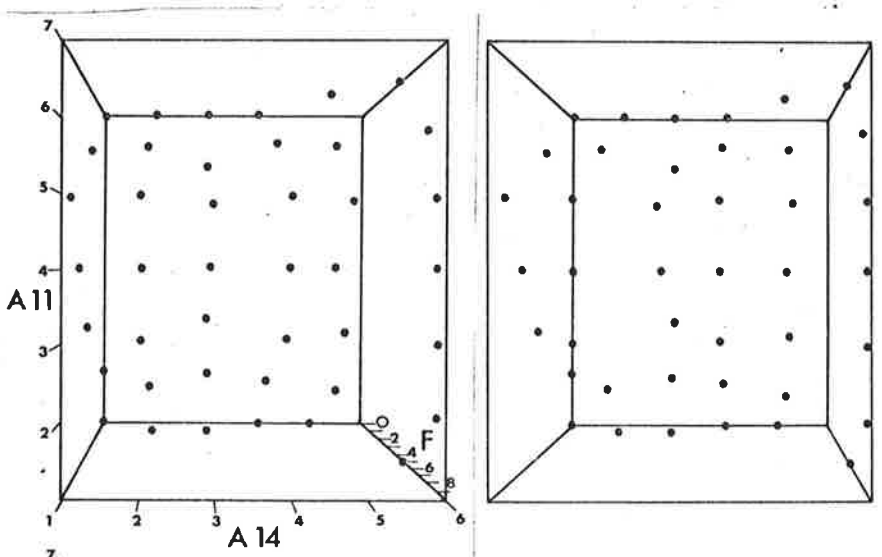
116

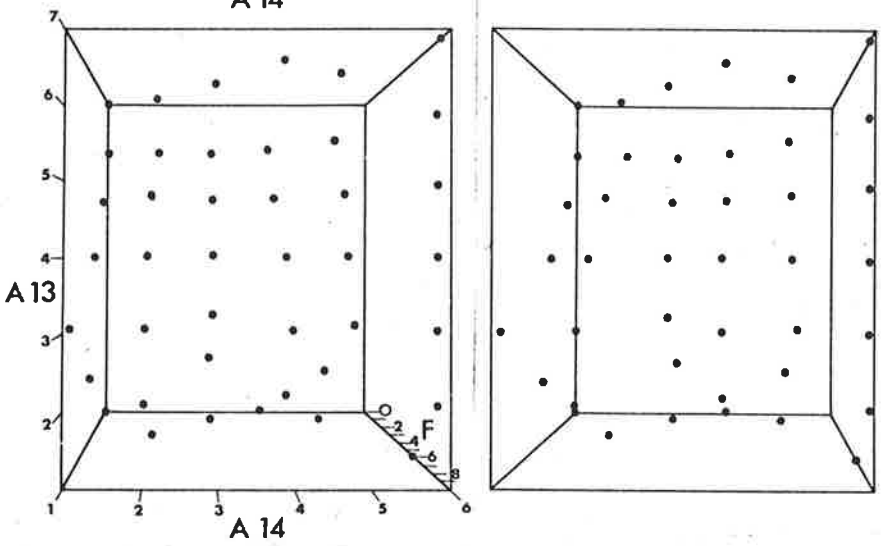
FIGURE 117. Number of secondary veins (A8) plotted against geographic region (A14) for 332 specimens of Saurauia as for previous stereo plots.

FIGURE 118. Secondary vein angle (A11) plotted against geographic region (A14) as for previous figures.

FIGURE 119. Dentition frequency (A13) plotted against geographic region as for previous figures.


A8
A 14
F
117


A 11
A 14
F
118


A 13
A 14
F
119

indicates that the leaves of region 1 are mostly broader below the centre line of the leaf. This same trend is indicated in region 3. Figure 117 indicates a general trend over regions 1 to 5 of increasing number of secondary veins towards the Indo-China region. Subjective assessment of the leaf data had already indicated this trend. It is complicated by the species of region 6 once again possessing the full range of states. Figure 118 indicates that the only trend in secondary vein angle is towards a reduction on variance in regions 1 to 4. Finally, figure 119 indicates a trend towards lower dentition frequencies in regions 1, 2 and 3. Although correlations for all cases discussed above are statistically significant, actual plots indicate that there is not a simple trend between any leaf characters and geography. The correlation of all leaf characters taken together with geography is more significant. It thus appears that although geography has a profound influence on leaf architecture, it may be of little value in a sequential classificatory procedure such as a key. Geographical influences evident in various leaf and floral characters have been discussed in chapter 10. This appears to suggest that geography seems to have played an important part in the speciation of the genus.

In this appendix various statistical procedures have been discussed in an attempt to consider alternate classifications to that produced by the analysis of similarity using I_D and D_I, discussed in great length in this thesis. The conclusions that can be reached with regard to the merits of the alternate procedures are (1) they produce essentially the same ordinations as do the measures of similarity, (2) they are sensitive to an unknown degree to deviations from multivariate normality, (3) they cannot handle multiple scores for single characters, (4) they have available a large number of optional procedures which unless individually studied with care, may produce

unknown effects on the classification.

The simplicity of measures of resemblance such as I_D and D_I and the fact that they produce essentially the same results as the other more complex procedures supports their use almost exclusively in this study. Further conclusions regarding relationships between Saurauia species have been based on these measures.

A final point to be made about the measures of similarity concerns the influence of sample size on the ordination. With analyses such as PCA, and discriminant analysis, scattergrams of OTUs on factors or discriminant scores become more confused as the number of species increases. Thus any clustering present within the set of 44 species disappeared when the full set of 193 was studied. This is a consequence of intermediate species being added to the analysis. However, an analysis based on a large number of species should be more reliable than one based on a small set. Despite this the interpretation of results of an analysis becomes more difficult as the number of species is increased. The results of discriminant analysis and PCA were difficult to compare, except to say that they produced a generally similar ordination. The use of nearest neighbour trees based on measures of similarity or distance allows an ordination to be produced which becomes easier to interpret as the number of species increases. The reason for this is that as the whole set of species is incorporated, the actual nearest neighbour species of a particular species are more likely to be included. This reduces the probability of spurious nearest neighbour relationships dominating the plot. Therefore figure 70 is considered to be a good representation of the morphological relationships within Saurauia.

APPENDIX 5

LISTING OF PROGRAM TAXON

This appendix contains a full Fortran listing of the computer program TAXON, written by D.T. Blackburn and C. Annells. The listing is derived from an actual execution of the program on a test data set and so includes a sample output from the test data. The heading for the output data specifies that the data was for SPECIMENS, RANVARS and using standard deviation (STANDEV) to specify the range of values rather than RANGE. The ASSOC.COEFF refers to values of the similarity indes ($1-I_D$) and DISTANCE refers to the Euclidean distance measure D_I. Details for applying the program are given within the listing and in chapter 7.

```
      PROGRAM TAXCN (INPUT,TAPE1=INPUT,OUTPUT,TAPE3=OUTPUT)
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $
$  SET DIMENSIONS TO THE SIZE OF THE DATA MATRIX.    $
$  THE PARAMETERS #NAME# AND #ISAMP# EQUAL THE NO.   $
$  OF OTUS. #NSTATE#,#ICON# AND #ICAR# ARE EQUAL TO  $
$  THE TOTAL NUMBER OF CHARACTER STATES.#KAR# IS A    $
$  MATRIX WHICH MUST BE SET TO (OTUS X CHARACTERS).   $
$  NOTE THAT IF THESE LAST 4 PARAMETERS ARE SET TO    $
$  MORE THAN 80,EACH DATA CARD BUT THE LAST MUST      $
$  BE FILLED WITH DATA.                               $
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $

      DIMENSION NAME(200),ISAMP(200),NSTATE(80),ICON(80)
      DIMENSION ICAR(80),KAR(200,80)
      INTEGER CA,CD,CT,CQ,CP,CH,CS,CO,RZ,RA,RD,RT,RQ,RP,RH
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $
$  THE NUMBER OF CHARACTERS IS SPECIFIED BY #NC#.     $
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $
      NC=9
C  ICON(N) IS THE CONTROL FOR THE DETERMINATION OF CHARACTERS FROM STATES
      PRINT 1000
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $
$ IN THE FOLLOWING READ,THE RANGE OF I MUST EQUAL     $
$ THE VALUE OF ICON.                                  *
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $

      READ 1001,INAME,(ICON(I),I=1,80)
      NS=NSPEC=0
C  LOOP 1  COUNT THE TOTAL NO OF STATES THAT CAN BE EXPECTED ON OTU DATA CARDS

$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $
$  THE RANGE OF THE FOLLOWING DO LOOP MUST EQUAL ICON $
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $

      DO 100 I=1,80
      IF(ICON(I).EQ.0)100,1
1     NS=NS+1
100   CONTINUE
      PRINT 500, NS
500   FORMAT(5X,*NO.OF STATES = *,I6)
C   READ DATA CARDS THIS LOOP IS CONTROLLED BY IF(EOF) STATEMENT
2     READ 1001,INAME,(ICAR(I),I=1,NS)
      IF(EOF(1))7,3
C   LOOP 2   SEARCH THE NAME FILE AS EACH NEW NAME IS READ
3     DO101 I=1,NSPEC
      NT=I
C   IF THE NAME IS ALREADY PRESENT, GO TO 4 TO ADD THE NEW DATA
      IF(NAME(I).EQ.INAME)4,101
101   CONTINUE
C   IF THE NAME IS NOT ON THE FILE, CREATE NEW ENTRY, AND ENTER DATA
      NAME(NSPEC+1)=INAME
      DO102 I=1,NS
102   KAR(NSPEC+1,I)=ICAR(I)
      NSPEC=NSPEC+1
      ISAMP(NSPEC)=1
      GOTO6
4     DO 103 I=1,NS
```

```
      IF(ICAR(I).EQ.0)103,5
5     KAR(NT,I)=1
103   CONTINUE
      ISAMP(NT)=ISAMP(NT)+1
6     PRINT 1003,INAME,(ICAR(I),I=1,NS)
      GOTO2
7     PRINT1004,NSPEC
      DO 200I=1,NSPEC
      NSTATE(I)=IV=0
      DO201 J=1,NS
      IF(KAR(I,J).EQ.0)201,8
8      IV=IV+1
201   CONTINUE
200   NSTATE(I)=IV
      PRINT 1005
      MNSPEC=NSPEC-1
      DO 300 I=1,MNSPEC
      II=I+1
      DO 300 J=II,NSPEC
      CA=CO=CT=CQ=CP=CH=CS=CO=ID=IT=0.
      RZ=RA=RD=RT=RQ=RP=RH=IM=0
      GOTO230
 230  DO 2500 L=1,NC
      M=0
      MAXH=0
      MAXHH=0
      MINH=10
      MINHH=10
      X=NS/NC
      J1=((L-1)*X)+1
      J2=L*X
      GOTO260
 260  DO 2000 K=J1,J2
      M=M+1
      IH=M*KAR(I,K)
      IF((IH.GT.MAXH).AND.(IH.LT.MINH))80,81
  80  MAXH=MINH=IH
      GOTO85
  81  IF(IH.GT.MAXH)82,83
  82  MAXH=IH
      GOTO85
  83  IF((IH.LT.MINH).AND.(IH.GE.1))84,85
  84  MINH=IH
      GOTO85
  85  IHH=M*KAR(J,K)
      IF((IHH.GT.MAXHH).AND.(IHH.LT.MINHH))86,87
  86  MAXHH=MINHH=IHH
      GOTO91
  87  IF((IHH.LT.MINHH).AND.(IHH.GE.1))88,89
  88  MINHH=IHH
      GOTO91
  89  IF(IHH.GT.MAXHH)90,91
  90  MAXHH=IHH
      GOTO91
  91  IF(M.EQ.X)2200,2000
2000  CONTINUE
2200  M=0
```

```
      IF((MAXH.EQ.0).OR.(MAXHH.EQ.0))2450,2520
 2450 NC=NC-1
      GOTO2340
 2340 IF(MAXH.EQ.0)2350,2360
 2350 NSTATE(J)=NSTATE(J)-((MAXHH-MINHH)+1)
      GOTO2500
 2360 NSTATE(I)=NSTATE(I)-((MAXH-MINH)+1)
      GOTO 2500
 2520 IF((MAXH.LT.MINHH).OR.(MAXHH.LT.MINH))2550,2600
 2550 IF(MAXH.LT.MINHH)2300,2400
 2300 IM=(MINHH-MAXH)
      GOTO2420
 2400 IM=(MINH-MAXHH)
      GOTO2420
 2420 IF(IM.LE.X)2430,2500
 2430 GOTO(51,50,49,48,47,46,45,45,45,45,45,45,45,45),IM
   45 RH=RH+1
      GOTO52
   46 RP=RP+1
      GOTO52
   47 RQ=RQ+1
      GOTO52
   48 RT=RT+1
      GOTO52
   49 RD=RD+1
      GOTO52
   50 RA=RA+1
      GOTO52
   51 RZ=RZ+1
      GOTO52
   52 IM=0
      GOTO2500
 2600 IF(((MAXH.GE.MAXHH).AND.(MINH.LE.MINHH)).OR.((MAXHH.GE.MAXH).AND.
     C(MINHH.LE.MINH)))2601,2605
 2601 IF((MAXH.GE.MAXHH).AND.(MINH.LE.MINHH))2602,2603
 2602 ID=(MAXHH-MINHH)+1
      GOTO2660
 2603 ID=(MAXH-MINH)+1
      GOTO2660
 2605 IF(MINH.LE.MINHH)2650,2700
 2650 ID=(MAXH-MINHH)+1
      GOTO2660
 2700 ID=(MAXHH-MINH)+1
      GOTO2660
 2660 IF(ID.LE.X-2)2750,2500
 2750 GOTO(20,19,18,17,16,15,14,13,13,13,13,13,13,13,13,13),ID
   13 CO=CO+1
      GOTO21
   14 CS=CS+1
      GOTO21
   15 CH=CH+1
      GOTO21
   16 CP=CP+1
      GOTO21
   17 CQ=CQ+1
      GOTO21
   18 CT=CT+1
```

```
      GOTO21
   19 CD=CD+1
      GOTO21
   20 CA=CA+1
      GOTO21
   21 ID=0
      GOTO2500
 2500 CONTINUE
      AS=2-NSTATE(I)-NSTATE(J)+2*CD+4*CT+6*CQ+8*CP
     $+10*CH+12*CS+14*CO
      IR=2*CA+AS
C #II# IS THE EUCLIDEAN DISTANCE
      IT=2*CA+AS-2*RZ-4*RA-6*RD-8*RT-10*RQ-12*RP-14*RH
C  R IS THE DISSOCIATION COEFFICIENT
      R=FLOAT(C-IR)/FLOAT(NSTATE(I)+NSTATE(J))
C  CALCULATE DISTANCE
      S=FLOAT(C-IT)/FLOAT(NSTATE(I)+NSTATE(J))
C  CALCULATE ASSOCIATION COEFFICIENT
      T=1-R

$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $
$ THE PROPORTION OF COMPARISONS THAT ARE     $
$ OUTPUT IS SPECIFIED BY DEFINING THE VALUE $
$ OF #Q# SO THAT VALUES MORE THAN A CERTAIN $
$ FRACTION OF THE THEORETICAL RANGE OF R ~ S$
$ ARE DISCARDED. THE VALUE TO BE SPECIFIED  $
$ IS A POSITIVE REAL NUMBER IN THE RANGE 0-1$
$ THE DEFAULT VALUE IS CURRENTLY .5         $
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $

      Q=0.5

      P=Q*NS/NC

      IF(S.GT.P)300,250
  250  PRINT 1006,NAME(I),NAME(J),NSTATE(I),NSTATE(J),NC,CA,T,S
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $
$ TO PRODUCE AN OUTPUT OF SPECIES NAMES AND $
$ DISTANCE VALUES FOR EACH COMPARISON,USE    $
$ THE FOLLOWING WRITE CARD WITHOUT THE COM- $
$ MENT IN COLUMN ONE. NOTE THAT DISCARD IS   $
$ IN FORCE ON THIS AS WELL. TO RETAIN THIS   $
$ OUTPUT,A CATALOG(TAPE3) CONTROL CARD MUST $
$ BE USED.                                  $
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $
C     WRITE(3,1007)NAME(I),NAME(J),S
  300 CONTINUE
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $
$ ENTER RUN NAME ON THE FOLLOWING FORMAT CARD $
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $
      PRINT 990,Q
 1000 FORMAT(1H1,10X,* SPECIMENS,RANVARS,STANDEV *)
  990 FORMAT( 5X,* DISCARD = *,F5.3)
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $
$ THE FOLLOWING TWO FORMAT STATEMENTS ARE SET $
$ TO THE SAME VALUE AS NSTATE,ICON ETC.       $
$ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $ $
```

```
1001 FORMAT(A5,80I1)
1003 FORMAT(1X,A5,80I1)
1004 FORMAT(5X,10X,*NO OF OTUS=*,I10)
1005 FORMAT(1X,*OTU1        OTU2  STATES1  STATES2*,2X,
    $*NO.CHARS  ASSOC.CHARS  ASSOC.COEFF  DISTANCE*)
1006 FORMAT(1X,A6,* X  *,A6,1I4,3X,1I7,4X,1I4,4X,1I7,5X,
    $F10.4,4X,F10.4)
1007 FORMAT(10X,A6,3X,A6,F10.4)
     STOP
      END
```

```
          SPECIMENS,RANVARS,STANDEV
   NO.OF STATES =      63
ANDRE000110000011100111000011110000011100011000111100000110000000010
BIFID111000000001110000110011111000000111111100001111000000100000000111
CAPIT011111110000000000110111101000000111110000111000001110111000
CAULI011100000000111001111011000000111111000000110111100000011101100000
CLEME111110011111000000110111100000011110111100001110000011110001110O
CONFE011111000111111100000001111001110000111100000111110000011110000
EMARG100000000000011011100000111110001110100000011000001000000010000000
LEPRD000011110011110011100110000001110000011100001111000011110000
              NO OF OTUS=         8
OTU1        OTU2  STATES1  STATES2  NO.CHARS  ASSOC.CHARS  ASSOC.COEFF  DISTANCE
ANDRE   X   BIFID    24       27        9          2          .3922        .7255
ANDRE   X   CAPIT    24       28        9          1          .2692       1.1538
ANDRE   X   CAULI    24       29        9          3          .3396        .8113
ANDRE   X   CLEME    24       33        9          2          .2807        .7895
ANDRE   X   CONFE    24       33        9          3          .3158        .7895
ANDRE   X   EMARG    24       19        9          2          .3721       1.2791
ANDRE   X   LEPRO    24       30        9          1          .3333        .8148
BIFID   X   CAPIT    27       28        9          1          .2182       1.1818
BIFID   X   CAULI    27       29        9          0          .2500        .9643
BIFID   X   CLEME    27       33        9          4          .4667        .5333
BIFID   X   CONFE    27       33        9          3          .2333        .9000
BIFID   X   EMARG    27       19        9          4          .3478        .9130
BIFID   X   LEPRO    27       30        9          1          .1754       1.0351
CAPIT   X   CAULI    28       29        9          3          .3158        .8596
CAPIT   X   CLEME    28       33        9          3          .3934        .6721
CAPIT   X   CONFE    28       33        9          0          .3607        .9672
CAPIT   X   EMARG    28       19        9          1          .1702       1.5957
CAPIT   X   LEPRO    28       30        9          0          .3448        .8621
CAULI   X   CLEME    29       33        9          1          .3548        .7097
CAULI   X   CONFE    29       33        9          1          .2903        .8710
CAULI   X   EMARG    29       19        9          1          .2083       1.2500
CAULI   X   LEPRO    29       30        9          1          .4068        .5932
CLEME   X   CONFE    33       33        9          2          .3030        .8182
CLEME   X   EMARG    33       19        9          3          .2308       1.0385
CLEME   X   LEPRO    33       30        9          1          .2540        .7778
CONFE   X   EMARG    33       19        9          3          .3077        .9231
CONFE   X   LEPRO    33       30        9          1          .4127        .7143
EMARG   X   LEPRO    19       30        9          3          .2041       1.2857
     DISCARD =  .500
```

APPENDIX 6

Descriptions of the leaves of *Saurauia* species

In this section the leaves of 94 species of *Saurauia* are described. Descriptions include architectural and wherever possible, epidermal features. A representative leaf of each species is figured as a drawing, composite photo/drawing or photograph of a cleared leaf. Seventy five species have epidermal features described and of these 37 have at least one surface figured.

Each description contains a summary of the leaf features and is terminated by a list of numbers representing the mean values of each character score. The character score listing allows rapid information retrieval from a standardised listing for data banking purposes. Each description is arranged in a standard format as follows.

Species name. Figure numbers; leaf, epidermis, geographical range. Number of specimens x total number of leaves scored.
Leaf description.
Species code number. Architectural character string/epidermal character string/ geographic region/

The character list consists of twenty-four variables. Some of these have been excluded from data analyses within this study but are included here for completeness. Missing data is marked by "-". The species description variables in their list order are as follows.

Variable name	Abbreviation	List Number
Leaf length (cm.)	LL	1
Leaf width (cm.)	W	2
Leaf length to width ratio	L/W	3
Apex angle	AA	4

Variable name	Abbreviation	List number
Base angle	BA	5
Position of maximum width (%)	MW	6
Percentage acuminate	%A	7
Number of secondary vein pairs	NoSec	8
Secondary vein intercostal shape	IS	9
Secondary vein straightness	Stness	10
Secondary vein angle	SecA	11
Tertiary vein angle	TertA	12
Marginal dentition frequency	Dent	13
Upper cuticle granule size	Gran	14
Granule contiguity	Contig	15
Upper cuticle periclinal thickening	U.S.thick	16
Upper cuticle anticlinal thickening	U.Ant.thick	17
Upper epidermal hair type	U.H.type	18
Upper epidermal hair density	U.H.dens	19
Lower cuticle periclinal thickening	L.S.thick	20
Lower epidermal hair type	L.H.type	21
Lower epidermal hair density	L.H.dens	22
Stomatal density	Stomates	23
Geographical region		24

Generic characters

The leaves of Saurauia may be characterised at the generic level in terms of the total ranges of the species variables given above, characters that are invariant in the genus, and characters not considered useful for distinguishing between species. Terminology is that described in Chapter 3 and supplemented by that of Hickey (1973) and Dilcher (1974).

Saurauia Willd.

Architectural features

Leaves spirally arranged, usually clustered at the ends of branches. Leaf length 3-50cm (mean 17.7), width 2-25cm (mean 6.9). Length to width 1.3-7.4 (mean 2.8). Leaf shape lorate to oblong, elliptic ovate, or obovate. Position of maximum width 32-68% (mean 55). Apex always acuminate or mucronate, sometimes minutely so. Length of acuminate portion up to 16% of leaf length (mean 6.9%). Apex angle 24°-145° (mean 67°), base long decurrent into a winged petiole to cordate, base angle 32°-225° (mean 87°). Margin always serrate. Teeth generally small, callose or with a long seta. Tooth supplied by a tertiary vein arising from a secondary vein. Teeth generally irregularly spaced, .6-8 per cm (mean 3.7), arranged in one or two series, and with acute sinuses. Margin often entire towards the leaf base. Petiole highly variable in length, generally normal but often winged. A few species have nearly sessile leaves. Stipules absent. Primary venation pinnate, moderately thick, straight to markedly curved. Secondary venation eucamptodromous, with 6-60 vein pairs (mean 15), secondary vein angle, generally becoming more acute towards the leaf apex, 16°-79° (mean 47°). Secondary veins evenly curved or more abruptly curving towards the margin, secondary vein straightness .19-.75 (mean .43). Secondary vein spacing close to distant, secondary vein intercostal shape 2.3-8.9 (mean 4.1). Intersecondary veins generally absent, if present usually composite and poorly defined. Tertiary veins acute to exmedial side of secondary veins, obtuse to admedial side, or right angled. Tertiary veins strongly percurrent, course simple, or forked generally simple and straight exmedially and sinuous or recurved admedially. Tertiary vein angle constant throughout or

increasing apically and exmedially, 30°-92° (mean 63°). Tertiary veins predominantly opposite across the secondary veins. Higher vein orders up to fifth or sixth order, Quaternary veins orthogonal, variable in thickness. Areoles well defined, though irregular in shape and with simple or curved, up to twice branched veinlets.

Epidermal features

Upper surface

Cuticle thick to thin generally granular to some degree. Epidermal cells, isodiametric, 12-42um in diameter (mean 26um), 4-7 sided. Anticlinal walls, generally distinct, rarely not visible, straight, curved or undulate, sometimes with bladed or beaded thickening and/or peg-like or spinose thickening in the corners. Surface ornament rarely absent, generally fine to coarsely granular, striate or ridged. Granules discrete to almost completely contiguous. Arrangement of granules various, evenly scattered, mural, surficial, bordered surficial, or lensing. Trichomes always present, often only on the venation, mostly uniseriate in which case they are generally deciduous, or multiseriate when they are generally persistent. Multiseriate trichomes, setose, conical, strigose or globular, often flattened and scale like, rarely spinose. Trichome base simple unmodified or thickened in the case of simple hairs, or generally with one to five series of radial epidermal cells in the case of multiseriate hairs. Trichome density up to 3500 per sq. cm (mean 390), rarely with mixed simple and multiseriate trichomes, often only conspicuous on the primary vein and up to 4mm in length. Stomates generally absent or very rare.

Lower surface

Cuticle mostly thin, occasionally medium thickness and with

granular ornamentation. Epidermal cells usually not visible on cuticle, rarely distinct. On very thin cuticles when epidermal cells are not expressed often only thickening of the outer stomata ledge of stomates can be discerned. Cuticle over stomatal complex often thinner than elsewhere. Stomates randomly oriented, 50-1300 per sq. mm (mean 400). Stomatal type, mostly indistinguishable on cuticular preparations, anomocytic or anisocytic. Stomatal ornament generally lacking, occasionally with striations perpendicular to pore. Guard cells level with surrounding epidermal cells, outer stomatal ledge conspicuous, plain, cuticle over guard cells generally very thin. Trichomes always present at least on the midrib, often very dense, up to 50,000 per sq. mm (mean 4200), simple, tufted, or multiseriate, setose, conical, strigose or globular. Trichomes up to 5 mm long especially on the midrib, mostly less than 1 mm. Setae often chaffy, sometimes shaggy, obtuse trichomes often scale like, occasionally overlapping and appressed, rarely spinose.

On leaves with sparse indument, trichomes are sometimes clustered in axils of secondary veins, or are found only on midrib.

Other features

Rhaphides are found in all species. These are frequently visible to the unaided eye as pale or shining rods beneath the upper epidermis, and may be up to 1 mm in length. They can often be seen as sparkling needles on the ends of broken stems or petioles. In preparations of cleared leaves at high magnification they can be seen as bundles of very fine acicular crystals. A further feature observable on broken petioles is that the spiral thickening of the xylem elements is often pulled out of the cells by the force of breaking the petiole. This thickening forms coherent silky threads which can be seen under relatively low power to be strands of spiral lignin.

Species descriptions

Saurauia aff.actinidifolia Stapf. figs 121,206.

2 x 8

LL 9.3-15.7, W 5.6-10. L/W 1.4-2.4. AA 49°-53°, apex acuminate, %A 10.3-12.5. Base obtuse to subrotund, BA 110°-150°. MW 38-58%, leaf shape ovate to slightly obovate. NoSec 8-11, IS 4.8-5.6, Stness .44-.49, SecA 49°-56°. TertA 54°-60°. Dent. 2.7-4.3, teeth setose, 1mm long. Leaf indument, short setose on veins of upper surface, scaly-strigose on veins beneath, setose scales on lower intercostals. Cuticle not seen.

1/12.6, 6.7, 1.9, 51, 127, 48, 11.5, 10, 5.2, .47, 53, 57, 3.3,/-/, 3/

Saurauia acuminata Merr. figs 121,155,156,207.

2 x 4

LL 31-41, W 12.5-16.5. L/W 2.4-2.6. AA 50°-53°, apex acuminate, %A 6.5-10. Base obtuse, rounded, BA 95°-119°. MW 44-47%, leaf shape ovate to elliptic. NoSec 20-23, IS 5.0-5.6, Stness .43-.45, SecA 50°-55°. TertA 72°-80°. Dent. 3.1-3.4, teeth inconspicuous, callose. Leaf indument, setose to 2mm on lower intercostals and veins.

Epidermis. Gran. fine, rarely contig., U.S.thick. surficial, U.Ant.thick. normal. Cell walls curved, cells irregular, 25um. U.H.type not seen, L.S.thick. none. L.H.type, setose, .08-1.8mm, L.H.dens. 700 per sq. cm. Stomates 230 per sq. mm.

2/34.1, 13.6, 2.5, 51, 108, 45, 9.0, 22, 5.3, .44, 53, 76, 3.3/ 3, 3, 5, 1, 6, 0, 1, 6, 700, 230/ 3/

Saurauia agamae Merr. figs 121,208.

1 x 2

LL 27.5-34.8, W 9.7-12.7. L/W 2.8. AA 35°-42°, apex acuminate, %A 10.8. Base obtuse, rounded, BA 115°-130°. MW 43-45%, leaf shape elliptic to oblong. NoSec 21, IS 6.1-6.3, Stness .49, SecA 54°-58°. TertA 77°. Dent. 4.7, teeth inconspicuous callose. Leaf indument unknown. Cuticle not seen.

3/31.1, 11.2, 2.8, 39, 123, 44, 10.8, 21, 6.1, .49, 56, 77, 4.7/ -/ 3/

Saurauia albiflora A.C. Smith figs 139,157,209.

1 x 5

LL 9.2-9.8, W 3-3.4. L/W 2.7-3.1. AA 97°-101°, apex mucronate, %A 3.8. Base cuneate to decurrent, BA 55°-65°. MW 46-55%, leaf shape elliptic. NoSec 15-16, IS 3.2, Stness .42, SecA 75°. TertA 30°. Dent. 8, teeth tiny callose, .5mm. Leaf indument, strigose on upper veins, and on lower veins and intercostals. Epidermis. Gran. coarse to 5um, frequently contig. U.S.thick. surficial and mural, U.Ant.thick. normal. Cell walls straight, cells polygonal, 36um. U.H.type not seen. L.S.thick. surficial. L.H.type, strigose, L.H.dens. 8/sq. cm. Stomates 330/sq. mm.

4/9.5, 3.2, 2.97, 94, 60, 51, 3.8, 15, 3.2, .42, 75, 30, 8/ 1, 2, 3, 1, 6, 0, 2, 4, 8, 330/ 5/

Saurauia alpicola A.C. Smith figs 139,158,159,210.

2 x 8

LL 15.6-17.1, W 5. L/W 3.1-3.4. AA 87°-102°, apex very shortly mucronate, %A 0-2. Base obtuse, BA 84°-112°. MW 65%, leaf shape narrow oblong to obovate. NoSec 14-17, IS 3.6, Stness .27-.34,

SecA 67°-71°. TertA 31°-42°. Dent. 5.6-6, teeth tiny callose to spinose. Leaf indument, glabrous above except for a few thorns on the midrib, strigose hairs on venation beneath, scabrid on intercostals.

Epidermis. Gran. fine, generally completely contig. U.S.thick. lensing. U.Ant.thick. peg-like. Cell walls curved, somewhat sinuous, 14um. U.H.type not seen on cuticle. L.S.thick. surficial. L.H.type, strigose or globular, L.H.dens. 50/sq. cm. Stomates 540/sq. mm.

5/16.4, 5.0, 3.24, 95, 98, 65, 0, 16, 3.6, .31, 69, 37, 5.8/ 3, 1, 7, 4, 6, 0, 3, 5, 50, 540/ 5/

Saurauia ampla Merr. figs 132,160,211.

1 x 1

LL 50, W 25. L/W 2. AA 69°, apex broad shortly acuminate, %A 0. Base obtuse, BA 100°. MW 61%, leaf shape obovate. NoSec 14, IS 5.6, Stness .37, SecA 43°. TertA 59°. Dent. 1.6, teeth small callose, .5mm. Leaf indument glabrescent, on both surfaces.

Epidermis. Gran. very fine, not contig. U.S.thick. surficial, U.Ant.thick. normal. Cell walls curved, markedly sinuous, 23um. U.H.type, simple uniseriate, U.H.dens. less than 1/sq. mm only on veins. L.S.thick. mural, L.H.type, simple, uniseriate mostly on veins on thickened bases, L.H.dens. 9000/sq. cm. Stomates 370/ sq. mm.

6/50, 25, 2, 69, 100, 61, 0, 14, 5.6, .37, 43, 59, 1.6/ 3, 3, 4, 1, 10, 3, 1, 9000, 370/ 4/

Saurauia andreana (F.v.M) Oliver figs 140,212.

15 x 47

LL 14.8-24.6, W 5.5-8.6. L/W 2.31-3.12. AA 39°-70°, apex long acuminate, %A 6.5-12.8. Base cuneate or convex acute, BA 46°-81°. MW 53-64%, leaf shape elliptical to obovate. NoSec 11-16, IS 2.9-4.6, Stness .27-.46, SecA 41°-52°. TertA 42°-62°. Dent. 3.6-5.6, teeth setose, to 1.5mm. Leaf indument, strigose above on veins, densely strigose on primary and secondary veins beneath, less dense on tertiaries. Cuticle very thin and difficult to prepare.

7/18.7, 7.2, 2.67, 55, 65, 57, 9.9, 12.9, 3.7, .35, 46.5, 52, 4.46/ -/ 6/

Saurauia arcana A.C. Smith figs 140,161,213.

1 x 5

LL 10.7-11.8, W 4.1-5.3. L/W 2.23-2.76. AA 75°-91°, apex mucronate, %A 4.5-11.6. Base abruptly acute, BA 77°-85°. MW 50-58%, leaf shape elliptic to obovate. NoSec 12-14, IS 3.9-4, Stness .32-.47, SecA 51°-54°. TertA 45°-51°. Dent. 3.5-5, teeth with curved stiff setae, up to 2mm. Leaf indument, pale appressed strigose hairs on primary vein above, deciduous short tangled simple hairs on intercostals beneath.

Epidermis. Gran. medium to coarse, up to 3um, frequently contig. U.S.thick. surficial, U.Ant.thick., normal. Cell walls straight or slightly curved, 23um. U.H.type globular, base peg-like with radial cuticular striations radiating for four to six epidermal cell diameters from the hair, U.H.dens. 1700/sq. cm. Lower cuticle very thin and not studied.

8/11.3, 4.7, 2.42, 81, 80, 56, 7.4, 13, 4.0, .4, 52, 49, 4.4/ 1, 3, 3, 1, 1, 1700, 1, 1, -, -/ 5/

Saurauia archboldiana A.C. Smith figs 140,162,214.

1 x 1

LL approximately 22.3, W 4.7. L/W 2.8. AA estimated as 90°, apex type unknown. Base acute, BA 45°. MW 65%, leaf shape obovate. NoSec approximately 30, IS 6.4, Stness .53, SecA 57°. TertA 35°. Dent. 4, teeth shortly setose, to .5mm. Leaf indument of conical hairs above and below.

Epidermis. Gran. dense medium up to 2um, rarely contig. U.S.thick. mural and surficial, coarsest on the anticlinal walls, U.Ant.thick. normal. Cell walls straight, cells polygonal, 25um. U.H.type conical, 200-300um high, 220-450um broad. U.H.dens. 50/sq.cm. L.S.thick. surficial, cells indistinct. L.H.type conical, size and density as for upper surface. Stomates 250/sq. mm.

9/22, 7.5, 2.9, 45, 65, -, 30, 6.4, .53, 57, 35, 4/ 2, 2, 6, 1, 2, 50, 3, 3, 50, 250/ 5/

Saurauia avellana Elmer figs 132,163,164,215.

2 x 6

LL 14.4-18.1, W 6.2-8.8. L/W 2.1-2.34. AA 107°-123°, apex mucronate, %A 3.8-4.8. Base obtuse or very weakly cordate, BA 115°-134°. MW 49-53%, leaf shape oblong. NoSec 15-16, IS 4.6-4.7, Stness .52-.57, SecA 55°-62°. TertA 45°-46°. Dent. 3.1-3.6, teeth callose up to .5mm. Leaf indument, simple hairs scattered on veins and intercostals, above and below, glabrescent above.

Epidermis. Gran. very fine, not contig. U.S.thick. mural, U.Ant.thick. normal. Cell walls curved, somewhat sinuous, cells very irregular, 21um. U.H.type simple, with 4-6 epidermal cells

surrounding thickened hair base, and with weak cuticular ridges, U.H.dens. 1800/sq. cm. L.S.thick. none except weak ridges perpendicular to pore and lying above subsidiary cells, cell walls not distinguishable. L.H.type tufted, L.H.dens. 19000/sq. cm. Stomates 360/sq. mm.

10/16.3, 7.5, 2.22, 115, 125, 51, 4.3, 15, 4.7, .55, 59, 46, 3.4/ 3, 3, 3, 1, 1, 1800, 2, 2, 19000, 360/ 4/

Saurauia bakeri Merr. figs 132,216.

1 x 3

LL 13.6-15.7, W 5.1-5.7. L/W 2.62-2.75. AA 59°-68°, apex acuminate, %A 5.5-9.3. Base acute, BA 64°-70°. MW 55-65%, leaf shape elliptical. NoSec 12-13, IS 3.5-3.6, Stness .33-.4, SecA 48°. TertA 68°. Dent. 6.5-7, teeth long setose, to 3mm. Leaf indument long setose on intercostals and venation both above and below, somewhat shorter and more dense below and crowded on midrib.

Epidermis. Gran. fine, not contig. U.S.thick. mural, U.Ant.thick. normal. Cell walls indistinct, curved, cells irregular, 28um. U.H.type multiseriate, setose, to 1mm, U.H.dens. 260/sq. cm. L.S.thick. none except weak ridges perp. to pore, cells indistinct, L.H.type multiseriate, setose, L.H.dens. 300/sq. cm. Stomates 180/sq. mm.

11/14.4, 5.3, 2.7, 64, 67, 58, 6.4, 13, 3.6, .35, 48, 68, 6.7/ 3, 3, 3, 1, 5, 260, 2, 5, 300, 180/ 4/

Saurauia bifida Warb. figs 140,165,217.

6 x 20

LL 5.8-12.6, W 2.1-4.8. L/W 2.45-2.86. AA 50°-63°, apex acuminate, %A 6.1-13.3. Base acute to right, BA 72°-90°. MW 51-59%, leaf shape elliptic. NoSec 8-11, IS 2.6-3.6, Stness .27-.45, SecA 27°-54°. TertA 57°-79°. Dent. 4.2-5, teeth setose in two series, larger to 2 mm smaller to 1 mm. Leaf indument strigose on primary and secondary veins above and below, short setae or conical trichomes on intercostals. Epidermis. Gran. fine to medium, frequently contig. U.S.thick. mural, U.Ant.thick. normal. Cell walls indistinct to distinct, mostly straight, cells polygonal, 18um. U.H.type setose or conical, U.H.dens. 200/sq. cm. L.S.thick. surficial cells distinct to indistinct, L.H.type setose or scattered simple hairs on veins, L.H.dens. 200/sq. cm. Stomates 180-330/sq. mm. 12/11.6, 4.3, 2.67, 53, 78, 54, 10, 9.5, 3.27, .39, 39, 66, 4.6/ 2, 3, 5, 1, 6, 200, 3, 1, 200, 180/ 5, 6/

Saurauia bracteosa DC. figs 122,166,167,218.

3 x 13

LL 21.9-28.9, W 10.8-12.9. L/W 2.1-2.27. AA 61°-91°, apex acuminate, %A 4.3-7.6. Base rotund to subcordate, BA 159°-180°. MW 46-55%, leaf shape elliptic. NoSec 13-14, IS 3.8-4.8, Stness .44-.52, SecA 53°-61°. TertA 58°-60°. Dent. 2.2-2.3, teeth setose to 1.5 mm. Leaf indument strigose on intercostals above, simple pilose on veins and intercostals below. Epidermis. Gran. fine, rarely contig. U.S.thick. mural, U.Ant.thick. peg-like. Cell walls distinct, straight, cells polygonal, 16um. U.H.type strigose, U.H.dens. 20/sq. cm.

L.S.thick. only as ridges perp. to stomatal pore or radial to hair bases. L.H.type simple, L.H.dens. 9000/sq. cm. Stomates 420/sq. mm.

13/25.5, 11.9, 2.19, 75, 168, 50, 6.3, 13, 4.2, .49, 56, 59, 2.2/ 3, 3, 3, 4, 3, 20, 2, 1, 10, 160/ 2/

Saurauia brassii Diels figs 140,168,219.

2 x 4

LL 22.6-37.6, W 7.5-12.4. L/W 3.04. AA 82°-109°, apex acuminate or mucronate, %A 1.4. Base cuneate, BA 24°-39°. MW 65-71%, leaf shape obovate. NoSec 14-15, IS 14-15, Stness .51-.58, SecA 39°-42°. TertA 77°-78°. Dent. 1.3-1.4, teeth tiny callose. Leaf indument, glabrous except for scattered setae on the veins above, rare simple hairs on intercostals below.

Epidermis. Gran. fine, rarely contig. U.S.thick. bordered surficial, U.Ant.thick. normal. Cell walls conspicuous, straight to slightly sinuous, 31um. U.H.type not seen on cuticle. L.S. thick. surficial, fine, cells indistinct. L.H.type simple, with about six radial epidermal cells around the simple hair bases, L.H.dens. 10/sq. cm. Stomates 160/sq. mm.

14/30, 10, 3.04, 96, 32, 68, 1.4, 15, 3.9, .55, 41, 78, 1.4/ 2, 3, 5, 1, 6, 0, 2, 1, 10, 160/ 6/

Saurauia calyptrata Lauterb. figs 28,141.

1 x 4

LL 3.2-6.2, W 2.3-3.2. L/W 1.4-1.94. AA 100°-129°, apex mucronate, %A 1.6-2.0. Base cuneate, BA 64°-84°. MW 62-74%, leaf shape obovate. NoSec 6-7, IS 3.9-4.8, Stness .5-.71, SecA 24.5°-29.5°. TertA 62°-68°. Dent. 6.3, teeth inconspicuous,

callose. Leaf indument, deciduous simple hairs above and below with rare strigose hairs on the veins beneath.

Epidermis. Gran. fine, rarely contig. U.S.thick. mural, U.Ant.thick. normal. Cell walls distinct, straight or slightly sinuous, cells irreg. polygonal, 17um. U.H.type simple, U.H.dens. 190/sq. cm mostly on veins. L.S.thick. none, cells indistinct. L.H.type, simple, L.H.dens. 200/sq. cm. Stomates 540/sq. mm, very thin cuticle above.

15/4.8, 2.7, 1.75, 119, 74, 67, 1.8, 6, 4.4, .62, 26, 65, 6.3/ 3, 3, 3, 1, 1, 190, 2, 200, 540/ 5/

Saurauia capitulata A.C. Smith figs 141,169,220.

8 x 22

LL 8.5-18.5, W 4.7-12.4. L/W 1.25-2.15. AA 124°-171°, apex very shortly mucronate, or not at all, %A 0-1.8. Base rounded to subcordate, BA 112°-217°. MW 52-64%, leaf shape broadly oblong to obovate or suborbicular. NoSec 8-15, IS 3.4-5.6, Stness .43-.56, SecA 52°-62°. TertA 43°-57°. Dent. 2.1-2.9, teeth rigid, thorny, up to 1.5 mm. Leaf indument, sparse scabrid trichomes on veins above, simple, twisted, very dense reddish hairs, mostly on veins beneath forming a close appressed woolly tomentum, scattered thorny scabrid trichomes, on the veins beneath.

Epidermis. Gran. fine, rarely contig. U.S.thick. mural, U.Ant. thick. peg-like. Cell walls distinct, straight, cells polygonal, 4-6 sided, 19um. U.H.type, scabrid, with radiating cuticular ridges over multicellular bases, U.H.dens. 30/sq. cm, mostly on veins. L.S.thick. mural with some beading on anticlinal walls. L.H.type, simple, twisted, up to .33 mm, L.H.dens.

16000/sq. cm. Stomates 990/sq. mm.

16/12.5, 7.7, 1.68, 149, 146, 58, .33, 11.9, 4.5, .51, 55, 49, 2.54/ 1, 3, 3, 4, 4, 30, 3, 1, 16000, 990/ 5, 6/

Saurauia aff.capitulata fig.141.

5 x 13

LL 8.8-16.3, W 4.6-7.3. L/W 1.94-2.65. AA 69°-126°, apex very shortly to not at all mucronate, sometimes terminating in a hard spine, %A 0-2.7. Base subcordate to strongly cordate, BA 201°-268°. MW 32-45%, leaf shape oavt to oblong. NoSec 9-15, IS 2.7-3.1, Stness .41-.48, SecA 58°-70°. TertA 30°-48°. Dent. 1.3-2.6, teeth rigid, thorny, up to 4 mm. Leaf indument, scattered spines on veins above, globular scabrid hairs on veins beneath, thorns on primary vein.

Epidermis. Gran. fine, rarely contig. U.S.thick, ridged, U.Ant.thick. normal. Cell walls distinct, straight, cells polygonal, 16um. U.H.type conical with radial cuticular ridges, U.H.dens. 12/sq. cm. L.S.thick. mural, very strongly thickened except over guard cells. L.H.type, globular, .15 mm diam., L.H.dens. 50/sq. cm. Stomates 1270/sq. mm.

17/13.6, 6, 2.27, 93, 225, 37.5, .6, 12.2, 3, .44, 64, 39, 1.85/ 1, 3, 9, 1, 4, 12, 3, 5, 50, 1270/ 6/

Saurauia cauliflora DC. figs 122,170,221.

5 x 14

LL 18-24, W 4.8-7.7. L/W 2.51-3.83. AA 29°-88°, apex acuminate, %A 2.3-9.9. Base acute to rounded obtuse, BA 61°-107°. MW 45-52%, leaf shape elliptic. NoSec 13-18, IS 3.0-4.4, Stness .32-.44, SecA 46°-58°. TertA 61°-70°. Dent. 2.1-2.5, teeth setose

to 1.5 mm. Leaf indument, glabrous above except for a few scattered setae on the midrib, densely appressed setose on veins and intercostals beneath.

Epidermis. Gran. medium, rarely contig. U.S.thick. striate, with ridges subparallel above individual cells, randomly oriented overall, U.Ant.thick. normal. Cell walls indistinct, marked by discontinuous ridges on cuticle, mostly curved. U.H.type simple with radial cuticular ridges, U.H.dens. 20/sq. cm. L.S.thick. none, cells indistinct in thin cuticle. L.H.type simple, L.H.dens. 30000/sq. cm. Stomates 250/sq. mm. 18/20.3, 6.3, 3.28, 55, 84, 49, 5.2, 15.6, 3.74, .39, 53, 66, 2.3/ 1, 3, 8, 1, 1, 5, 1, 1, 30000, 250/ 2/

Saurauia clementis Merr. figs 132,222.

4 x 16

LL 9.7-20, W 5-7.7. L/W 1.95-2.63. AA 53°-88°, apex acuminate, %A 4.9-8.4. Base acute to rounded obtuse, BA 82°-121°. MW 50-57%, leaf shape elliptic to obovate. NoSec 8-13, IS 3.3-3.9, Stness .44-.48, SecA 44°-57°. TertA 41°-78°. Dent. 2.3-4.1, teeth setose, up to 1 mm. Leaf indument, densely setose on primary vein above, less so on higher order veins and intercostals, hairs up to 2 mm, beneath, hairs as above, less dense on intercost. hairs up to 2 mm.

Epidermis. Gran. fine, rarely contig. U.S.thick, mural, U.S.Ant.thick. bladed. Cell walls distinct, straight, cells irreg. polygonal, 31um. U.H.type conical to setose, .3-.5 mm long, .1-.2 mm broad at the base, U.H.dens. 20/sq. cm. L.S.thick. none, cells indistinct, L.H.type multiseriate, conical to setose, up to 1 mm long, .2 mm broad, L.H.dens. 30/sq. cm. Stomates

210/sq. mm.

19/15, 6.3, 2.34, 67, 100, 53, 7.3, 10.5, 3.6, .47, 48, 66, 3.18/ 3, 3, 3, 2, 2, 20, 1, 6, 30, 210/ 4/

Saurauia conferta Warb. figs 142,152,171,223.

26 x 90

LL 13.6-29.5, W 5.4-10.7. L/W 1.94-4.06. AA 37°-99°, apex acuminate, %A 4.3-13.1. Base cuneate to decurrent, BA 30°-71°. MW 47-71%, leaf shape obovate. NoSec 10-20, IS 3.9-7.2, Stness .35-.61, SecA 24°-51°. TertA 45°-89°. Dent. 1.8-3.5, teeth callose, up to 1 mm. Leaf indument, glabrous or with sparse simple hairs both above and beneath on veins and intercostals. Hairs more dense beneath.

Epidermis. Gran. medium, frequently contig. U.S.thick. mural, U.S.Ant.thick. normal. Cell walls distinct, slightly curved, cells mostly six or seven sided, 23um. U.H.type simple with radial cuticular ridges, U.H.dens. 300-500/sq. cm. L.S.thick. none, cells indistinct in thin cuticle. L.H.type, simple, L.H.dens. 1100/sq. cm. Stomates 470/sq. mm.

20/20.9, 7.3, 2.91, 59, 44, 60, 6.3, 14.3, 5.19, .53, 35, 73, 2.36/ 2, 2, 3, 1, 1, 400, 1, 1, 1100, 470/ 6/

Saurauia congestiflora A.C. Smith figs 143,224.

4 x 7

LL 14.7-24.7, W 5.1-10. L/W 2.24-2.49. AA 60°-97°, apex acuminate, %A 3-5.1. Base obtuse to subcordate, BA 76°-122°. MW 45-63%, leaf shape elliptic, oblong to obovate. NoSec 13-14, IS 4.0-4.5, Stness .44-.53, SecA 40°-48°. TertA 55°-66°. Dent. 4.0-5.7, teeth callose, .5 mm. Leaf indument, deciduous above,

seen only as hair bases, dense below, mostly on veins, rusty tomentose.

Epidermis. Gran. fine, rarely contig. U.S.thick. dense, mural, U.S.Ant. thick. bladed and peg-like. Cell walls distinct, straight, cells polygonal, 21um. U.H.type multiseriate, strigose, with 1 or 2 rings of epidermal cells concentric with the hair base, U.H.dens. 80/sq. cm. L.S.thick. none except weak cuticular ridges perp. to stomatal pore. L.H.type simple, multicelled, L.H.dens. 1200/sq. cm. Stomates 850/sq. mm.

21/17.8, 7.5, 2.4, 77, 110, 53, 3.2, 13, 4.2, .48, 44, 61, 4.5/ 3, 3, 3, 2, 3, 80, 1, 1, 1200, 850/ 6/

Saurauia aff.congestiflora fig 143.

4 x 14

LL 7.5-13, W 4.0-6.6. L/W 1.84-2.71. AA 91°-127°, apex rounded, shortly acuminate, %A 2-2.5. Base broadly obtuse to subcordate, BA 91°-175°. MW 50-60%, leaf shape elliptic. NoSec 9-10, IS 3.2-4.4, Stness .42-.50, SecA 39°-55°. TertA 59°-76°. Dent. 3.0-6.4, teeth tiny, callose. Leaf indument, densely tufted tomentose, soon glabresecent above in older leaves except on midrib, persistent, dense appressed hairs beneath, reddish.

Epidermis. Gran. coarse, mostly contig. U.S.thick. dense, bordered facial and somewhat lensing, U.S.Ant.thick., thick bladed and peg-like. Cell walls distinct, curved, somewhat sinuous, cells irreg., 25um. U.H.type, multiseriate, bases only, seen, U.H.dens. 30/sq. cm. L.S.thick. none except weak cuticular ridges perp. to stomatal pore. L.H.type, fine setose, L.H.dens. 900/sq. cm mostly on veins. Stomates 680/sq. cm.

22/10.4, 5, 2.13, 109, 139, 56, 2.1, 10, 3.8, .46, 46, 64, 4.6/ 1, 3, 5, 4, 5, 30, 1, 6, 900, 680/ 6/

Saurauia dielsiana A.C. Smith figs 143,225.

3 x 7

LL 11-13.5, W 4.9-5.8. L/W 2.19-2.76. AA 65°-88°, apex acuminate, %A 2.7-9.5. Base acute, BA 56°-83°. MW 54-60%, leaf shape elliptic to obovate. NoSec 9-14, IS 3.3-4.8, Stness .24-.38, SecA 37°-57°. TertA 52°-71°. Dent. 4.5-6, teeth setose, .5-1 mm. Leaf indument scattered strigose hairs over veins and intercostals above, short erect setae beneath.

Epidermis. Gran. medium, rarely contig. U.S.thick. mural and surficial, U.S.Ant.thick. normal. Cell walls straight or curved, indistinct. U.H.type, conical, .2 x .08 mm. U.H.dens. 500/sq. cm. L.S.thick. none, cuticle thin, cells indistinct. Hairs not seen. Stomates 250/sq. mm.

23/12.7, 5.2, 2.43, 77, 71, 58, 5, 11, 3.8, .3, 45, 60, 5.5/ 2, 3, 6, 1, 2, 500, 1, 7, -, 250/ 6/

Saurauia distasosa Korth figs 123,226.

2 x 8

LL 51.1-17.6, W 5.8-7.2. L/W 2.34-2.63. AA 52°-73°, apex acuminate, %A 4.4-10.2. Base obtuse to acute, some cuneate, BA 74°-110°. MW 59%, leaf shape obovate. NoSec 11, IS 3.2, Stness .42-.46, SecA 46°-47°. TertA 47°-55°. Dent. 2.8-3.1, teeth setose. Leaf indument, scattered strigose hairs on veins and intercostals, on both surfaces. Epidermis not seen.

24/16.4, 6.5, 2.49, 63, 92, 59, 73, 11, 3.2, .44, 47, 51, 3.0/- / 2/

Saurauia dufaurii (F.v.M) Diels figs 143,227.

3 x 10

LL 8.1-14.5, W 3-3.2. L/W 2.53-4.66. AA 29°-87°, apex acuminate, %A 2.6-12.7. Base acute to decurrent, BA 37°-44°. MW 61-63%, leaf shape obovate to oblanceolate. NoSec 9-11, IS 2.9-3.2, Stness .17-.33, SecA 22°-37°. TertA 80°-86°. Dent. 4.4-4.8, teeth .5-1 mm with acute apices and rounded sinuses. Leaf indument scattered scabrid scales on midrib above, scabrid on primary and secondary veins below, globular tufted hairs on intercostals of undersurface.

Epidermis. Upper cuticle very thin and difficult to prepare. Gran. fine, not contig. U.S.thick. mural, U.S.Ant.thick. normal. Cell walls indistinct. U.H.type globular, U.H.dens. 10/sq. cm. L.S.thick. none, cuticle very thin, cells indistinct. L.H.type globular, L.H.dens. 65/sq. cm mostly on veins. Stomates 140/sq. mm.

25/10.7, 3.1, 3.47, 64, 40, 62, 6.3, 10, 3.1, .27, 29, 82, 4.6/ 3, 3, 3, 1, 4, 10, 1, 5, 65, 140/ 6/

Saurauia eburnea A.C. Smith figs 144,228.

2 x 6

LL 15.8-23, W 4-5.6. L/W 3.95-4.1. AA 61°-70°, apex short acuminate, %A 1.7-3.8. Base decurrent into winged petiole, BA 34°-43°. MW 60-67%, leaf shape narrow obovate. NoSec 18-21, IS 4.1-4.2, Stness .28-.34, SecA 41°-43°. TertA 70°-78°. Dent. 2.7-3.1, teeth acute, prominent irregularly spaced, acute. Leaf indument glabrescent, simple hairs both above and beneath.

Epidermis. Gran. fine, frequently contig. U.S.thick. irregular ridges, U.S.Ant.thick. normal. Cell walls indistinct, U.H.type

simple, U.H.dens. 800/sq. cm. L.S.thick. none, cuticle thin epidermal cells indistinct. L.H.type simple, L.H.dens. 600/sq. cm. Stomates 750/sq. mm.

26/19.4, 4.8, 4.02, 66, 39, 64, 2.8, 20, 4.2, 31, 42, 74, 2.9/ 3, 3, 9, 1, 1, 800, 1, 1, 600, 750/ 6/

Saurauia aff.egregia Diels figs 144,229.

2 x 4

LL 15.5-20.7, W 5.4-9.2. L/W 2.25-2.86. AA 41°-51°, apex acuminate, %A 4-8.1. Base acute to obtuse, somewhat rounded, BA 83-137. MW 49-56%, leaf shape elliptic. NoSec 13-14, IS 3.6-4.9, Stness .32-.45, SecA 50°-53°. TertA 44°-47°. Dent. 3.9-4.0, teeth, small obtuse, ciliate, up to 1 mm. Leaf indument, strigose on veins above, dense erect setae on veins and intercostals beneath.

Epidermis. Gran. medium, frequently contig., dense. U.S.thick. mural, U.S.Ant.thick. normal. Cell walls distinct, straight or slightly curved, cells irreg. polygonal, 36um. U.H.type strigose .5 x .2 mm, U.H.dens. 8/sq. cm. L.S.thick. none, cuticle thin, cells indistinct. L.H.type short setose, L.H.dens. 1500/sq. cm. Stomates 380/sq. mm.

27/18.1, 7.3, 2.56, 46, 110, 53, 6.1, 14, 4.3, .39, 52, 46, 4/ 2, 3, 3, 1, 3, 8, 1, 6, 1500, 380/ 6/

Saurauia elegans (Choisy) F.Vill. figs 133,230.

6 x 16

LL 9.9-19.5, W 3.3-6.2. L/W 2.69-4.31. AA 51°-77°, apex acute to shortly acuminate, %A 0-7.7. Base rounded obtuse or broadly

acute, BA 75°-157°. MW 47-51%, leaf shape oblong to elliptic. NoSec 20-30, IS 4.1-6, Stness .58-.72, SecA 49°-62°. TertA 47°-80°. Dent. 5.9-7.6, teeth callose setulose, in two series. Leaf indument scabrid above, strigose below.

Epidermis. Gran. medium, rarely contig. U.S.thick. surficial irregularly scattered over the strongly bullate epidermis, U.S.Ant.thick. peg-like. Cell walls distinct, straight, cells polygonal, 13um. U.H.type not seen. L.S.thick. none, cuticle thin, cells indistinct. L.H.type simple, L.H.dens. 50000/sq. cm. A few scattered conical hairs occur on veins, .3 x .2 mm to .08 x .04 mm. Stomates 1300/sq. mm.

28/14.6, 4.3, 3.45, 62, 128, 48, 3.5, 25.8, 4.9, .66, 57, 71, 7/ 2, 3, 4, 4, 6, 0, 2, 1, 50000, 1300/ 4/

Saurauia emarginata White & Francis figs 144,231.

5 x 10

LL 4.9-12.2, W 1.5-2.7. L/W 2.94-4.8. AA 41°-64°, apex acute or acuminate, %A 6.1-10.7. Base acute, cuneate, BA 52°-71°. MW 52-65%, leaf shape elliptic to obovate. NoSec 8-10, IS 2.4-3.3, Stness .3-.52, SecA 19°-30°. TertA 50°-74°. Dent. 1.2-2.3, teeth prominent, acute, spinose. Leaf indument glabrous above or with scattered scales on midrib, scabrid scales on midrib beneath.

Epidermis. Gran. coarse, dense, frequently contig. U.S.thick. mural with few weak ridges, U.S.Ant.thick. normal. Cell walls distinct, somewhat sinuous, cells irreg. polygonal, 11um. U.H.type simple, weak radial cuticular ridges around hair base, U.H.dens. 800/sq. cm. L.S.thick. none, cuticle very thin and difficult to prepare.

29/8.1, 2.3, 3.62, 50, 61, 58, 8.3, 8.8, 2.8, .4, 24, 58, 1.54/ 2, 3, 1, 3, 1, 1, 800, -/ 6/

Saurauia excurrens A.C. Smith figs 144,232,233.

1 x 4

LL 13.7-17.4, W 1.94-2.34. L/W 7.06-7.44. AA 23°-33°, apex acuminate, %A 14.4-15.2. Base acute, BA 32°-44°. MW 45-51%, leaf shape lorate. NoSec approx. 60, IS 5, Stness .75, SecA 78°-80°. TertA 32°. Dent. 3.5-4.3, teeth, tiny callose. Leaf indument glabrous above, few strigose hairs on veins beneath. Epidermis. Gran. coarse, frequently contig., up to 5um in diam. U.S.thick. mural, U.S.Ant.thick. normal. Cell walls distinct, straight, cells polygonal, 42um. U.H.type not seen. L.S.thick. none, cells indistinct. L.H.type strigose, L.H.dens. 60/sq. cm. Stomates 580/sq. mm.

30/15.4, 2.1, 7.31, 26, 39, 48, 14.7, 60, 5, .75, 79, 32, 4/ 1, 2, 3, 1, 6, 0, 1, 3, 60, 580/ 5/

Saurauia ferox Korth. figs 123,234.

1 x 3

LL 9.1-10.7, W 2.4-2.9. L/W 3.62-3.79. AA 33°-39°, apex acuminate, %A 12.5-15. Base cuneate, BA 42°. MW 58-63%, leaf shape obovate. NoSec 6, IS 2.6, Stness .48, SecA 16°. TertA 90°, all tert. veins parallel. Dent. 8, teeth, setose, in two series, longer up to 1 mm shorter teeth up to .5 mm. Leaf indument strigose on veins on both surfaces.
Epidermis. Gran. fine, not contig. U.S.thick. mural, U.S.Ant. thick. normal. Cell walls indistinct, straight, cells polygonal, 28um. U.H.type very rare strigose, U.H.dens. less than 1/sq. cm. L.S.thick. none, cuticle thin, cells indistinct, with very weak cuticular ridges perp. to stomatal pore. L.H.type strigose, L.H.dens. 5/sq. cm. Stomates 110/sq. mm.

31/9.7, 2.6, 3.7, 36, 42, 61, 13.8, 6, 2.6, .48, 16, 90, 8/ 1, 3, 3, 1, 3, 0, 1, 1, 5, 110/ 3/

Saurauia fimbriata A.C. Smith figs 144,235.

1 x 3

LL 17.1-19.1, W 6.03-7.06. L/W 2.6-2.84. AA 40°-49°, apex acuminate, %A 9.7-10.7. Base acute, BA 73°. MW 52-53%, leaf shape elliptic. NoSec 12, IS 4.6, Stness .46, SecA 38°-43°. TertA 68°-75°. Dent. 3.8-4.5, teeth acute, up to 1 mm. Leaf indument, sparse deciduous strigose hairs above, strigose beneath. Epidermis. Gran. medium, frequently contig. up to 2um in diam. U.S.thick. mural, U.S.Ant.thick. beaded or peg-like. Cell walls distinct, straight, cells polygonal, 18um. U.H.type simple, with weak radial cuticular ridges at the base, U.H.dens. 300/sq. cm. L.S.thick. none, cells distinct. L.H.type simple, mostly on veins, L.H.dens. 6000/sq. cm. Stomates 850/sq. mm.

32/18, 6.6, 2.72, 45, 73, 53, 10.2, 12, 4.6, .46, 40, 71, 4.1/ 2, 3, 3, 3, 1, 300, 3, 1, 6000, 850/ 5/

Saurauia fragrans Hoogl. figs 124,236.

2 x 6

LL 26.1-30, W 8.2-11. L/W 2.76-3.2. AA 44°-52°, apex acuminate, %A 6.7-7.1. Base acute or cuneate, BA 47°-77°. MW 52-61%, leaf shape elliptic to obovate. NoSec 15-18, IS 3.5-3.9, Stness .37-.54, SecA 45°-51°. TertA 65°-69°. Dent. 2.6-3.7, teeth, prominent with rounded sinuses, up to 2 mm, callose. Leaf indument strigose on midrib, glabrescent elsewhere. Cuticle not seen.

33/28.1, 9.6, 2.98, 48, 62, 57, 6.9, 17, 3.7, .46, 48, 67, 3.2/ 2/

Saurauia gjellerupii Laut. figs 144,237.

3 x 6

LL 13.6-22.9, W 5-9.4. L/W 2.46-2.72. AA 58°-70°, apex acuminate, %A 6.8-7.8. Base cuneate to attenuate, BA 47°-81°. MW 53-59%, leaf shape elliptic to obovate. NoSec 8-11, IS 2.6-3.7, Stness .28-.47, SecA 29°-37°. TertA 69°-75°. Dent. 2.6-4.3, teeth inconspicuous, callose. Leaf indument, glabrous above, strigose on veins beneath. Cuticle not seen.

34/19.8, 7.8, 2.56, 63, 69, 57, 5.5, 10, 3.1, .36, 34, 72, 3.4/ 5/

Saurauia aff.glabra Merr. figs 124,172,173.

1 x 1

LL 23.5, W 11.1. L/W 2.12. AA 56°, apex acuminate, %A 9.3. Base acute, BA 81°. MW 49%, leaf shape elliptical. NoSec 14, IS 6.2, Stness .25, SecA 49°. TertA 50°. Dent. 1, teeth callose. Leaf indument deciduous simple hairs and scattered scabrid hairs on veins, both surfaces.

Epidermis. Gran. coarse, mostly contig. U.S.thick. bordered surficial, U.S.Ant.thick. normal. Cell walls very distinct, mostly straight, cells generally 5 or 6 sided, 18um. U.H.type simple with rare scabrid hairs, mostly on veins, U.H.dens. 300/ sq. cm. L.S.thick. bordered surficial, cells distinct except where cuticle thins over guard cells, L.H.type not seen. Stomates 500/sq. mm.

35/23.5, 11.1, 2.12, 56, 81, 49, 9.3, 14, 6.2, .25, 49, 50, 1/ 2, 1, 5, 1, 1, 300, 3, 7, 0, 500/ 3/

Saurauia glabrifolia Merr. figs 134,238.

1 x 2

LL 10.1-12, W 3.06-3.65. L/W 3.3. AA 47°-68°, apex acuminate, %A 4.3-10. Base cuneate to acute, BA 46°-50°. MW 60-63%, leaf shape obovate. NoSec 10-11, IS 2.2-2.9, Stness .35, SecA 43°. TertA 60°. Dent 3.3-3.6, teeth small callose, up to 1 mm. Leaf indument, scattered strigose hairs on veins of both surfaces. Epidermis. Gran. very fine, not contig. U.S.thick. surficial, U.S.Ant.thick. normal. Cell walls indistinct, somewhat sinuous, cells irregular, 31um. U.H.type not seen. L.S.thick. none, cells indistinct in thin cuticle. L.H.type not seen. Stomates 110/sq. mm.

36/11, 3.4, 3.3, 57, 48, 62, 7.4, 10, 2.7, .35, 43, 60, 3.4/
1, 3, 3, 1, 6, 0, 1, 7, 0, 110/ 4/

Saurauia gracilipes Merr. figs 134,239.

1 x 3

LL 12.8-14.9, W 4.35-5.6. L/W 2.52-3.13. AA 47°-54°, apex acuminate, %A 7-12.8. Base acute, BA 67°-73°. MW 53-59%, leaf shape elliptic to obovate. NoSec 7-8, IS 2.9-3.2, Stness .23-.51, SecA 24°-31°. TertA 75°. Dent. 4-4.4, teeth rigid acute, erect, up to 2 mm. Leaf indument strigose hairs on both surface, mostly on veins.

Epidermis. Gran. fine, not contig. U.S.thick. surficial, U.S.Ant.thick. normal. Cell walls indistinct, straight cells polygonal, 42um. U.H.type strigose, .9 x .25 to .4 x .2 mm., U.H.dens. 1200/sq. cm. L.S.thick. none, cells indistinct in thin cuticle. L.H.type conical, .8 x .3 mm to .6 x .3 mm, L.H.dens. 10/sq. cm. Stomates 220/sq. mm.

37/13.8, 5, 2.78, 52, 70, 57, 9.8, 8, 3, .5, 27, 75, 4.2/
3, 2, 1, 3, 1200, 1, 3, 10, 220/ 4/

Saurauia grandis Ridl. figs 124,174,241.

1 x 2

LL 11.5-21.8, W 8-17.4. L/W 1.25-1.43. AA 95°-105°, apex obtuse, %A o. Base obtuse to subcordate, BA 126°-187°. MW 50-51%, leaf shape broad elliptic to suborbicular. NoSec 9-11, IS 4.3-4.5, Stness .39-.48, SecA 61°-63°. TertA 34°. Dent. .6, teeth, inconspicuous callose. Leaf indument glabrescent above, densely tomentose beneath.

Epidermis. Gran. fine, not contig. U.S.thick. mural, U.S.Ant. thick. bladed and peg-like. Cell walls straight distinct, cells polygonal, 18um. U.H.type, multiseriate, only bases remaining, U.H.dens. 1000/sq. cm. L.S.thick. none except for weak cuticular ridges perp. to stomatal pore. L.H.type, simple, dense, L.H.dens. 13000/sq. cm. Stomates 500/sq. mm.

38/16.7, 12.7, 1.34, 100, 157, 51, 0, 10, 4.4, .45, 62, 34, .6/ 3, 3, 3, 4, 3, 1000, 1, 1, 13000, 500/ 2/

Saurauia griffithii Dyer figs 120,240.

1 x 3

LL 18.1-33, W 10.1-13.6. L/W 1.8-2.47. AA 80°-105°, apex mucronate, %A 1.8-4.0. Base obtuse, very shortly decurrent, BA 98°-105°. MW 40-41%, leaf shape ovate. NoSec 30-36, IS 8.9, Stness .74, SecA 67°. TertA 50°. Dent. 1.5, teeth up to 2 mm. Leaf indument tomentose on both surfaces, sparsely so and glabrescent above, densely, beneath.

Epidermis. Gran. fine, not contig. U.S.thick. surficial granules and irregular cuticular ridges, U.S.Ant.thick. normal. Cell walls indistinct, masked by cuticular ridges. U.H.type, simple, U.H.dens. 1000/sq. cm. L.S.thick. none, epidermal cells

indistinct on thin cuticle. L.H.type simple, L.H.dens. 43000/sq. cm. Stomates masked by dense indumentum.

39/25.5, 12.3, 2.05, 93, 102, 40, 2.9, 33, 8.9, .74, 67, 50, 1.5/ 3, 3, 2, 1, 1, 1000, 1, 1, 43000, -/ 1/

Saurauia holotricha Diels figs 145,242.

3 x 10

LL 10.5-13.3, W 3-3.4. L/W 3.56-4.02. AA 20°-26°, apex acuminate, %A 13-16.8. Base acute, ultimately rounded, BA 65°-85°. MW 53-54%, leaf shape elliptic to obovate. NoSec 9-11, IS 3.1-3.4, Stness .28-.35, SecA 29°-35°. TertA 51°-72°. Dent. 6.0-6.4, teeth setose, up to 2 mm. Leaf indument setose on both surfaces, on veins and intercostals.

Epidermis. Gran. very fine, not contig. U.S.thick., surficial, cuticle very thin, U.S.Ant.thick., normal. Cell walls indistinct. U.H.type, setose, .6 x .08 mm to .35 x .04 mm, U.H.dens. 1200/sq. cm. L.S.thick., none, cuticle very thin, cells not distinguishable. L.H.type, setose, 1 x .06 mm to .4 x .04 mm, L.H.dens. 1200/sq. cm. Stomates 480/sq. cm.

40/12.1, 3.2, 3.82, 24, 73, 54, 14.5, 10, 3.2, .30, 32, 60, 6.2/ 3, 3, 1, 1, 5, 1200, 1, 6, 1200, 480/ 5, 6/

Saurauia horrida Hook.f. figs 125,243.

1 x 4

LL 10.9-16, W 4.1-5.4. L/W 2.6-3.0. AA 35°-50°, apex acuminate, %A 12.2-14.8. Base acute to right, BA 81°-86°. MW 47-50%, leaf shape elliptic. NoSec 14-17, IS 4.4-4.5, Stness .54, SecA 51°. TertA 62°. Dent. 7-8, teeth setose, up to 1.5 mm. Leaf indument strigose on veins and intercostals of both surfaces.

Epidermis. Gran. fine, not contig. U.S.thick., mural, U.S.Ant.thick., normal. Cell walls distinct, straight to slightly sinuous, cells irregular, 31um. U.H.type, setose, .4 x .07 mm, U.H.Dens. unknown. L.S.thick., none, cells indistinct in very thin cuticle. L.H.type, setose, up to 1 x .2 mm, L.H.dens., unknown. Stomates 380/sq. cm.

41/13, 4.8, 2.72, 43, 85, 49, 13.9, 15, 4.5, .54, 51, 62, 7.5/ 3, 3, 1, 2, 1, 5, -, 1, 6, -, 380/ 3/

Saurauia javanica (Nees) Hoogl. figs 125,244.

5 x 14

LL 11.8-19.9, W 3.2-7.2. L/W 2.76-4.02. AA 30°-42°, apex acuminate, %A 8.3-13.7. Base ultimately rounded, acute or obtuse above, BA 82°-128°. MW 47-57%, leaf shape elliptic to oblong. NoSec 9-11, IS 2.5-4.4, Stness .25-.36, SecA 24°-35°. TertA 87°-96°. Dent. 4.1-6.2, teeth small, callose. Leaf indument, scattered strigose hairs on both surfaces, glabrescent above.

Epidermis. Gran. fine, not contig. U.S.thick, mural, U.S.Ant.thick, normal. Cell walls distinct, straight to slightly curved, cells irreg. 31um. U.H.type strigose, U.H.dens. 10/sq. cm. L.S.thick., none, cells indistinct in thin cuticle. L.H.type conical, .4 x .1 mm, L.H.dens. 10/sq. cm. Stomates 240/sq. cm.

42/17.3, 5, 3.51, 35, 96, 51, 10.2, 9.8, 3.24, .29, 27, 92, 4.9/ 3, 3, 1, 2, 10, 2, 3, 10, 240/ 2/

Saurauia kajewskii A.C. Smith figs 153,245.

1 x 3

LL 12.4-17.1, W 5.4-7.7. L/W 2.23-2.45. AA 47°-51°, apex acuminate, %A 10.6-14.1. Base right, BA 89°-99°. MW 46-50%, leaf shape elliptic. NoSec 12, IS 4.2, Stness .37, SecA 47°. TertA 64°. Dent. 5.2, teeth setose, up to 1 mm. Leaf indument setose on both surfaces.

Epidermis. Gran. medium, rarely contig. U.S.thick., mural. U.S.Ant.thick., normal. Cell walls distinct, curved, cells irreg. 23um. U.H.type setose, U.H.dens. 1000/sq. cm. L.S.thick. none, cells indistinct in thin cuticle. L.H.type, setose, .65 x .1 mm to .18 x .03 mm. L.H.dens. 1000/sq. cm. Stomates 320/sq. cm.

43/14.3, 6.2, 2.33, 48, 93, 32, 12.5, 12, 4.2, .37, 47, 64, 5.2/ 2, 3, 3, 1, 5, 1000, 1, 6, 1000, 320/ 6/

Saurauia lanceolata DC. figs 125,246.

2 x 6

LL 14.4-18.5, W 4.7-5.9. L/W 3.06-3.12. AA 55°-73°, apex acuminate, %A 3.6-7.8. Base rounded obtuse, BA 98°-107°. MW 53-60%, leaf shape elliptic to obovate. NoSec 17-19, IS 3.7, Stness .45, SecA 50°-53°. TertA 69°-70°. Dent. 3.7-3.9, teeth small, callose, .5 mm. Leaf indument, glabrous above, sparsely strigose on veins beneath. Cuticle not seen.

44/16.5, 5.3, 3.09, 64, 103, 57, 5.7, 18, 37, .45, 52, 70, 3.8, 16.3/ 2/

Saurauia latibracteata Choisy figs 134,247.

6 x 10

LL 10.6-18, W 5-7.6. L/W 2.08-2.64. AA 63°-120°, apex acute to acuminate, %A 0-7.2. Base rotund, BA 95°-150°. MW 45-62%, leaf shape elliptic to obovate. NoSec 10-17, IS 3-5.2, Stness .45-.62, SecA 35°-51°. TertA 55°-78°. Dent. 2.1-3.3, teeth prominent, broad with acute sinuses, up to 2 mm high. Leaf indument glabrous above or with scattered strigose hairs on midrib, beneath with very short strigose hairs on veins. Epidermis. Gran. coarse, frequently contig. up to 8um diam. U.S.thick., mural, U.S.Ant.thick., normal. Cell walls indistinct, straight, cells polygonal, 25um. U.H.type, multiseriate, strigose hairs, on veins, U.H.dens. 50/sq. cm. L.S.thick., none, cells indistinct, in moderately thin cuticle. L.H.type simple, peg-like base, L.H.dens. 1500/sq. cm. Stomates 540/sq. mm.

45/14.4, 6.2, 2.32, 80, 120, 53, 4.6, 12.3, 4, .5, 43, 67, 2.7/ 1, 2, 3, 1, 3, 50, 2, 1, 1500, 540/ 4/

Saurauia laxa Merr. figs 134,248.

1 x 2

LL 13.8, W 5. L/W 2.75. AA 53°, apex acuminate, %A 9.8-12.2. Base rotund, BA 59°. MW 60%, leaf shape obovate. NoSec 14, IS 3.8, Stness .45, SecA 44°. TertA 60°. Dent. 2.2-3.2, teeth prominent, up to 1 mm. Leaf indument, scattered strigose hairs on veins of both surfaces.

Epidermis. Gran. coarse, frequently contig. up to 5um diam. U.S.thick., mural, U.S.Ant.thick. normal. Cell walls distinct, straight, cells polygonal, 31um. U.H.type, multiseriate,

strigose hairs, up to .5 mm. U.H.dens. 50/sq. cm. L.S.thick. none, cells barely distinguishable in moderately thin cuticle. L.H.type, simple hairs on veins and intercostals, L.H.dens. 1100/sq. cm. Stomates 570/sq. cm.

46/13.8, 5, 2.75, 53, 59, 60, 10.8, 14, 3.8, .45, 44, 60, 2.6/ 1, 2, 3, 1, 3, 50, 2, 1, 1100, 570/ 4/

Saurauia leprosa Korth. figs 125,175,249.

4 x 9

LL 19.8-34, W 6.3-11.8. L/W 2.37-3.17. AA 49°-76°, apex acuminate, %A 3.9-5.8. Base obtuse, BA 72°-118°. MW 49-53%, leaf shape elliptic. NoSec 13-16, IS 3.2-5.4, Stness .47-.5, SecA 50°-58°. TertA 66°-77°. Dent. 1.5-3.2, teeth setose. Leaf indument, fine scattered setae or glabrescent above, setose on midrib beneath, tomentose on intercostals.

Epidermis. Gran. coarse, frequently contig. U.S.thick., striate, parallel above individual epidermal cells, random overall, U.S.Ant.thick., normal. Cell walls indistinct, curved, cells irreg. 36um. U.H.type simple, with radial citicular striations around hair base, U.H.dens 200/sq. cm. L.S.thick., none, cells indistinct in thin cuticle. L.H.type, globular, with 8-10 cells, L.H.dens. 300/sq. cm. Stomates 220/sq. mm.

47/25.3, 9.3, 2.71, 66, 100, 50, 4.6, 14.8, 4.5, .48, 56, 72, 2.3/ 2, 1, 8, 1, 1, 200, 1, 5, 300, 220/ 2/

Saurauia leytensis Merr. figs 135,250.

1 x 4

LL 12.1-15.3, W 6.2-7. L/W 1.95-2.26. AA 65°-99°, apex acuminate, %A 5.3-9.3. Base acute, BA 65°-82°. MW 54-64%,

leaf shape elliptic to obovate. NoSec 8-9, IS 3.3-3.7, Stness .34, SecA 37°. TertA 78°-80°. Dent. 3-4, teeth callose. Leaf indument strigose on both surfaces.

Epidermis. Gran. fine, not contig. U.S.thick., mural, U.S.Ant. thick., normal. Cell walls distinct, curved, cells polygonal, 36um. U.H.type, simple, with peg-like, thickened base, U.H.dens. 2300/sq. cm. L.S.thick., none, cells indistinct in thin cuticle. L.H.type, setose, 1.1 x .25 mm to .2 x .1, L.H.dens. 100/sq. cm on veins only. Stomates 150/sq. mm.

48/13.9, 6.6, 2.12, 82, 73, 59, 7.4, 9, 3.5, .34, 37, 79, 3.5/ 3, 3, 5, 1, 1, 2300, 1, 6, 100, 150/ 4/

Saurauia luzoniensis Merr. figs 135,251.

2 x 7

LL 8-13.4, W 2.6-3.4. L/W 3.11-3.98. AA 41°-45°, apex acuminate, %A 11.4-15.3. Base acute, BA 64°-81°. MW 47-50%, leaf shape elliptic to oblong. NoSec 12-15, IS 2.8-2.9, Stness .31-.37, SecA 48°-49°. TertA 54°-56°. Dent. 2.4, teeth callose. Leaf indument sparse strigose, mainly on veins on both surfaces.

Epidermis. Gran. medium, frequently contig. up to 2um in diam. U.S.thick., mural, U.S.Ant.thick., normal. Cell walls distinct, straight, cells 25um. U.H.type, simple, U.H.dens. 50/sq. cm. L.S.thick., surficial, coarsely granular, cells indistinct. L.H.type simple, L.H.dens., 2300/sq. cm. Stomates 270/sq. mm.

49/10.7, 3, 3.54, 43, 73, 49, 13.4, 14, 29, .34, 49, 55, 2.4/ 2, 3, 3, 1, 1, 50, 2, 1, 2300, 270/ 4/

Saurauia macrantha A.C. Smith figs 146,252.

2 x 6

LL 15.1-16.8, W 5.6-6.8. L/W 2.52-2.71. AA 94°-139°, apex obtuse to mucronate, %A 0-1.5. Base obtuse, BA 98°-103°. MW 60-62%, leaf shape elliptic to obovate. NoSec 15-18, IS 3.9-4.4, Stness .33-.37, SecA 64°-67°. TertA 58°-65°. Dent. 4-4.4, teeth callose. Leaf indument, scabrid hairs on both surfaces.

Epidermis. Gran. coarse, almost completely contig. U.S.thick., surficial, lensing, U.S.Ant.thick., normal. Cell walls somewhat sinuous, cells irreg. 15um. U.H.type, simple, U.H.dens., 200/sq. cm. L.S.thick., none, cells indistinct. L.H.type, simple hairs on mesophyll, scabrid, globular on veins, L.H.dens., 1000/sq. cm. Stomates 510/sq. mm.

50/16, 6.2, 2.62, 117, 101, 61, .75, 17, 4.2, .35, 66, 62, 4.2/ 1, 1, 7, 2, 2, 200, 3, 3, 1000, 510/ 5/

Saurauia macrotricha Kurz. figs 120,176,177.

2 x 3

LL 18.7-19.7, W 6.4-6.9. L/W 2.71-3.06. AA 45°-54°, apex acuminate, %A 10.7-12. Base acute, BA 60°-111°. MW 50-51%, leaf shape elliptic. NoSec 17-21, IS 4.3-4.8, Stness .48-.55, SecA 40°-53°. TertA 60°-77°. Dent. 2.5-4.3, teeth callose, up to 1 mm. Leaf indument, strigose on veins above, strigose on veins, tomentose on intercostals beneath.

Epidermis. Gran. fine, not contig. U.S.thick., mural, U.S.Ant. thick., spinose. Cell walls distinct, straight to slightly sinuous, cells polygonal, 4 to 6 sided, 21um. U.H.type simple

and conical, .5 x .15 mm, U.H.dens., 1400/sq. cm. and conical hairs .50/sq. cm. L.S.thick., none, cells indistinct, weak cuticular ridges perp. to stomatal pores. L.H.type, simple on veins and intercostals, conical hairs, .4 x .12 mm to .06 x .03 mm mainly on veins, L.H.dens., simple hairs, 2000/sq. cm, conical hairs, 550/sq. cm. Stomates 390/sq. mm.

51/19.2, 6.7, 2.89, 50, 86, 51, 11.4, 19, 46, 52, 47, 69, 3.4/ 3, 3, 5, 1, 1400, 2, 1, 2000, 390/ 1/

Saurauia mahmudii Hoogl. figs 126,253.

1 x 1

LL 23.1, W 10.4. L/W 2.23. AA 94°, apex mucronate, %A 3.9. Base acute, BA 65°. MW 66%, leaf shape obovate. NoSec 12-15, IS 3.8, Stness .46, SecA 44°. TertA 55°. Dent. 2.3, teeth callose. Leaf indument, strigose on veins of both surfaces. Epidermis. Gran., medium frequently contig., up to 2um diam. U.S.thick., mural, U.S.Ant.thick., normal. Cell walls distinct, cells 28um. U.H.type, conical, .1 x .1 mm, U.H.dens. 50/sq. cm. L.S.thick., none, cells indistinct. L.H.type, conical. Stomates 510/sq. mm.

51/23.1, 10.4, 2.23, 94, 65, 66, 3.9, 14, 3.8, .46, 44, 55, 2.3/ 2, 3, 4, 1, 2, 50, 1, 3, 0, 510/ 2/

Saurauia malayana Hoogl. figs 126,178,254.

5 x 11

LL 20-39, W 9.9-15. L/W 2.12-2.61. AA 66°-87°, apex acuminate, %A 3.2-5.6. Base obtuse to rotund, BA 88°-154°. MW 51-59%, leaf shape elliptic. NoSec 15-19, IS 4.3-4.9, Stness .42-.57, SecA 55°-60°. TertA 45°-62°. Dent. 1.7-2.5, teeth callose, up

to 1.5 mm. Leaf indument, strigose on veins above, strigose and tomentose beneath.

Epidermis. Gran. coarse, frequently contig., up to 4um. U.S.thick., mural, U.S.Ant.thick., spinose. Cell walls distinct, straight, cells polygonal, 25um. U.H.type, simple, U.H.dens. 200/sq. cm. L.S.thick., none except for weak cuticular striations perp. to stomatal pores, cell indistinct. L.H.type, simple, L.H.dens. 5000/sq. cm. Stomates 570/sq. mm.

53/28.7, 12.4, 2.37, 76, 135, 54, 4.1, 17, 4.58, .53, 57, 55, 2.2/ 1, 2, 3, 5, 1, 200, 1, 1, 5000, 570/ 2/

Saurauia matthewsii Merr. figs 126,255.

1 x 2

LL 17.2-19.2, W 6.3-7.4. L/W 2.64-2.76. AA 44°-45°, apex acuminate, %A 9.4-10.9. Base acute, BA 67°-80°. MW 54-55%, leaf shape elliptic. NoSec 10-11, IS 4.1-4.2, Stness .39-.4, SecA 32°-35°. TertA 68°-72°. Dent. 6-6.5, teeth setose, up to 1.5 mm. Leaf indument, strigose on veins of both surfaces.

Epidermis. Gran. medium, not contig. U.S.thick., bordered surficial, U.S.Ant.thick., normal. Cell walls distinct, slightly sinuous, cells irreg. 36um. U.H.type simple, U.H.dens. 50/sq. cm. L.S.thick., none, cells indistinct. L.H.type, setose, 1 x .18 mm to .2 x .03 mm, L.H.dens. 700/sq. cm. Stomates 200/sq. mm.

54/18.2, 7.9, 2.7, 45, 74, 55, 10, 11, 4.1, .4, 33, 72, 6.3/ 2, 1, 5, 1, 1, 50, 1, 6, 400, 220/ 3/

Saurauia merrillii Elm. figs 135,256.

1 x 2

LL 16.7, W 5.8. L/W 2.9. AA 36°, apex acuminate, %A 8.4-10.8. Base rounded obtuse, BA 110°. MW 39%, leaf shape ovate to elliptic. NoSec 13, IS 3.3-3.4, Stness .31-.34, SecA 49°-64°. TertA 57°. Dent. 3-5.4, teeth setose, .5 mm. Leaf indument strigose on both surfaces.

Epidermis. Gran. medium, rarely contig. U.S.thick. bordered surficial, U.S.Ant.thick, normal. Cell walls sinuous, cells irreg. 31um. U.H.type setose, 1.4 x .18 mm to .75 x .13 mm. U.H.dens. 400/sq. cm. L.S.thick. none, cells indistinct in thin cuticle. L.H.type setose, hair sizes as on upper surface, L.H.dens. 400/sq. cm. Stomates 220/sq. mm.

55/16.7, 5.8, 2.9, 36, 110, 39, 9.6, 13, 3.3, .33, 54, 57, 4.4/ 2, 3, 5, 1, 1, 400, 1, 6, 400, 220/ 4/

Saurauia napaulensis DC. figs 120,179,257.

10 x 22

LL 22-35, W 6.5-11.1. L/W 2.1-3.56. AA 45°-120°, apex obtuse, mucronate to acuminate, %A 0-10.1. Base acute to obtuse, BA 70°-131°. NoSec 20-43, IS 6.2-9.6, Stness .5-.79, SecA 49°-60°. TertA 53°-93°. Dent. 2.4-3.9, teeth callose, up to 1 mm. Leaf indument, glabrescent above, densely tomentose with scattered strigose hairs beneath.

Epidermis. Gran. medium, rarely contig. U.S.thick. ridged, random except where radial to simple hair bases, U.S.Ant.thick. peg-like. Cell walls curved, indistinct, obscured by cuticular ridges, cells irreg. 23um. U.H.type simple, U.H.dens. 900/sq. cm. L.S.thick. none, cells indistinct in thin cuticle.

L.H.type simple, L.H.dens. 16000/sq. cm. Stomates 570/sq. mm.
56/25.4, 9.1, 2.78, 85, 97, 53, 3.5, 33, 7.5, .61, 51, 72, 2.9/
2, 3, 9, 3, 1, 900, 2, 1, 16000, 570/ 1/

Saurauia novo-guineensis Scheffer figs 147,152.

4 x 5

LL 19.9-36.4, W 7.5-13. L/W 2.65-2.8. AA 50°-58°, apex acuminate, %A 6.4-7.2. Base acute, cuneate, BA 43°-62°. MW 52-59%, leaf shape obovate. NoSec 17-22, IS 4.7-5.7, Stness .43-.69. SecA 38°-44°. TertA 78°-82°. Dent. 3.2-3.7, teeth callose up to 1 mm. Leaf indument sparsely strigose on veins of both surfaces. Cuticle not seen.
57/26.3, 9.8, 2.69, 53, 53, 55, 6.8, 19.3, 5.2, .54, 40, 81, 3.4/ 5, 6/

Saurauia nudiflora DC. figs 127,180-182,258.

11 x 31

LL 14-47, W 7.3-21.4. L/W 1.95-3.09. AA 40°-88°, apex acute to acuminate, %A 0-10.2. Base acute to obtuse, BA 36°-113°. MW 52-64%, leaf shape, elliptic to obovate. NoSec 10-17, IS 3.2-4.4, Stness .32-.52, SecA 39°-62°. TertA 60°-80°. Dent. 1.4-3.1, teeth callose. Leaf indument, glabrescent above, simple and strigose hairs scattered on veins beneath. Epidermis. Gran. medium, frequently contig. U.S.thick., bordered surficial or mural and surficial, U.S.Ant.thick., normal. Cell walls curved, some slightly sinuous, cells irreg. polygonal, 28um. U.H.type, simple, U.H.dens. 1500/sq. cm. L.S.thick., none, cells indistinct or distinct in moderately thin cuticle. L.H.type, simple, L.H.dens. 300/sq. cm.

Stomates 360/sq. mm.

58/23.5, 9.8, 2.43, 61, 76, 57, 6.3, 12.5, 3.65, .42, 49, 65, 2.4/ 2, 2, 5, 1, 1, 1500, 3, 1, 300, 360/ 2/

Saurauia oblancilimba Quis. figs 136,183,259.

1 x 3

LL 8-10.3, W 3.2-3.6. L/W 2.5-3.08. AA 61°-104°, apex mucronate, %A 6.4-10. Base acute, BA 54°-62°. MW 57-67%, leaf shape obovate. NoSec 8-9, IS 2.2-2.5, Stness .25-.32, SecA 30°-34°. TertA 52°. Dent. 4.5, teeth, callose. Leaf indument, scabrid on veins of both surfaces.

Epidermis. Gran. medium, frequently contig. U.S.thick., mural, U.S.Ant.thick. peg-like. Cell walls sinuous, distinct, cells polygonal, 25um. U.H.type simple, U.H.dens. 1500/sq. cm. L.S.thick. mural, medium to coarsely granular, cells distinct. L.H.type, conical, 5-seriate, L.H.dens. 800/sq. cm. Stomates 450/sq. mm.

59/9.5, 3.4, 2.84, 79, 58, 62, 8.2, 9, 2.4, .29, 32, 52, 4.5/ 2, 2, 3, 4, 2, 1500, 3, 2, 800, 450/ 4/

Saurauia occulta A.C. Smith figs 147,184,260.

3 x 11

LL 4.6-12.9, W 2.2-6.9. L/W 2.08-2.52. AA 63°-84°, apex acuminate, %A 5.5-10.3. Base acute to rounded obtuse, BA 75°-104°. MW 52-55%, leaf shape elliptic to obovate. NoSec 6-11, IS 3.4-4.4, Stness .42-.53, SecA 31°-48°. TertA 50°-70°. Dent. 3.8-5.6, teeth callose. Leaf indument strigose hairs on veins of both surfaces, somewhat thorny below.

Epidermis. Gran. fine, not contig. U.S.thick., mural, U.S.Ant.

thick., beaded and peg-like. Cell walls straight to slightly sinuous, cells distinct, 17um. U.H.type, strigose, U.H.dens. 100/sq. cm. L.S.thick., surficial, cells indistinct on moderately thick cuticle. L.H.type, strigose, L.H.dens. 700/ sq. cm mostly on veins. Stomates 830/sq. mm.

60/9, 4.3, 2.33, 77, 85, 54, 7.2, 9.3, 3.7, .48, 40, 57, 4.6/ 3, 3, 4, 3, 100, 2, 4, 700, 830/ 5/

Saurauia panayensis Merr. figs 136,185,261.

4 x 6

LL 20.4-26, W 6-10.7. L/W 2.44-3.95. AA 63°-83°, apex acuminate, %A 4.5-7.4. Base acute, BA 38°-84°. MW 57-62%, leaf shape obovate. NoSec 11-13, IS 3-3.7, Stness .27-.46, SecA 40°-63°. TertA 32°-42°. Dent. 1.7-2.4, teeth prominent, callose, up to 2 mm, rounded sinuses. Leaf indument glabrous or very sparsely scabrid on veins on both surfaces. Epidermis. Gran. medium to coarse, frequently contig. U.S.thick., mural, U.S.Ant.thick., sub-spinose. Cell walls distinct, straight, cells polygonal, 25um. U.H.type, rare simple hairs with thin cuticle around hair base, L.H.dens. 100/sq. cm. L.S.thick., none, cells indistinct. L.H.type, scattered simple hairs on veins, L.H.dens. 1200/sq. cm. Stomates 330/sq. mm.

61/23, 8.4, 2.86, 70, 65, 61, 6.13, 12.3, 3.25, .35, 54, 38, 2.05/ 1, 2, 3, 5, 1, 100, 2, 1, 1200, 330/ 4/

Saurauia papillulosa Merr. figs 136,186,262.

1 x 3

LL 11.2-12.2, W 4.4-4.9. L/W 2.49-2.54. AA 41°-59°, apex

acuminate, %A 10.4-15.5. Base acute, BA 76°-79°. MW 52-54%, leaf shape elliptic. NoSec 8-11, IS 2.8-3.5, Stness .25-.27, SecA 48°-51°. TertA 57°. Dent. 3.4-3.9, teeth callose, inconspicuous. Leaf indument, scabrid above on veins, scabrid beneath on veins and intercostals with a few strigose hairs on midrib.

Epidermis. Gran. fine, not contig. U.S.thick., mural, U.S.Ant.thick., bladed with acute peg-like. Cell walls distinct, straight, cells polygonal, mostly six sided, 28um. U.H.type, strigose, U.H.dens. 100/sq. cm. L.S.thick, none, cells indistinct in thin cuticle. L.H.type, strigose, L.H.dens. 400/sq. cm. Stomates 400/sq. mm.

62/11.7, 4.7, 2.52, 53, 78, 53, 13.2, 10, 3.1, .26, 50, 57, 3.6/ 2, 2, 3, 4, 3, 100, 1, 4, 400, 400/ 4/

Saurauia pendula Bl. figs 128,263.

5 x 13

LL 13.3-23.8, W 4.8-7.9. L/W 2.24-2.84. AA 63°-90°, apex acuminate, %A 2.8-7.3. Base cuneate to decurrent, BA 40°-109°. MW 55-64%, leaf shape elliptic to obovate. NoSec 11-13, IS 3.3-3.7, Stness .23-.41, SecA 41°-57°. TertA 53°-60°. Dent. 1.6-2.5, teeth callose in the sinuses of crenations. Leaf indument glabrous above, scattered strigose hairs on veins beneath.

Epidermis. Gran. coarse, frequently conting. U.S.thick., mural, U.S.Ant.thick., normal. Cell walls slightly curved, cells irreg. 28um. U.H.type, not seen. L.S.thick., mural, medium granules, cells distinct. L.H.type, simple, L.H.dens. 400/sq. cm. Stomates 160/sq. mm.

63/16.5, 6.5, 2.57, 77, 68, 59, 5.2, 11.6, 3.44, .34, 49, 57, 2.14/ 1, 2, 3, 1, 6, 0, 3, 1, 400, 160/ 2/

Saurauia pentapetala (Jack) Hoogl. figs 128,187,188,269,270.

7 x 15

LL 15.2-34.2, W 5.6-15.9. L/W 2-3.44. AA 38°-104°, apex acuminate, %A 1.8-10.7. Base cuneate to decurrent, BA 36°-81°. MW 56-64%, leaf shape elliptic to obovate. NoSec 10-18, IS 2.9-5.2, Stness .41-.55, SecA 34°-56°. TertA 50°-75°. Dent. 2.1-3.8, teeth callose or setose. Leaf indument, strigose above and beneath, glabrescent above.

Epidermis. Gran. coarse, mostly contig. U.S.thick., bordered surficial, U.S.Ant.thick., normal. Cell walls distinct, sinuous, cells irreg. 13um. U.H.type, strigose, U.H.dens. 50/sq. cm. L.S.thick., bordered surficial, granules coarse, frequently contig. L.H.type, strigose. Stomates 360/sq. mm.

64/25, 9.9, 2.76, 73, 62, 60, 5.7, 14.3, 3.89, .47, 48, 64, 2.59/ 1, 1, 5, 1, 3, 50, 3, 7, 0, 160/ 2/

Saurauia planchonii Hook.fil. figs 128,264.

1 x 1

LL 29.3, W 9.4. L/W 3.11. AA 54°, apex acuminate, %A 7. Base cuneate, BA 59°. MW 58%, leaf shape elliptical. NoSec 18, IS 4.5, Stness .54, SecA 57°. TertA 75°. Dent. 2.7, teeth setose, up to .5 mm. Leaf indument glabrescent, simple hairs on veins.

Epidermis. Gran. medium, frequently contig. U.S.thick., mural, U.S.Ant.thick., normal. Cell walls indistinct, curved, cells irreg. 25um. U.H.type simple, U.H.dens. 700/sq. cm. L.S.thick. mural, medium granules, cells distinct. L.H.type, simple on veins, L.H.dens. 500/sq. cm. Stomates 50/sq. mm large and sparse.

65/29.3, 9.4, 3.11, 54, 59, 58, 7, 18, 4.5, .54, 57, 75, 2.7/

2, 3, 5, 1, 1, 700, 3, 1, 500, 50/ 3/

Saurauia pleurotricha Diels figs 148,265.

2 x 6

LL 14.9-23.7, W 8.4-9.8. L/W 1.77-2.55. AA 60°-127°, apex acuminate, %A 2.8-8.4. Base cuneate, ultimately rounded, BA 78°-86°. MW 60-65%, leaf shape obovate. NoSec 15-16, IS 4.5-6, Stness .37-.5, SecA 40°-55°. TertA 77°-81°. Dent. 3.3-4, teeth setose, up to 5 mm long. Leaf indument, densely setose on both surfaces.

Epidermis. Gran. coarse, frequently contig. U.S.thick. mural, U.S.Ant.thick. normal. Cell walls distinct, straight to slightly curved walls, cells irreg. 25um. U.H.type setose, 2 to 4 mm x .15 mm, mostly on veins, simple hairs on intercostals. Simple hair bases with radial cuticular striations. Setae with distinct bases, with rosette of thin walled, radially elongate epidermal cells, surrounded by about five rows of concentrically arranged cells with coarse granular thickening. U.H.dens., simple hairs, 400/sq. cm., setae, 30/sq. cm. L.S.thick. none, cells indistinct. L.H.type setose, as on upper surface. Stomates 280/sq. mm.

66/19.3, 9.1, 2.16, 94, 82, 63, 5.6, 16, 5.3, .44, 48, 79, 3.7/ 1, 2, 3, 1, 5, 30, 1, 5, 30, 280/ 6/

Saurauia plurilocularis White & Francis figs 148,272.

7 x 12

LL 18-43, W 3.3-10.7. L/W 3-5.42. AA 30°-39°, apex acuminate, %A 1.7-5.7. Base decurrent into winged petiole, BA 28°-35°.

MW 61-66%, leaf shape obovate to elliptic. NoSec 20-31, IS 3.8-6, Stness .31-.4, SecA 46°-72°. TertA 68°-102°. Dent. 2-2.7, teeth conspicuous with acute apices and rounded sinuses up to 1.5 mm. Leaf indument, glabrescent, simple hairs on young leaves.

Epidermis. Gran. coarse, frequently contig. U.S.thick., ridges irregular and obscuring epidermal cells, U.S.Ant.thick., normal. Cell walls indistinct, obscured, cells irregular. U.H.type, not seen. L.S.thick., none, cells indistinct. L.H.type, simple, L.H.dens. 1000/sq. cm. Stomates 440/sq. mm.

67/31, 8.5, 3.83, 69, 34, 62, 3.63, 25.3, 5.17, .34, 61, 81, 2.36/ 1, 3, 9, 1, 6, 0, 1, 1, 1000, 440/ 6/

Saurauia polyosma (Blanco) Merr. figs 137,266.

1 x 2

LL 15.2-16.4, W 4.2-4.5. L/W 3.62-3.72. AA 43°-47°, apex acuminate, %A 4.8-5. Base acute, ultimately rounded, BA 62°-72°. MW 54-59%, leaf shape elliptic to obovate. NoSec 15-16, IS 2.9, Stness .38, SecA 53°. TertA 72°-75°. Dent. 2.6, teeth callose, .2-.3 mm. Leaf indument scattered strigose on both surfaces.

Epidermis. Gran. coarse, frequently contig. U.S.thick., mural and surficial, U.S.Ant.thick., normal. Cell walls distinct, straight, cells polygonal, 5 to 7 sided, 31um. U.H.type not seen. L.S.thick., mural, cells indistinct but discernible. L.H.type simple mainly on veins, L.H.dens. 800/sq. cm. Stomates 200/sq. mm.

68/15.8, 4.4, 3.67, 45, 67, 56, 4.9, 15, 2.9, .38, 53, 73, 2.6, 13.3/ 1, 2, 6, 1, 6, 0, 2, 1, 800, 200/ 4/

Saurauia polysperma (Blanco) Merr. figs 137,189,267.

1 x 3

LL 12.3-18.9, W 2.95-4.1. L/W 4.16-4.78. AA 49°-74°, apex acute to very shortly mucronate, %A 0. Base acute, BA 38°-55°. MW 50-62%, leaf shape elliptic to obovate. NoSec 11, IS 2.4, Stness .19, SecA 36°. TertA 70°. Dent. 2.4, teeth inconspicuous callose. Leaf indument scattered scabrid hairs above, strigose on veins beneath.

Epidermis. Gran. coarse, frequently contig. up to 9um. U.S. thick., surficial, U.S.Ant.thick., normal. Cell walls indistinct, visible as regions of fine granules, straight, cells polygonal, 31um. U.H.type, globular, on veins, U.H.dens. 200/sq. cm. L.S.thick., mural, coarsely granular, cells distinct. L.H.type strigose, on veins, L.H.dens. 60/sq. cm. Stomates 270/sq. mm. 69/16, 3.5, 4.52, 61, 45, 55, 0, 11, 2.4, .19, 36, 70, 2.4/ 1, 2, 6, 1, 2, 200, 3, 2, 60, 270/ 4/

Saurauia poolei C.T. White figs 148,271.

6 x 14

LL 13.6-20.3, W 6.5-9.7. L/W 1.87-2.9. AA 42°-79°, apex acuminate, %A 7.7-12. Base acute to decurrent, BA 56°-88°. MW 54-60%, leaf shape obovate to elliptic. NoSec 11-15, IS 3.5-4.8, Stness .33-.47, SecA 37°-57°. TertA 51°-63°. Dent. 4-5, teeth setose, up to 1 mm. Leaf indument strigose to setose on both surfaces.

Epidermis. Gran. very fine, not contig. U.S.thick., mural, U.S.Ant.thick., normal. Cell walls indistinct on thin cuticle, cells irreg. 25um. U.H.type, short setose, .5 x .06 mm to .08 x .03 mm, U.H.dens. 450/sq. cm. L.S.thick., none, cells

not visible on very thin cuticle. L.H.type, as on upper surface except 1.5 x .12 mm to .1 x .03 mm, L.H.dens. 450/sq. cm. Stomates 200/sq. mm.

70/16.6, 7.7, 2.21, 64, 67, 57, 9, 12.2, 4.27, .39, 49, 60, 4.4/ 3, 3, 3, 1, 5, 450, 1, 6, 450, 400/ 6/

Saurauia punduana Wall. figs 120,190,273.

2 x 4

LL 25-28, W 9.4-9.8. L/W 2.59-3. AA 45°-56°, apex acuminate, %A 8-9.1. Base rounded obtuse, BA 103°-153°. MW 50-53%, leaf shape elliptic. NoSec 27-32, IS 5.8-6.6, Stness .59-.62, SecA 61°-62°. TertA 49°-50°. Dent. 2.3-2.5, teeth setose, up to 1 mm. Leaf indument glabrous above or with scattered strigose hairs on midrib, dense short tomentose beneath.

Epidermis. Gran. fine to medium, frequently contig. U.S.thick., surficial, with striations above cells, U.S.Ant.thick., normal. Cell walls distinct, sinuous, cells irreg. 21um. Cuticular striations, more or less parallel above individual cells but random overall, radial to hair bases. U.H.type simple, U.H.dens. 400/sq. cm. L.S.thick., none, cells indistinct on thin cuticle. L.H.type, simple, L.H.dens. 27000/sq. cm. Stomates obscured by dense hairs, 500/sq. mm.

71/26.5, 9.6, 2.8, 51, 128, 52, 8.6, 30, 6.2, .61, 62, 50, 2.4/ 2, 2, 8, 1, 1, 400, 1, 2, 27000, 500/ 1/

Saurauia purgans B.L. Burtt. figs 148,153,268.

3 x 8

LL 13.4-17.8, W 5.5-6.3. L/W 2.31-3.03. AA 40°-61°, apex acuminate, %A 8.3-10.2. Base acute to obtuse, BA 58°-89°.

MW 54-58%, leaf shape elliptic to obovate. NoSec 10-12, IS 3.3-3.5, Stness .35-.42, SecA 40°-45°. TertA 58°-67°. Dent. 3.2-7, teeth setose up to 2 mm. Leaf indument short strigose on both surfaces, up to 2 mm long on midrib. Epidermis. Gran. fine, rarely contig. U.S.thick., surficial, U.S.Ant.thick., normal. Cell walls distinct, straight or slightly curved, cells irreg. polygonal, 25um. U.H.type, conical, .4 x .25 mm to .2 x .15 mm. U.H.dens. 12/sq. cm. L.S.thick., none, cells indistinct on thin cuticle. L.H.type conical, .4 x .2 mm, L.H.dens. 12/sq. cm. Stomates 510/sq. mm. 72/15.3, 5.9, 2.58, 52, 76, 57, 9.3, 11, 3.4, .38, 43, 67, 5.4/ 3, 3, 4, 1, 2, 12, 1, 3, 12, 510/ 6/

Saurauia reinwardtiana BC. figs 129,191,274.

1 x 2

LL 14.1-15.5, W 4.6-4.7. L/W 3.02-3.35. AA 34°-35°, apex acuminate, %A 8.9-12.3. Base rounded obtuse, BA 90°-112°. MW 46-47%, leaf shape elliptic. NoSec 11, IS 3.1, Stness .34-.38, SecA 37°. TertA 87°-89°. Dent. 4.4-4.8, teeth setose, .5 mm. Leaf indument strigose on both surfaces, scabrid on veins beneath.

Epidermis. Gran. medium, rarely contig. U.S.thick., bordered surficial, U.S.Ant.thick., normal. Cell walls indistinct, curved, cells irreg. polygonal, 28um. U.H.type, not seen. L.S.thick., none, cells indistinct on thin cuticle. L.H.type conical .4 x .1 mm to .14 x .07 mm, L.H.dens. 40/sq. cm. Stomates 190/sq. mm.

73/14.8, 4.7, 3.19, 35, 101, 47, 10.8, 11, 3.1, .36, 37, 88, 4.6/ 2, 3, 5, 1, 6, 0, 1, 3, 40, 190/ 2/

Saurauia roxburghii Wall. figs 120,192,193,275.

4 x 5

LL 20.6-25.7, W 7.6-8.6. L/W 2.65-3.06. AA 32°-48°, apex acuminate, %A 8.0-11.4. Base acute to obtuse, BA 75°-100°. MW 48-53%, leaf shape elliptic. NoSec 13-15, IS 3.5-3.6, Stness .41-.55, SecA 43°-45°. TertA 60°-80°. Dent. 1.8-3.1, teeth setose, tooth 1 mm with seta 1 mm. Leaf indument scattered strigose on midrib above, glabrescent or with simple scattered hairs on veins beneath.

Epidermis. Gran. fine to medium, frequently contig. especially above cell walls. U.S.thick., mural, with faint cuticular striations over cells, U.S.Ant.thick., peg-like to short spinose. Cell walls distinct slightly sinuous, cells irreg. 4 to 8 sided, 31um. U.H.type, simple, U.H.dens. 400/sq. cm. L.S.thick., mural, finely granular, cells indistinct but discernible. L.H.type, simple, on veins, L.H.dens. 1000/sq. cm. Stomates 210/sq. mm.

74/23, 7.9, 2.91, 41, 84, 51, 9.8, 14, 3.58, .48, 44, 70, 2.38/ 2, 2, 3, 5, 1, 400, 3, 1, 1000, 210/ 1, 2/

Saurauia rubens Ridl. figs 129,276.

2 x 8

LL 24.3-25.7, W 9.2-10.5. L/W 2.41-2.82. AA 58°-73°, apex acuminate, %A 6.1-7.4. Base cuneate, BA 36°-49°. MW 65-68%, leaf shape obovate. NoSec 12-13, IS 3.3, Stness .31-.39, SecA 46°-47°. TertA 63°-65°. Dent. 1.5-2.1, teeth callose. Leaf indument very sparsely strigose on primary and secondary veins.

Epidermis. Gran. medium, rarely contig. U.S.thick., mural,

U.S.Ant.thick., normal. Cell walls distinct, curved, cells irreg. 25um. U.H.type not seen. L.S.thick., none, epidermal cells not discernible on thin cuticle. L.H.type not seen. Stomates 450/sq. mm.

75/25, 9.9, 2.62, 66, 43, 67, 6.8, 13, 3.3, .35, 47, 64, 1.8/ 2, 3, 5, 1, 3, 5, 1, 4, 5, 450/ 2/

Saurauia rubicunda (A.Gray) Seem. figs 154,194,195,277.

20 x 63

LL 11.3-17, W 4-7.5. L/W 2-2.85. AA 67°-155°, apex acuminate to mucronate or rounded obtuse, %A 0-6.7. Base acute to rounded obtuse, BA 72°-138°. MW 46-57%, leaf shape elliptic. NoSec 10-14, IS 3.3-5.1, Stness .2-.54, SecA 31°-53°. TertA 56°-75°. Dent. 3-5.9, teeth callose. Leaf indument, glabrescent or with scattered simple hairs above, scattered strigose hairs beneath. Epidermis. Gran. medium to coarse, frequently contig. U.S.thick., mural, U.S.Ant.thick., normal. Cell walls distinct, straight or slightly curved, cells irreg. polygonal, 28um. U.H.type, simple on veins, U.H.dens. 200/sq. cm. L.S.thick., mural, finely granular, cell walls indistinct to distinct. L.H.type, simple, on veins, L.H.dens. 400/sq. cm. Stomates 290/sq. mm.

76/13.9, 5.9, 2.4, 96, 102, 52, 2.32, 12, 3.8, .4, 44, 66, 4.4/ 1, 2, 3, 1, 1, 200, 3, 1, 400, 290/ 6/

Saurauia rubrisquamata A.C. Smith figs 149,196,278.

2 x 3

LL 11.6-12.3, W 4.5-5.2. L/W 2.23-2.73. AA 45°-75°, apex acuminate, %A 7-10.8. Base acute to obtuse, BA 62°-103°.

MW 54-58%, leaf shape elliptic to obovate. NoSec 8, IS 2.7-3, Stness .23-.35, SecA 35°. TertA 67°-78°. Dent. 4.8-5.3, teeth erect stiff setose, up to 2 mm. Leaf indument, strigose scales on veins of both surfaces.

Epidermis. Gran. medium, not contig. U.S.thick., mural, U.S.Ant.thick., normal. Cell walls distinct, straight, cells polygonal often 4 sided, radial around hair bases, 19um. U.H.type, conical, .9 x .4 mm to .15 x .28 mm, U.H.dens. 50/sq. cm. L.S.thick., none, cells not discernible on thin cuticle. L.H.type, conical, L.H.dens. 250/sq. cm. Stomates 610/sq. mm.

77/12, 44, 2.33, 60, 83, 56, 8.9, 8, 2.9, .29, 35, 73, 5.1/ 2, 3, 3, 1, 2, 50, 1, 3, 250, 610/ 6/

Saurauia samarensis Merr. figs 137,197,279.

1 x 3

LL 10.8-19.2, W 4.2-6.5. L/W 2.55-2.96. AA 31°-59°, apex acuminate, %A 7.5-17.5. Base acute to rounded obtuse, BA 79°-126°. MW 49-55%, leaf shape elliptic. NoSec 9-12, IS 3.4, Stness .33-.44, SecA 41°-43°. TertA 78°-87°. Dent. 4.8, teeth curved setose, up to 1 mm. Leaf indument strigose on veins of upper surface, setose on veins beneath.

Epidermis. Gran. fine, not contig. U.S.thick., mural, U.S.Ant. thick., normal. Cell walls distinct, straight, cells polygonal, 28um. U.H.type, conical, .7 x .2 mm to .06 x .05 mm, U.H.dens. 300/sq. cm. L.S.thick., none, cells not visible on thin cuticle. L.H.type setose, 1 x .13 mm to .1 x .03 mm. L.H.dens. 2000/sq. cm. Stomates 190/sq. mm.

78/14.2, 5.2, 2.71, 44, 106, 53, 12.9, 11, 3.4, .39, 42, 83, 4.8/ 3, 3, 3, 1, 2, 300, 1, 4, 2000, 190/ 4/

Saurauia sp.1 aff.scaberrima Lauterb. figs 149,198,199,280.

2 x 2

LL 26-27.1, W 10.5-11.8. L/W 2.3-2.47. AA 81°-117°, apex obtuse, very shortly mucronate, %A 0. Base cordate, BA 180°-220°. MW 38-43%, leaf shape ovate to oblong. NoSec 17-20, IS 4.1-4.4, Stness .51-.54, SecA 50°-62°. TertA 33°-44°. Dent. 1.6-2.6, teeth short stiff spinose, up to 2 mm. Leaf indument glabrous above except for scattered thorns on midrib, densely rufous tomentose on intercostals beneath, midrib thorny.

Epidermis. Gran. coarse, 1-12um, not contig. U.S.thick., mural, U.S.Ant.thick., bladed, acute subspinose in corners. Cell walls very distinct, straight, cells polygonal, 5 to 7 sided, 14um. U.H.type, conical, base diam. .11-.42 mm, surrounded by 1 to 3 rows of thin walled cells, outside these, 3-11 concentric rows of cells with acute anticlinal thickening elongated towards hair base. U.H.dens. 20/sq. cm. L.S.thick., coarse granules, mural. L.H.type, branched, tufted hairs, L.H.dens. 1200/sq. cm. Stomates 850/sq. mm.

79/26.6, 11.2, 2.39, 99, 200, 41, 0, 19, 4.3, .53, 56, 39, 2.1/ 1, 3, 3, 2, 2, 20, 3, 2, 1200, 850/ 6/

Saurauia sp.2 aff.scaberrima Lauterb. fig.149.

1 x 4

LL 6.5-9.2, W 4-5. L/W 1.62-1.98. AA 134°-141°, apex rotund, minute apiculate, %A 1.4. Base cordate, BA 188°-218°. MW 44-49%, leaf shape elliptic. NoSec 8-11, IS 3.5-4.5, Stness .38-.45, SecA 36°-48°. TertA 72°-76°. Dent. 4.4-5, teeth rigid, spinose, up to 2 mm. Leaf indument, glabrous above except for deciduous spines on midrib, deciduous shaggy, tufted hairs

beneath with strigose spines on primary and secondary veins. Epidermis. Gran. fine, cot contig. U.S.thick., mural, U.S.Ant.thick., peg-like. Cells distinct on thick cuticle, straight walled, or slightly sinuous, polygonal, 23um. U.H.type, conical, on veins, U.H.dens. 60/sq. cm. L.S.thick., none, cells indistinct. L.H.type, conical, L.H.dens. 400/sq. cm. Stomates 1300/sq. mm.

80/8.4, 4.6, 1.84, 138, 205, 47, 1.4, 10, 3.9, .43, 42, 74, 4.7/ 3, 3, 3, 4, 2, 60, 1, 3, 400, 1300/ 6/

Saurauia schmutzii Hoogl. figs 129,200,201,281.

2 x 6

LL 19.7-30.7, W 7.7-12.4. L/W 2.38-2.58. AA 83°-117°, apex acute to obtuse, %A 0-.8. Base rotund obtuse to cordate, BA 100°-221°. MW 43-56%, leaf shape elliptic. NoSec 20-25, IS 5.2-5.7, Stness .48-.61, SecA 52°-57°. TertA 40°-50°. Dent. 2.1-3.1, teeth callose. Leaf indument, glabrescent above, densely tomentose on young leaves, strigose on midrib of mature leaves, densely tomentose on veins and intercostals of all leaves.

Epidermis. Gran. medium, rarely contig. U.S.thick., mural, U.S.Ant.thick., peg-like. Cell walls straight, distinct, cells polygonal, 21um. U.H.type, simple, U.H.dens. 3500/sq. cm. L.S.thick., mural, cells indistinct, weak cuticular ridges, perp. to stomatal pores. L.H.type, tufted, L.H.dens. 9600/ sq. cm. Stomates 600/sq. mm.

81/24.3, 9.9, 2.46, 96, 173, 50, .4, 23, 5.4, .55, 55, 46, 2.8/ 2, 3, 3, 4, 1, 3500, 1, 2, 9600, 600/ 2/

Saurauia schumanniana Diels figs 149,153,282.

15 x 37

LL 9.3-17.2, W 2.8-6.6. L/W 2.11-2.78. AA 52°-85°, apex acuminate, %A 7.8-12.4. Base acute, cuneate, BA 52°-85°. MW 48-61%, leaf shape obovate to elliptic. NoSec 8-11, IS 2.7-3.8, Stness .34-.57, SecA 27°-49°. TertA 67°-94°. Dent. 3.4-7.3, teeth setose. Leaf indument short strigose scales on veins of both surfaces, more dense beneath, often glabrescent above. Cuticle very thin and difficult to prepare.

82/12.8, 4.9, 2.61, 51, 70, 55, 10.7, 9.4, 3.18, .42, 37, 80, 4.8/ -/ 6/

Saurauia sparsiflora Elm. figs 138,202,283.

3 x 8

LL 8.8-10.8, W 2.1-3.8. L/W 2.85-3.56. AA 51°-84°, apex acuminate, %A 2.5-5. Base acute to obtuse, BA 50°-97°. MW 50-57%, leaf shape elliptic. NoSec 9-10, IS 2.1-2.5, Stness .19-.31, SecA 36°-58°. TertA 54°-70°. Dent. 2-3, teeth callose. Leaf indument glabrous above or with scattered strigose hairs on midrib, scattered strigose hairs on veins beneath.

Epidermis. Gran. coarse, frequently contig. up to 5um in diam. U.S.thick., mural, U.S.Ant.thick., normal. Cell walls distinct, straight, cells polygonal, 36um. U.H.type, simple, U.H.dens. 200/sq. cm. L.S.thick., surficial, scattered coarse granules, otherwise cells indistinct. L.H.type not seen. Stomates 210/sq. mm.

83/9, 2.9, 3.15, 63, 72, 54, 4, 9, 2.3, .25, 46, 60, 2.5/ 1, 1, 3, 1, 1, 200, 2, 7, 0, 210/ 4/

Saurauia sterrolepida Diels figs 27,150.

3 x 6

LL 4.8-8.2, W 2.1-2.8. L/W 2.14-3.32. AA 50°-98°, apex acuminate, %A 4.7-9.7. Base acute, BA 45°-65°. MW 54-66%, leaf shape elliptic to obovate. NoSec 9-12, IS 2.3-3.1, Stness .32-.4, SecA 43°-55°. TertA 50°-62°. Dent. 1.2-4, teeth rigid spines, up to 2 mm. Leaf indument, glabrous above except for few spines on midrib, glabrous beneath except for spines on primary and secondary veins.

Epidermis. Gran. coarse, frequently contig. U.S.thick., mural, somewhat lensing, granules elongate, forming short ridges from 1 to 12um long, U.S.Ant.thick., normal. Cell walls curved, distinct, cells irreg. 25um. U.H.type, conical, U.H.dens. 5/sq. cm. L.S.thick., none, cells not discernible on thin cuticle. L.H.type not seen. Stomates 300/sq. mm.

84/6.7, 2.4, 2.79, 68, 55, 60, 7.2, 10, 2.7, .36, 49, 55, 2.5/ 1, 2, 3, 1, 2, 5, 1, 3, 5, 300/ 5/

Saurauia aff.stichophlebia Diels figs 150,284.

5 x 8

LL 26.8-31.1, W 12.9-15.8. L/W 1.97-2.52. AA 69°-116°, apex acuminate, %A 2.1-6.1. Base acute cuneate to obtuse, BA 44°-122°. MW 55-68%, leaf shape obovate. NoSec 24-39, IS 5.1-8, Stness .59-.73, SecA 47°-65°. TertA 42°-70°. Dent. 2.7-3.6, teeth setose, up to 1.5 mm. Leaf indument setose on both surfaces, sometimes glabrescent above.

Epidermis. Gran. medium to coarse, up to 5um, frequently contig. U.S.thick., mural, U.S.Ant.thick., peg-like. Cell walls straight, distinct, cells polygonal, 31um. U.H.type,

simple, U.H.dens. 2000/sq. cm. L.S.thick., none, cuticle very thin and difficult to prepare.

85/31, 13, 2.36, 90, 90, 62, 4.2, 27, 6.5, .6, 53, 56, 3.1/ 2, 2, 3, 4, 1, 2000, 1, 7, -, -/ 6/

Saurauia subspinosa Anth. figs120,285.

1 x 3

LL 20.9-27.3, W 6.8-9.6. L/W 2.74-3.06. AA 46°-65°, apex acuminate, %A 4.3-8.2. Base acute to obtuse, BA 80°-94°. MW 54-56%, leaf shape elliptic. NoSec 16-19, IS 4.7-5.2, Stness .51-.68, SecA 35°-40°. TertA 83°-89°. Dent. 2.1-2.4, teeth spinose up to 3 mm. Leaf indument sparsely strigose on both surfaces. Cuticle not seen.

86/23.2, 8.1, 2.88, 52, 88, 55, 6, 18, 5, 6, 38, 86, 2.4/ -/ 1

Saurauia tafana A.C. Smith figs 150,203,204,286.

2 x 9

LL 8-10.6, W 3.4-5. L/W 2.12-2.81. AA 63°-70°, apex acuminate, %A 5-12.3. Base acute to obtuse, BA 80°-99°. MW 49-58%, leaf shape elliptic. NoSec 8-10, IS 2.5-2.9, Stness .22-.46, SecA 30°-38°. TertA 57°-64°. Dent. 6-7.5, teeth setose, up to 1 mm. Leaf indument setose on both surfaces somewhat shorter and more erect beneath, hairs persistent.

Epidermis. Gran. medium, not contig. U.S.thick., surficial, U.S.Ant.thick., normal. Cell walls distinct, straight to slightly curved, cells polygonal, 23um. U.H.type, long setose, 1.1 x .28 mm to .25 x .1 mm, U.H.dens. 440/sq. cm. L.S.thick., none, cells indistinct on thin cuticle. L.H.type, setose, .6 x .08 mm to .15 x .025 mm, L.H.dens. 500/sq. cm. Stomates 690/sq. mm.

87/9.7, 4, 2.42, 66, 91, 54, 8.9, 9, 2.7, .28, 35, 61, 7.1/
3, 3, 4, 1, 5, 440, 1, 6, 500, 690/ 6/

Saurauia tristyla DC. figs 120,287.

7 x 16

LL 11.2-27, W 5.2-9.5. L/W 2.04-2.95. AA 46°-88°, apex acuminate, %A 3.7-14.3. Base acute to obtuse, or cuneate, BA 48°-120°. MW 51-62%, leaf shape elliptic to obovate. NoSec 11-17, IS 3.1-5.2, Stness .31-.56, SecA 38°-55°. TertA 69°-84°. Dent. 2.1-3.3, teeth callose ciliate, up to 1 mm long. Leaf indument glabrescent on both surfaces or scattered strigose. Epidermis. Gran. fine, not contig. U.S.thick., mural, U.S.Ant. thick., peg-like. Cell walls straight, distinct, cells polygonal 31um. U.H.type, simple, U.H.dens. 500/sq. cm. L.S.thick., mural, cells distinct in relatively thin cuticle. L.H.type, simple, L.H.dens. 900/sq. cm. Stomates 330/sq. mm.
88/18.9, 7.2, 2.64, 59, 81, 55, 9, 14.4, 4.1, .49, 47, 75, 2.7/
3, 3, 3, 4, 1, 500, 3, 1, 900, 330/ 1, 2/

Saurauia vallium White & Francis figs 151,288.

1 x 2

LL 5.5-7.2, W 3-4.2. L/W 1.72-1.81. AA 88°-91°, apex mucronate, %A 4.8-6.8. Base obtuse, somewhat rounded, BA 92°-110°. MW 58-62%, leaf shape obovate. NoSec 8, IS 3.3-3.8, Stness .26-.36, SecA 49°-55°. TertA 86°. Dent. 4.6-5.7, teeth callose, up to 1 mm. Leaf indument glabrous above, scattered strigose scales on veins beneath.
Epidermis. Gran. fine, not contig. U.S.thick., even, U.S.Ant.thick., normal. Cell walls not discernible on evenly

granular thin cuticle. U.H.type not seen. L.S.thick., none, cells indistinct on thin cuticle. L.H.type, strigose on veins, L.H.dens. 200/sq. cm. Stomates 690/sq. mm.

89/6.4, 3.6, 1.77, 90, 101, 60, 5.8, 8, 3.5, .31, 52, 86, 5.3/ 3, 3, 2, 1, 6, 0, 1, 4, 200, 690/ 6/

Saurauia verheyenii Hoogl. figs 131,289.

3 x 8

LL 17-21.3, W 5.9-7.3. L/W 2.56-3.1. AA 54°-68°, apex acuminate, %A 7.3-10.4. Base acute to obtuse, somewhat rounded, BA 83°-107°. MW 54-59%, leaf shape elliptic to obovate. NoSec 13, IS 3.1-3.4, Stness .41-.47, SecA 37°-43°. TertA 66°-70°. Dent. 2.9-3.5, teeth setose up to 1 mm. Leaf indument, sparsely strigose on both surfaces. Cuticle not seen.

90/19.1, 6.7, 2.87, 60, 97, 56, 8.7, 13, 3.2, .44, 4, 68, 3.2/ -/ 2

Saurauia vulcani Korth. figs 131,205,291.

4 x 9

LL 19.1-30.7, W 8.6-14.7. L/W 1.89-2.22. AA 77°-91°, apex acuminate, %A 4.9-5.3. Base subcordate to cordate, BA 174°-200°. MW 41-50%, leaf shape elliptic. NoSec 14-16, IS 4.1-4.7, Stness .51-.53, SecA 54°-66°. TertA 42°-56°. Dent. .84-2.9, teeth setose, up to 2 mm. Leaf indument glabrous or sparsely setose above, setose on veins beneath, short dense tomentum on lower intercostals.

Epidermis. Gran. fine, not contig. U.S.thick., weak ridges, mural, U.S.Ant.thick., beaded and peg-like. Cell walls distinct, straight, cells polygonal, 4 to 8 sided, 17um. U.H.type strigose,

U.H.dens. 200/sq. cm. L.S.thick., none, cells not discernible on thin cuticle. L.H.type, simple, L.H.dens. 19000/sq. cm. Stomates 670/sq. mm.

91/23.5, 11.5, 2.06, 82, 184, 47, 5.18, 14.8, 4.4, .52, 58, 48, 2/ 3, 3, 3, 4, 3, 200, 1, 1, 19000, 670/ 2/

Saurauia xiphophylla Diels figs 151,290.

2 x 6

LL 19.1-28.6, W 5.3-6.6. L/W 4-4.83. AA 25°-32°, apex acuminate, %A 9.1-12.6. Base cuneate, ultimately rounded, BA 43°-80°. MW 50-54%, leaf shape elliptic. NoSec 17-18, IS 2.9-3.3, Stness .49-.54, SecA 33°-36°. TertA 54°-60°. Dent. 4.1-5.2, teeth setose, up to 3 mm. Leaf indument setose on veins on both surfaces. Cuticle very thin and difficult to prepare.

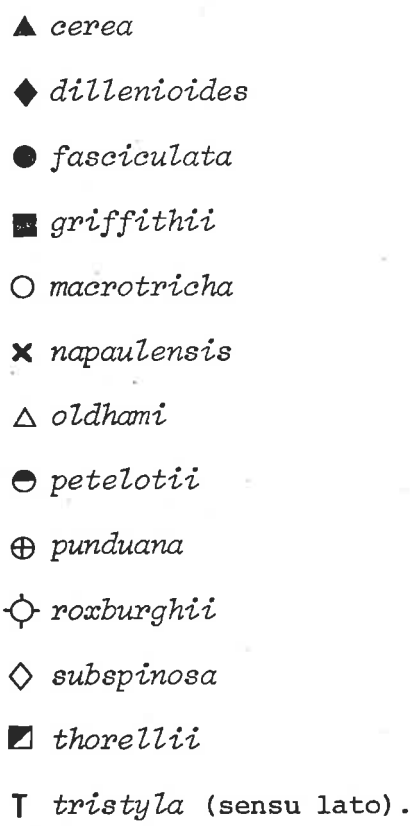
92/25, 5.6, 4.48, 29, 60, 54, 10.8, 18, 3.1, .51, 34, 57, 4.6/ -/ 6/

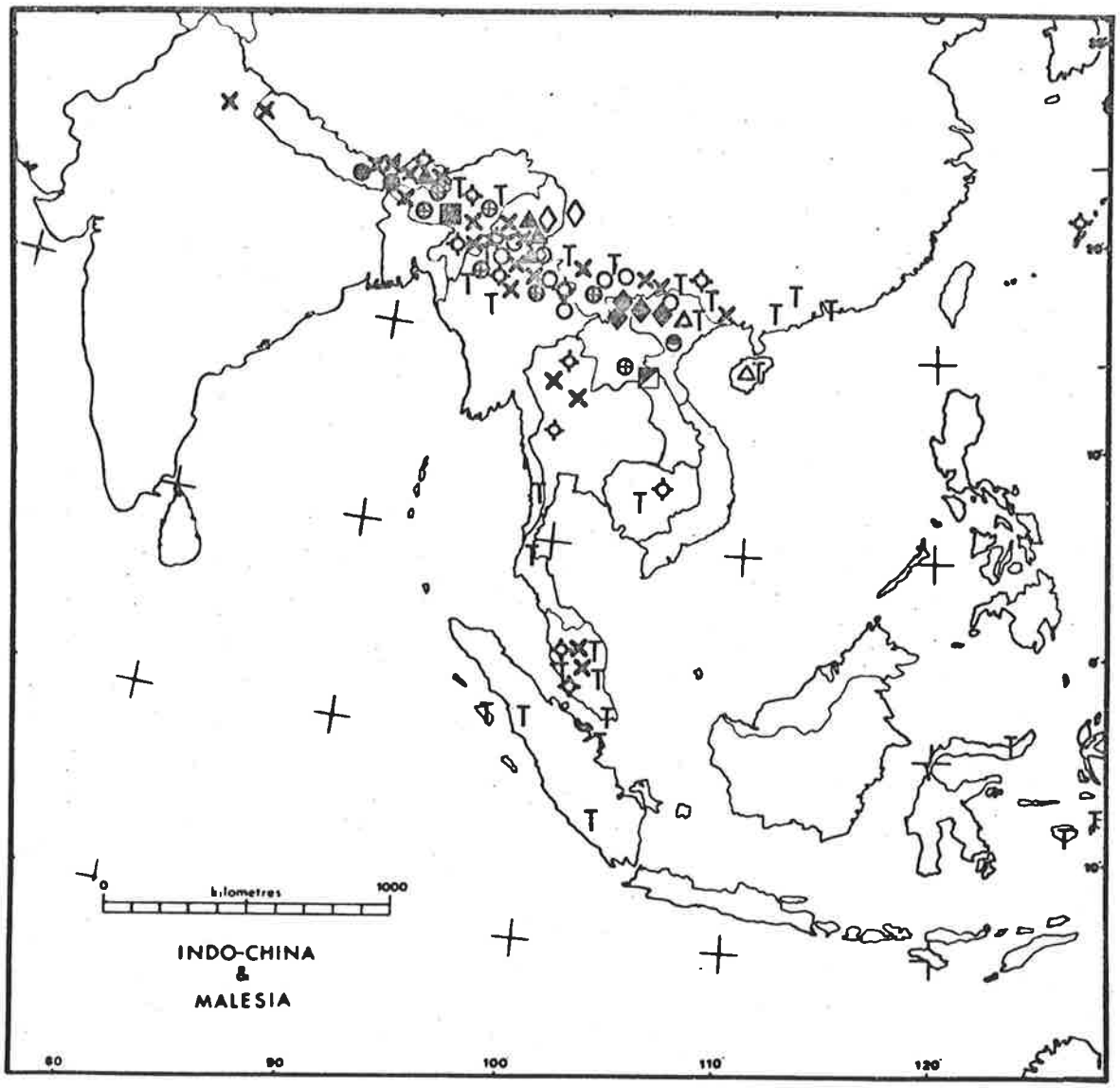
APPENDIX 7.

Distribution maps for the Old World species of *Saurauia*. The maps are arranged in regional groups viz. Region 1; Region 2 and 3; Region 4; Region 5 and 6. All localities referred to in the literature and on herbarium specimens seen in the study, have been included.

Region 1 species.

FIGURE 120.




0
kilometres
1000
INDO-CHINA
&
MALESIA
80
90
100
110
120

Region 2 and 3 species

FIGURE 121.

▲ *actinidifolia*
◆ *acuminata* Merr.
● *acuminata* Jack (*Ternstroemia*)
■ *agamae*
○ *amoena*
X *amplifolia* Merr.
△ *asperifolia*

FIGURE 122.

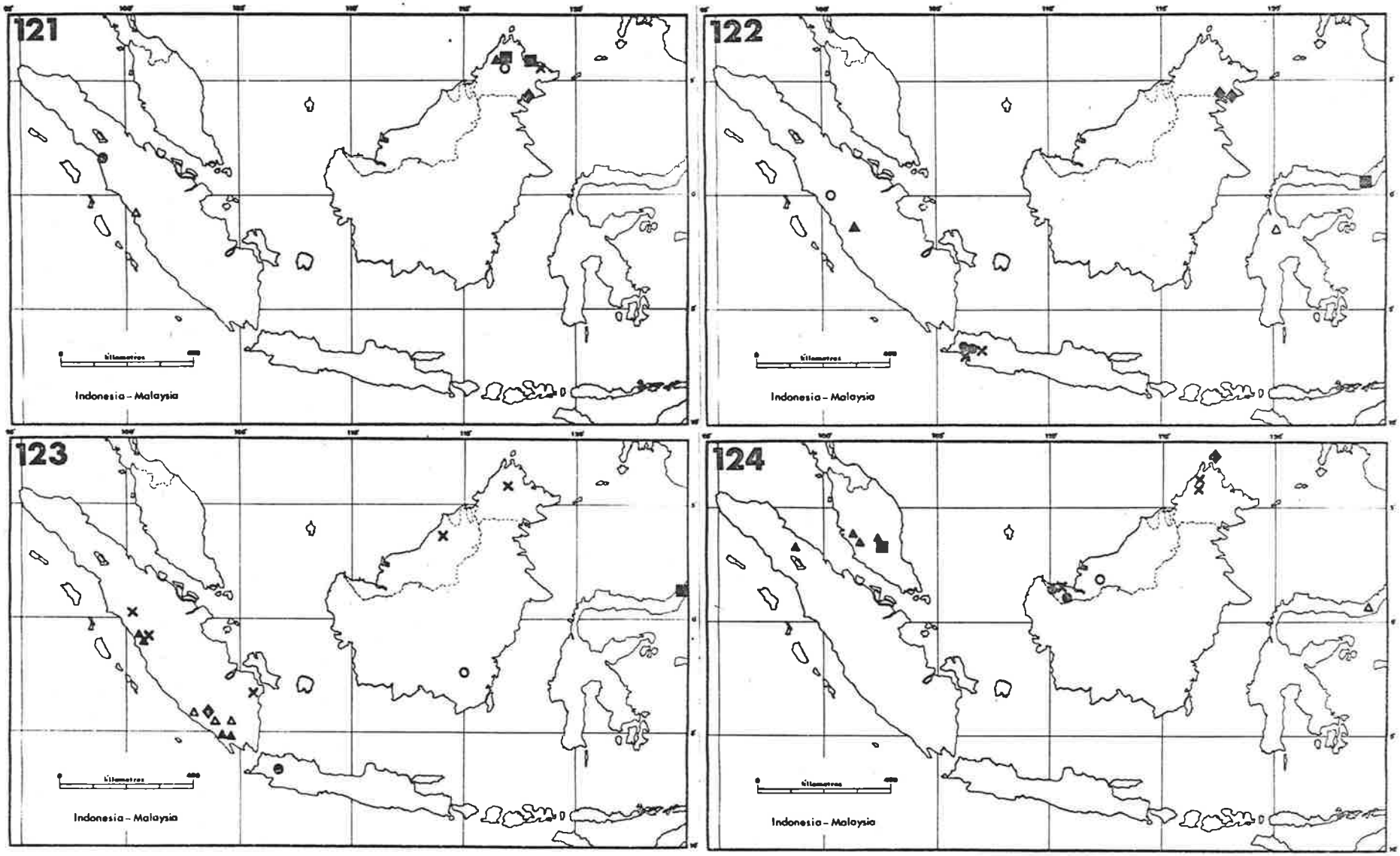
▲ *auricoma*
◆ *borneensis*
● *bracteosa*
■ *callithrix*
○ *castanifolia*
X *cauliflora*
△ *costata*

FIGURE 123.

▲ *cuspidella*
◆ *dempoensis*
● *distasosa*
■ *euryolepis*
○ *excavata*
X *ferox*
△ *forbesii*

FIGURE 124.

◆ *fraseri*
▲ *fragrans*
● *glabra*
■ *grandis*
○ *havilandii*
X *heterosepala*
△ *hirsuta.*


121
Indonesia - Malaysia
122
Indonesia - Malaysia
123
Indonesia - Malaysia
124
Indonesia - Malaysia

Region 2 and 3 species

FIGURE 125.

▲ *horrida*
◆ *hosei*
● *javanica*
■ *kinabaluensis*
○ *lanceolata*
X *lepidicalyx*
△ *leprosa*

FIGURE 126.

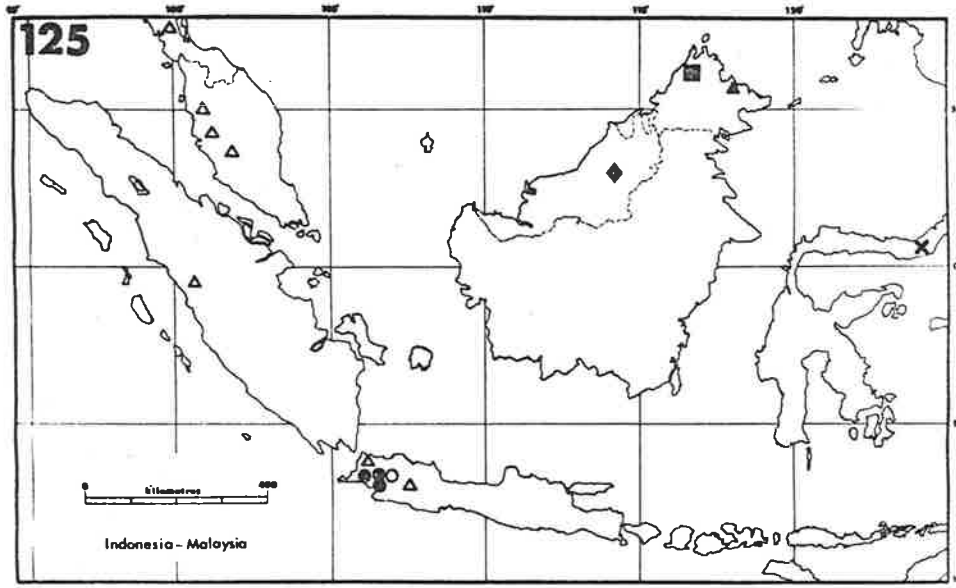
▲ *leucophloea*
◆ *longifolia*
● *longipetiolata*
■ *longistyla*
○ *mahmudii*
X *malayana*
△ *matthewsii*

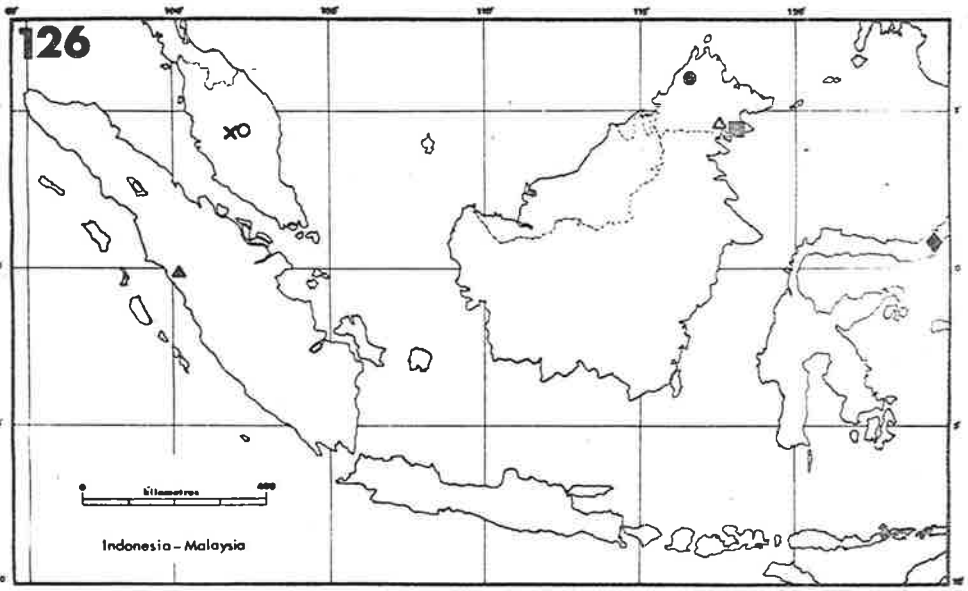
FIGURE 127.

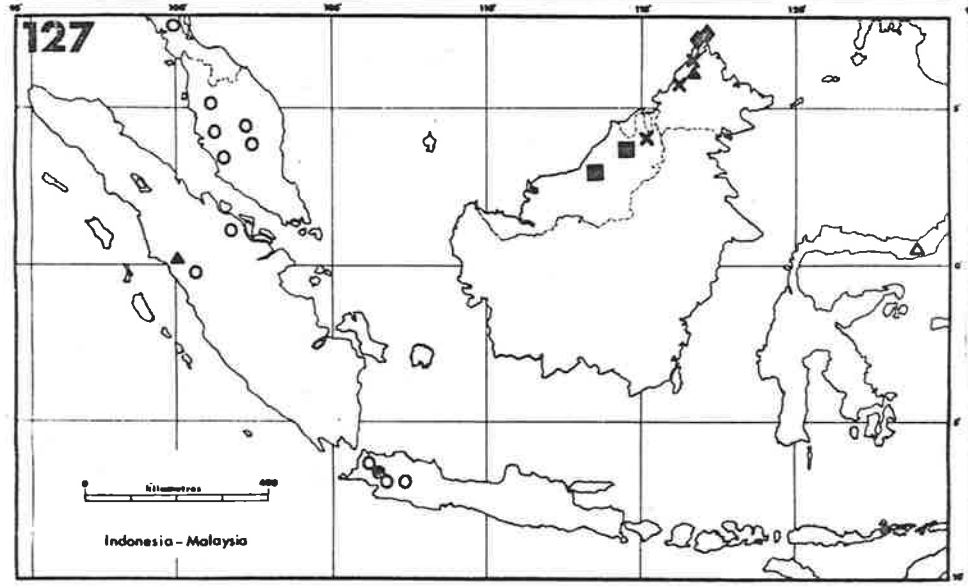
▲ *media*
◆ *melegritoi*
● *micrantha*
■ *myrmecoidea*
○ *nudiflora*
X *oblancifolia* Merr.
△ *oligolepis*

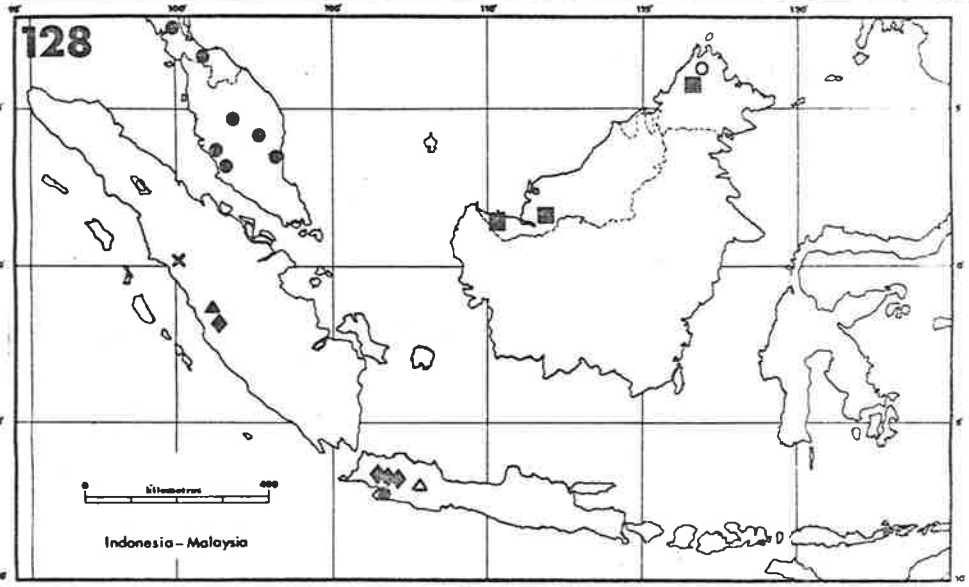
FIGURE 128.

▲ *paniculigera*
◆ *pendula*
● *pentapetala*
■ *planchonii*
○ *platyphylla*
X *punctata*
△ *ramiflora*


125
Indonesia - Malaysia


126
Indonesia - Malaysia


127
Indonesia - Malaysia


128
Indonesia - Malaysia

Region 2 and 3 species.

FIGURE 129.

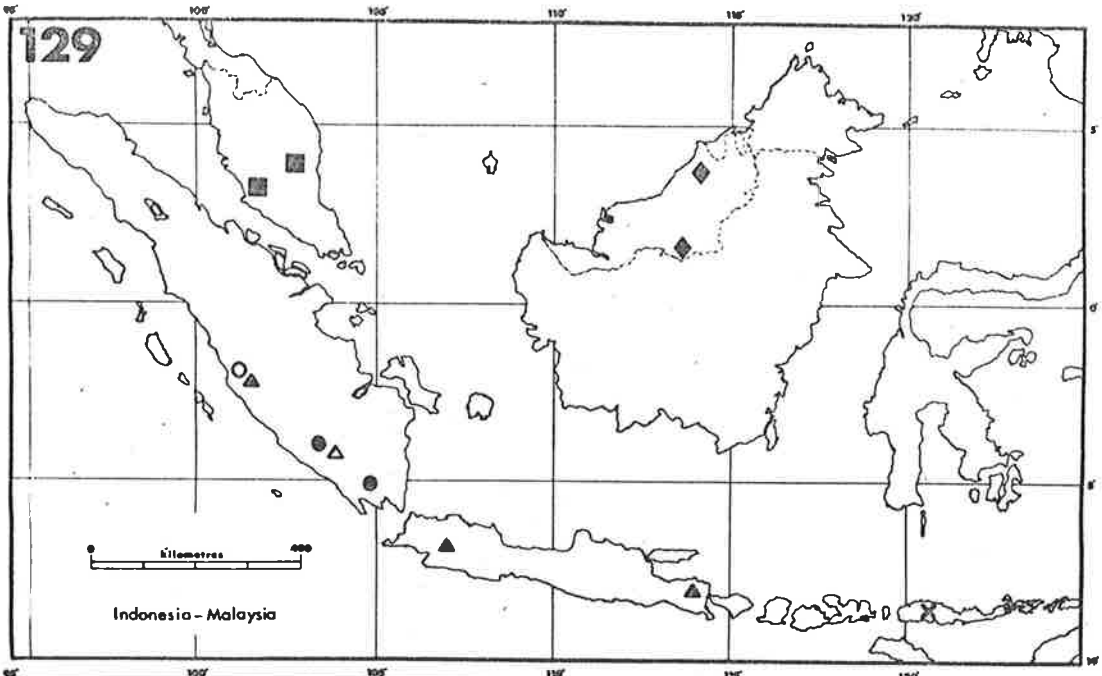
▲ *reinwardtiana*
◆ *ridleyi*
● *roseata*
■ *rubens*
○ *sapotoides*
schmutzii
△ *setigera*

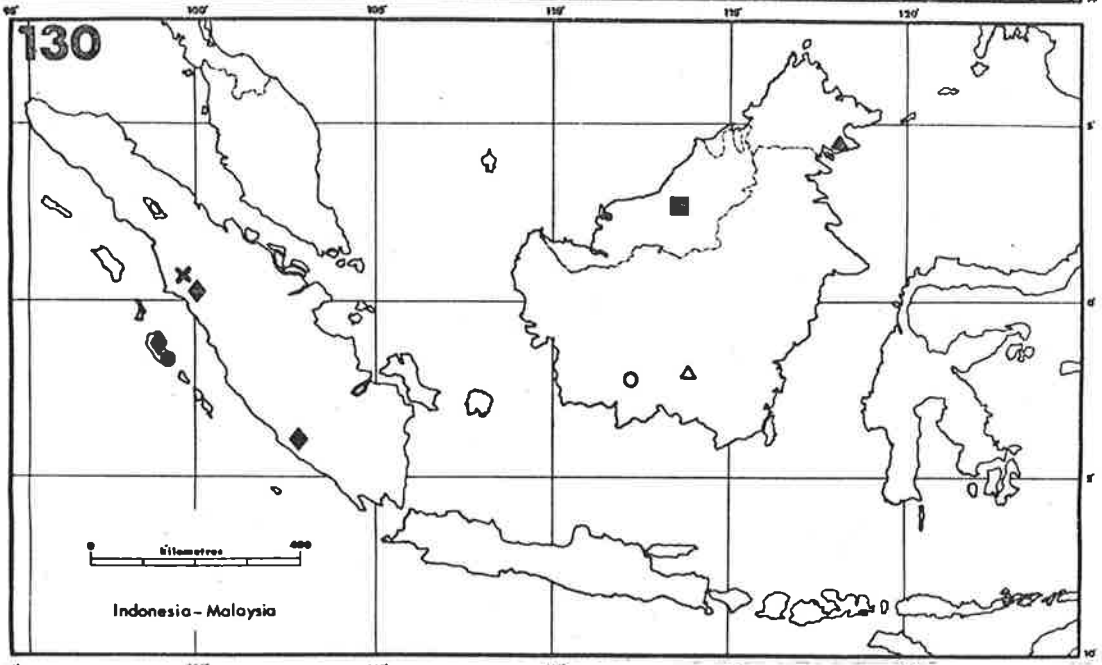
FIGURE 130.

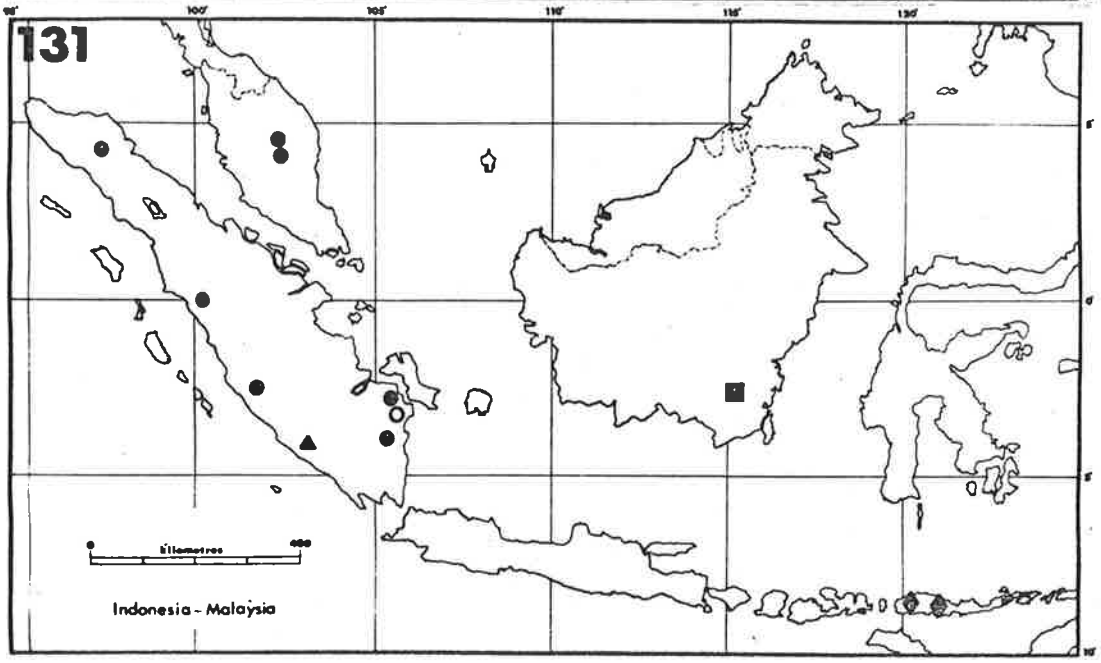
▲ *simplex*
◆ *singalanensis*
● *siporensis*
■ *spinuloso-setosa*
○ *subcordata*
sumatrana
△ *tewensis*

FIGURE 131.

▲ *trichopoda*
◆ *verheyenii*
● *vulcani*
■ *winkleri*
○ *xylantha.*


129
Indonesia - Malaysia


130
Indonesia - Malaysia


131
Indonesia - Malaysia

Region 4 species.

FIGURE 132.

▲ *alvarezii*
◆ *ampla*
● *avellana*
■ *bakeri*
○ *bicolor*
X *bontocensis*
△ *clementis*

FIGURE 133.

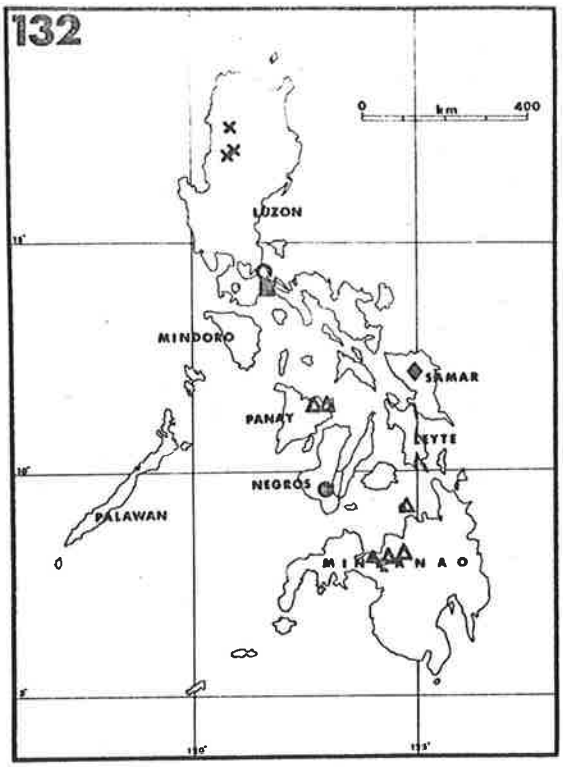
▲ *confusa*
◆ *cordata*
● *denticulata*
■ *elegans*
○ *elmeri*
X *fasciculiflora*
△ *gigantifolia*

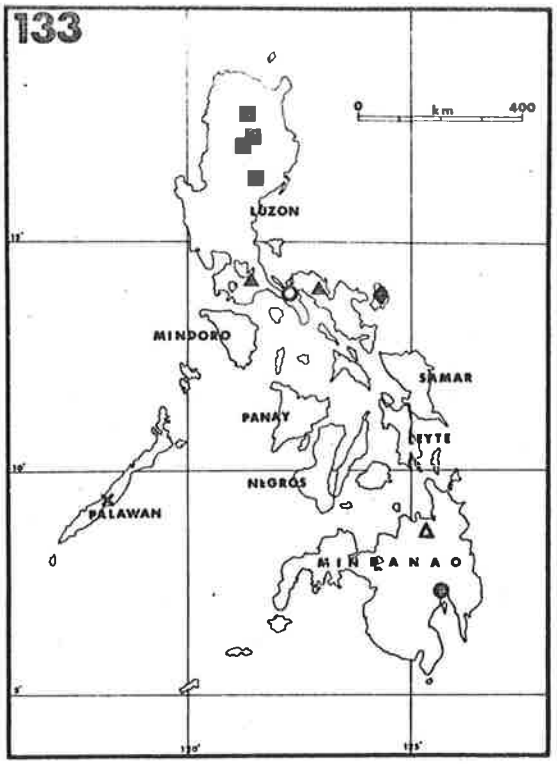
FIGURE 134.

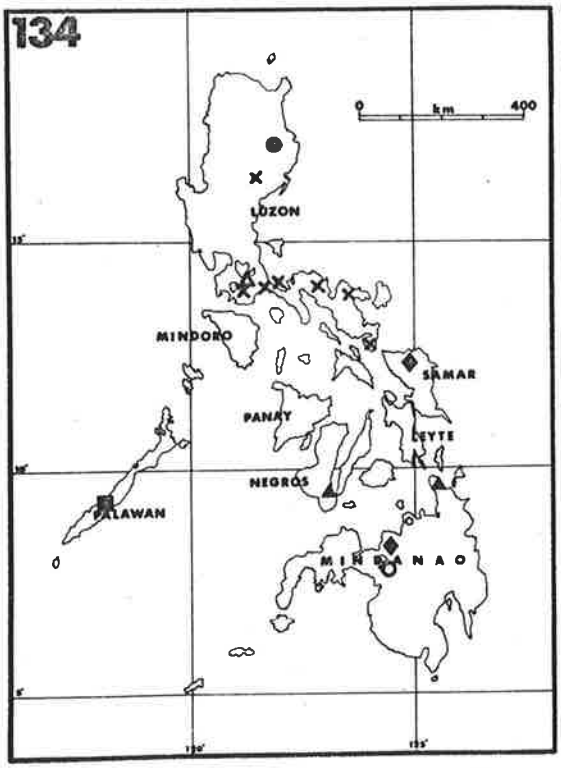
▲ *glabrifolia*
◆ *gracilipes*
● *klemmei*
■ *knemaefolia*
○ *lanaensis*
X *latibracteata*
△ *laxa*

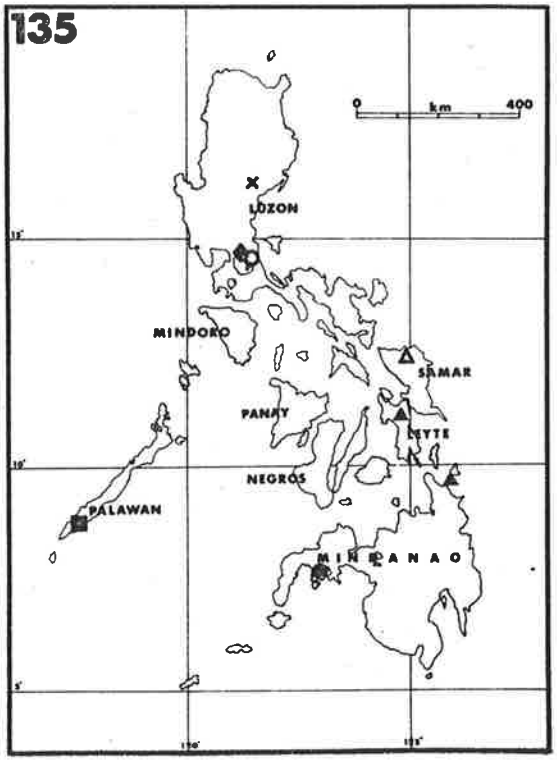
FIGURE 135.

▲ *leytensis*
◆ *loheri*
● *longipedicellata*
■ *longistyla*
○ *luzoniensis*
X *macgregorii*
△ *merrillii*


132
0 km 400
LUZON
MINDORO
SAMAR
PANAY
LEYTE
NEGROS
PALAWAN
MINDANAO


133
0 km 400
LUZON
MINDORO
SAMAR
PANAY
LEYTE
NEGROS
PALAWAN
MINDANAO


134
0 km 400
LUZON
MINDORO
SAMAR
PANAY
LEYTE
NEGROS
PALAWAN
MINDANAO


135
0 km 400
LUZON
MINDORO
SAMAR
PANAY
LEYTE
NEGROS
PALAWAN
MINDANAO

Region 4 species.

FIGURE 136.

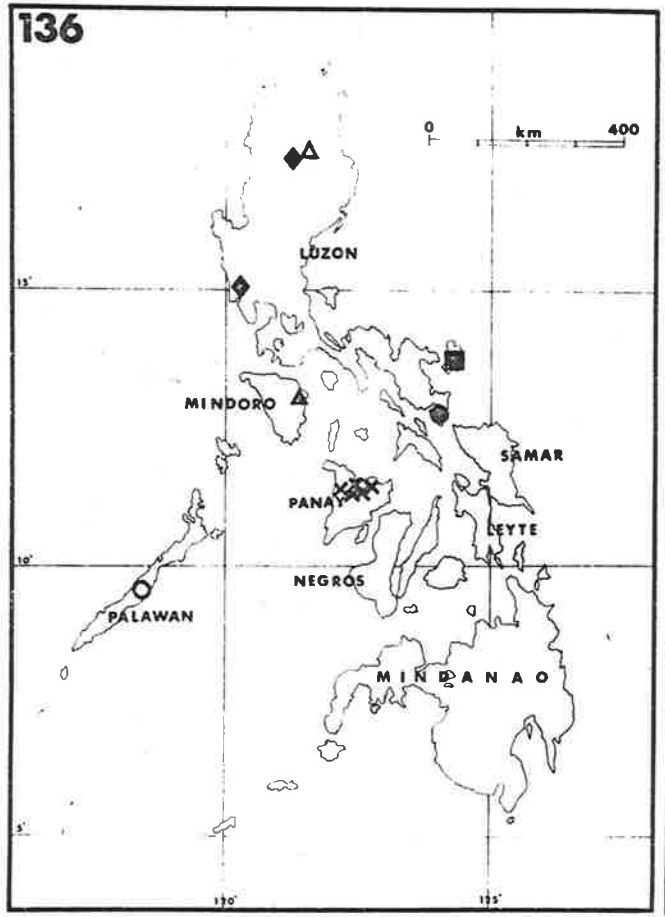
▲ *mindorensis*
◆ *oblancilimba*
● *oligantha*
■ *oligophlebia*
○ *palawanensis*
X *panayensis*
△ *papillulosa*

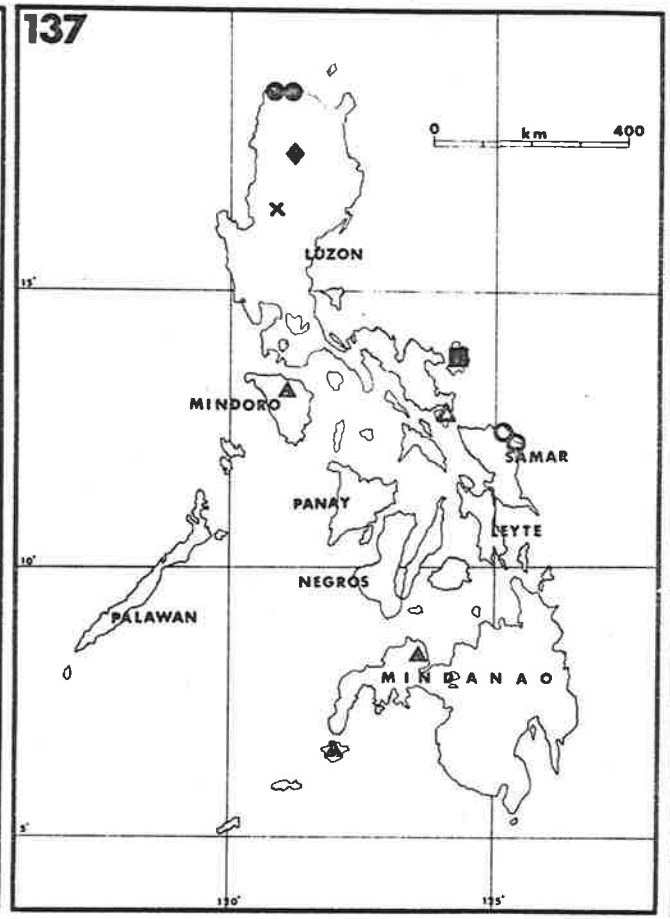
FIGURE 137.

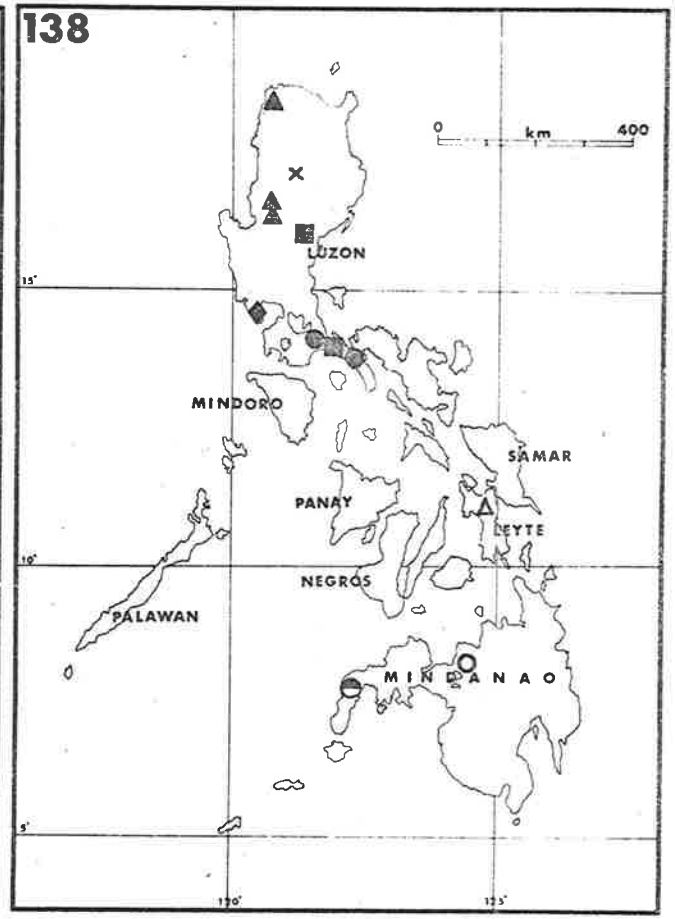
▲ *philippinensis*
◆ *polyosma*
● *polysperma*
■ *ramosii*
○ *samarensis*
X *santosii*
△ *sorsogonensis*

FIGURE 138.

▲ *sparsiflora*
◆ *subglabra*
● *tayabensis*
■ *trichophora*
○ *truncifloravanoverberghii*
△ *wenzelii*
⊖ *zamboangensis*


136
0
km
400
LUZON
MINDORO
SAMAR
PANAY
LEYTE
NEGROS
PALAWAN
MINDANAO
15°
10°
5°
120°
125°


137
0
km
400
LUZON
MINDORO
SAMAR
PANAY
LEYTE
NEGROS
PALAWAN
MINDANAO
15°
10°
5°
120°
125°


138
0
km
400
LUZON
MINDORO
SAMAR
PANAY
LEYTE
NEGROS
PALAWAN
MINDANAO
15°
10°
5°
120°
125°

Region 5 and 6 species.

FIGURE 139.

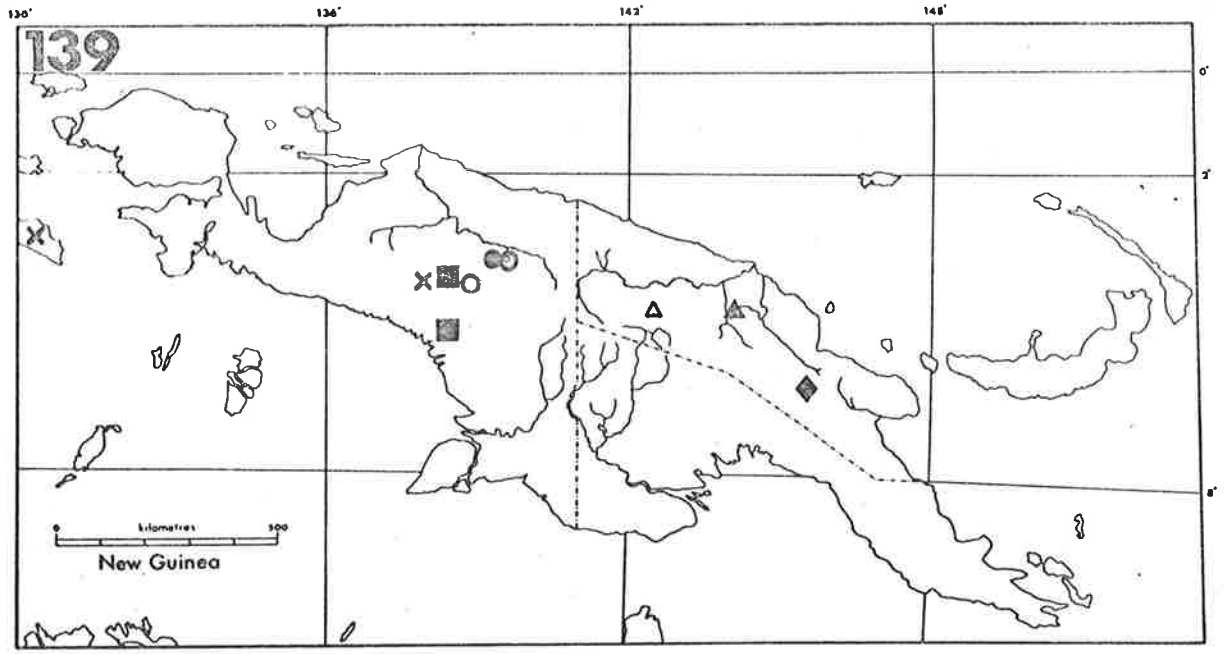
▲ *achyrantha*
◆ *aculeata*
● *albiflora*
■ *alkmaarensis*
○ *alpicola*
X *altissima*
△ *amplifolia* Diels

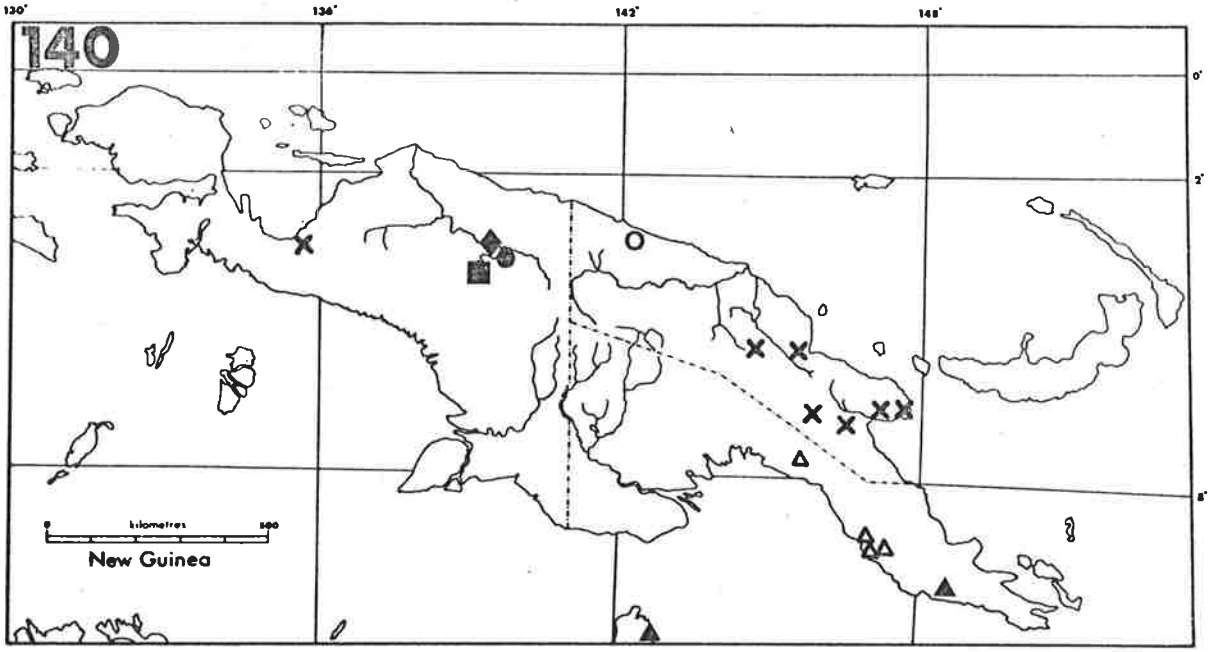
FIGURE 140.

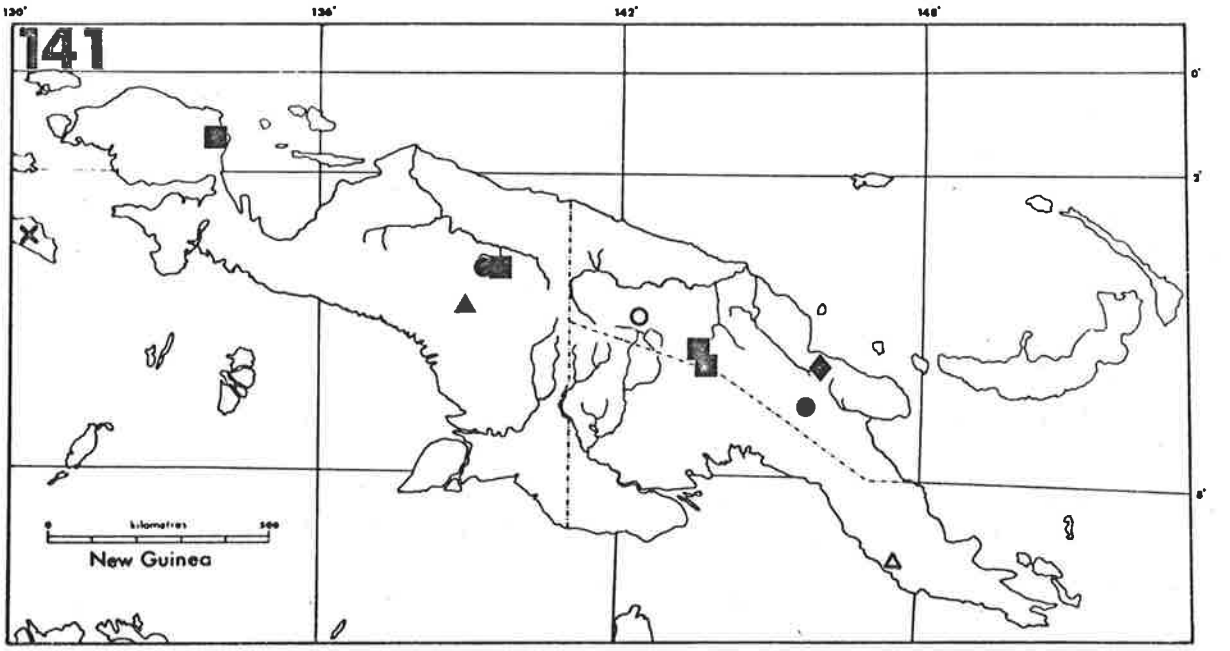
▲ *andreana*
◆ *arcana*
● *archboldiana*
■ *belensis*
○ *bibracteata*
X *bifida*
△ *brassii*

FIGURE 141.

▲ *brevirostris*
◆ *buddleifolia*
● *calyptrata*
■ *capitulata*
○ *caroli*
X *ceramica*
△ *collina*. .


139
New Guinea


140
New Guinea

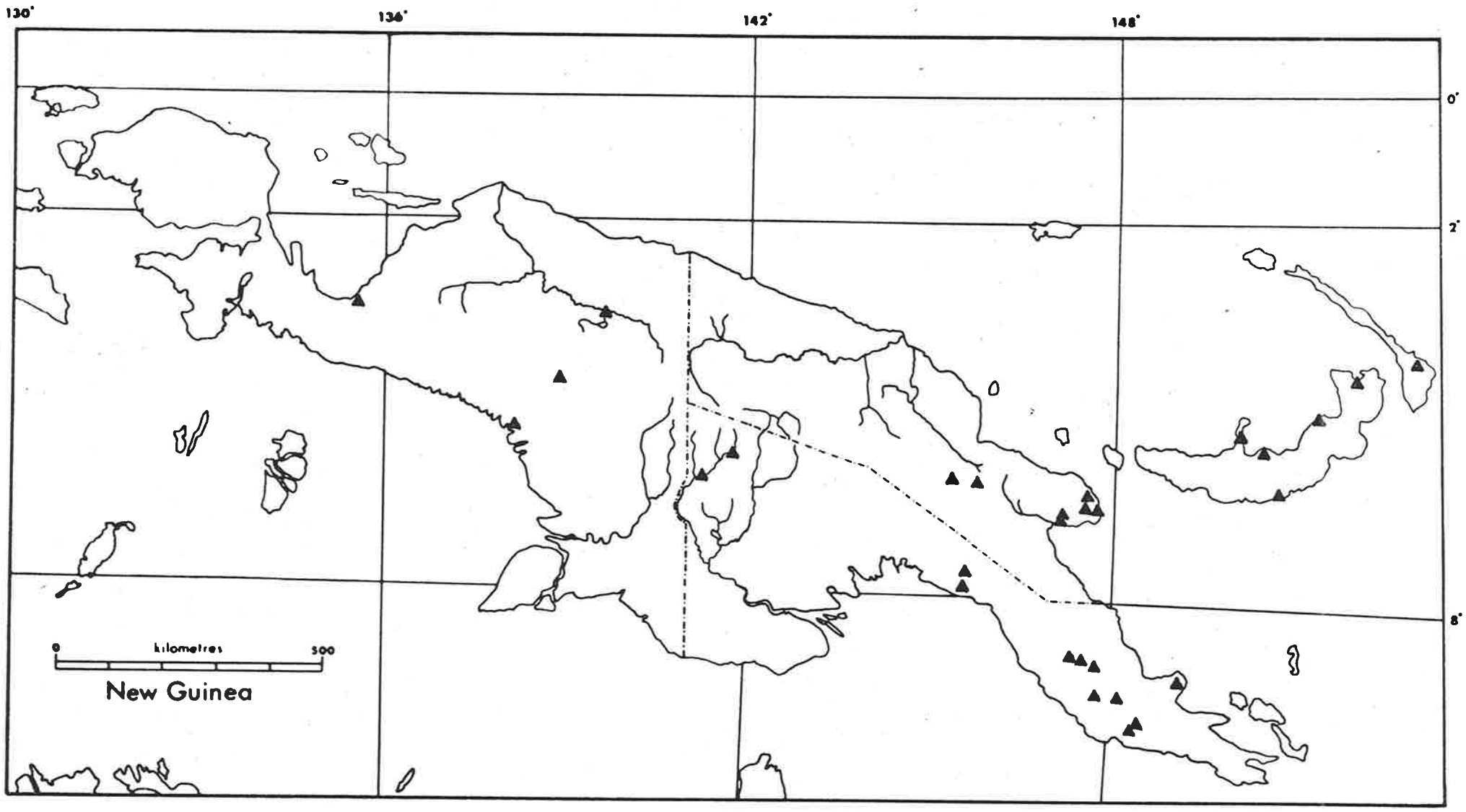

141
New Guinea

Region 5 and 6 species.

FIGURE 142.

▲ *conferta*

(see also figure 152).


130°
136°
142°
148°
0°
2°
8°
0
kilometres
500
New Guinea

Region 5 and 6 species.

FIGURE 143.

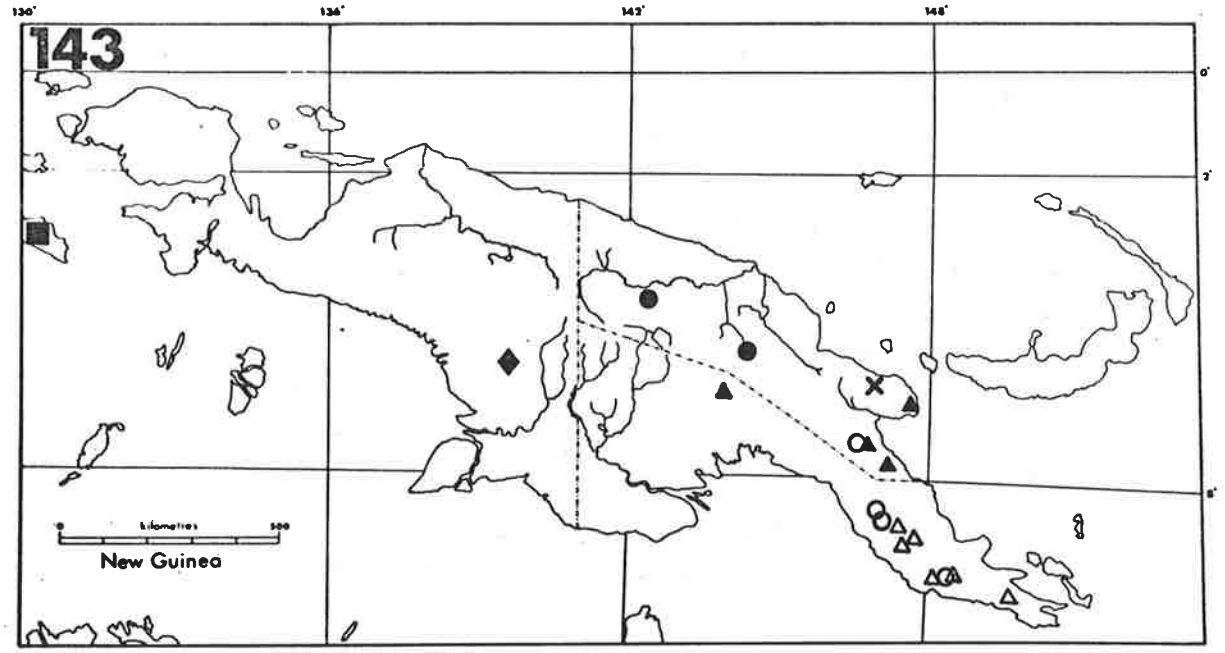
▲ *congestiflora*
◆ *decurrens*
● *desquamulata*
■ *dicalyx*
○ *dielsiana*
X *drimytiflora*
△ *dufaurii*

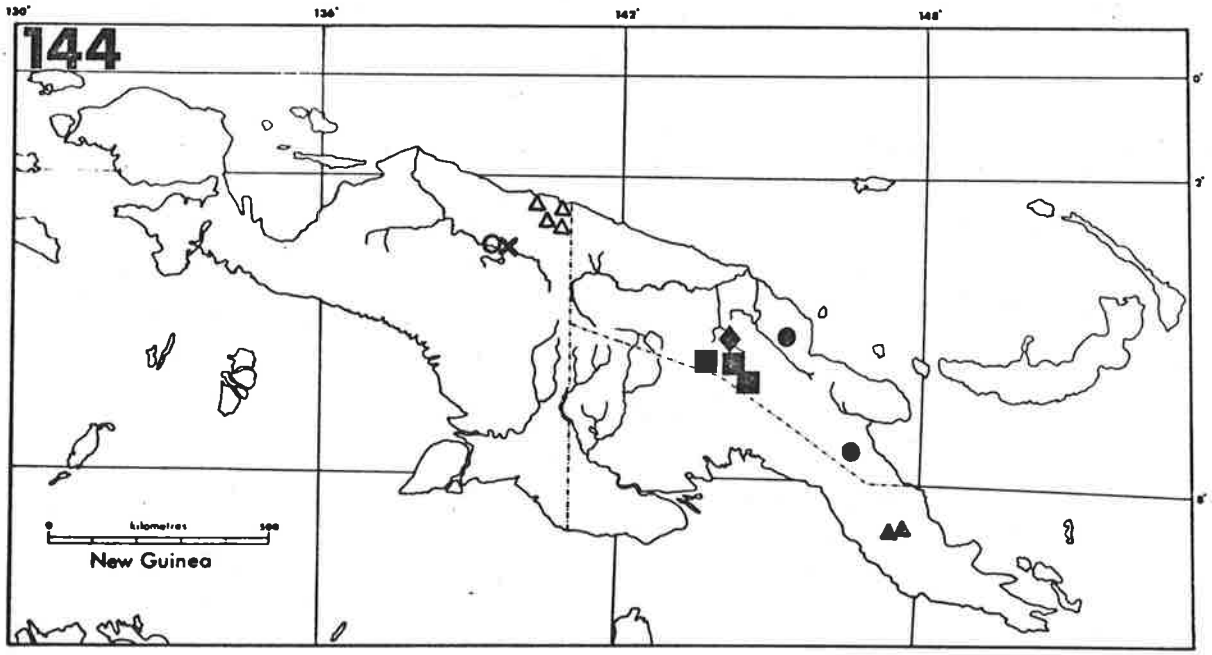
FIGURE 144.

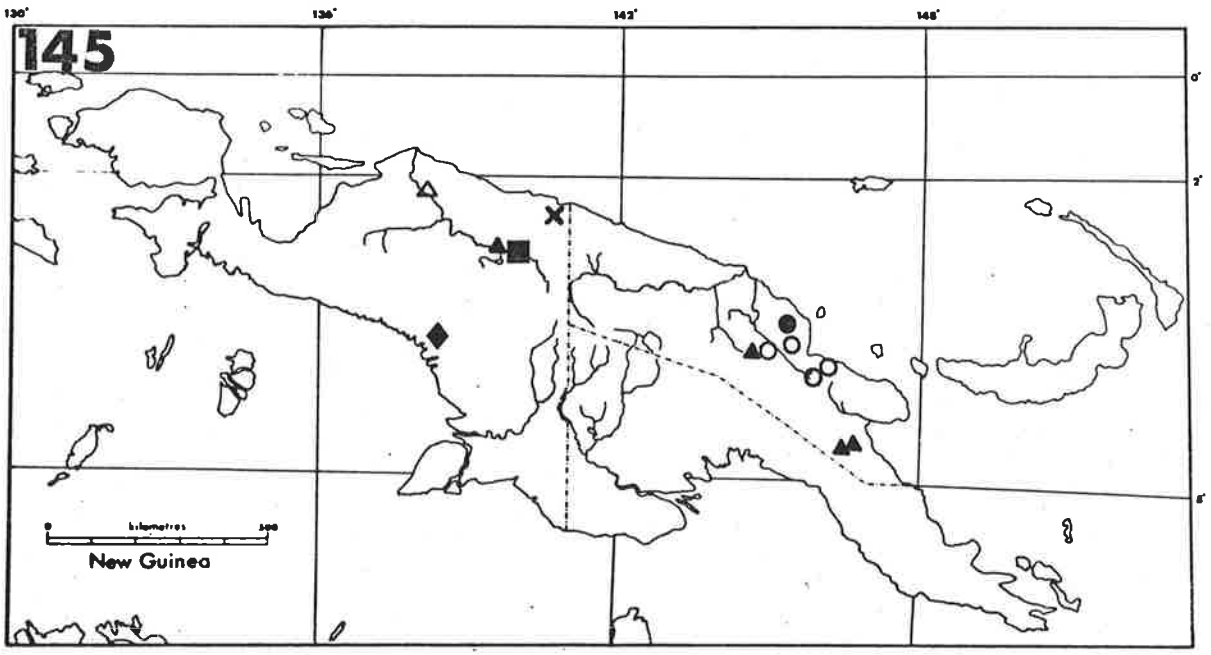
▲ *eburnea*
◆ *echioides*
● *egregia*
■ *emarginata*
○ *excurrens*
X *fimbriata*
△ *gjellerupii*

FIGURE 145.

▲ *holotricha*
◆ *hystrix*
● *iboana*
■ *idenburgensis*
○ *klinkii*
X *lactea*
△ *lamii*


130°
136°
142°
148°
143
0°
2°
8°
New Guinea


130°
136°
142°
148°
144
0°
2°
8°
New Guinea


130°
136°
142°
148°
145
0°
2°
8°
New Guinea

Region 5 and 6 species

FIGURE 146.

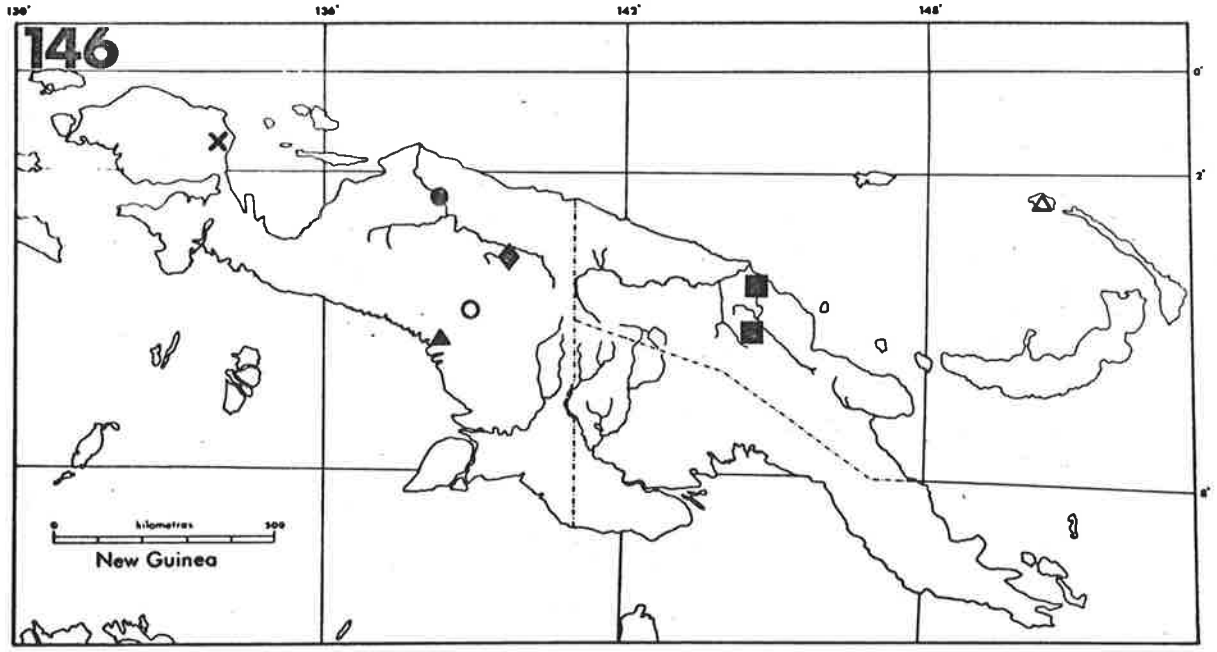
▲ *lorentzii*
◆ *macrantha*
● *mamberamana*
■ *meiandra*
○ *mollissima*
x *monadelpha*
△ *naumanii*

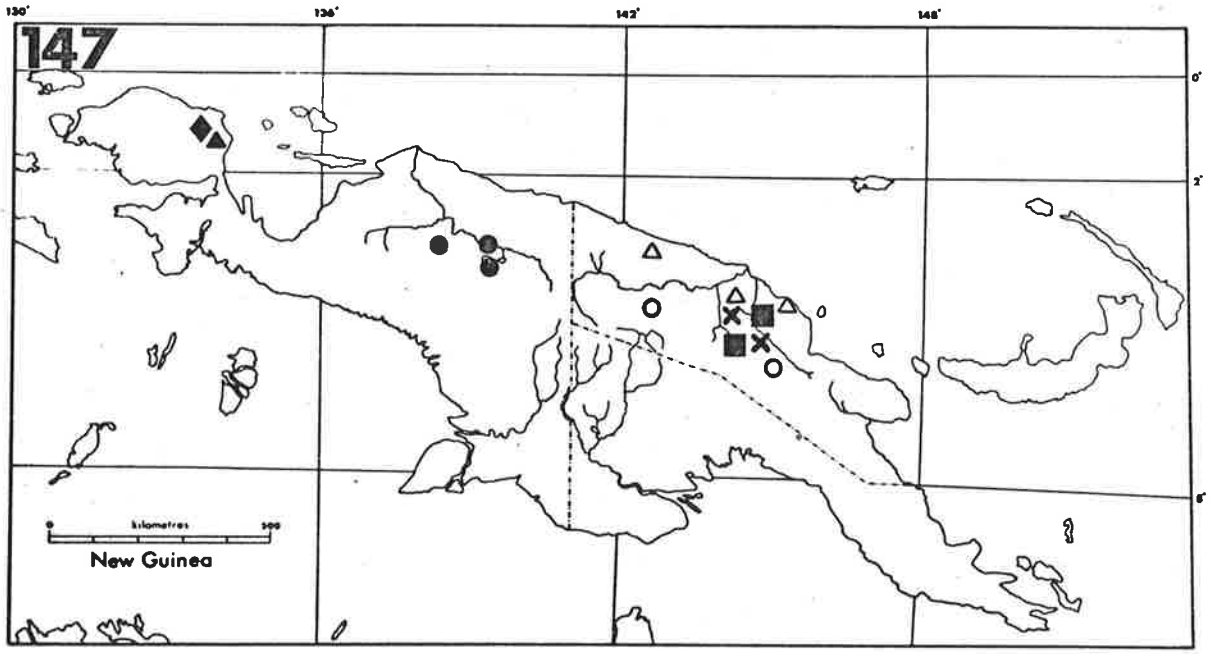
FIGURE 147.

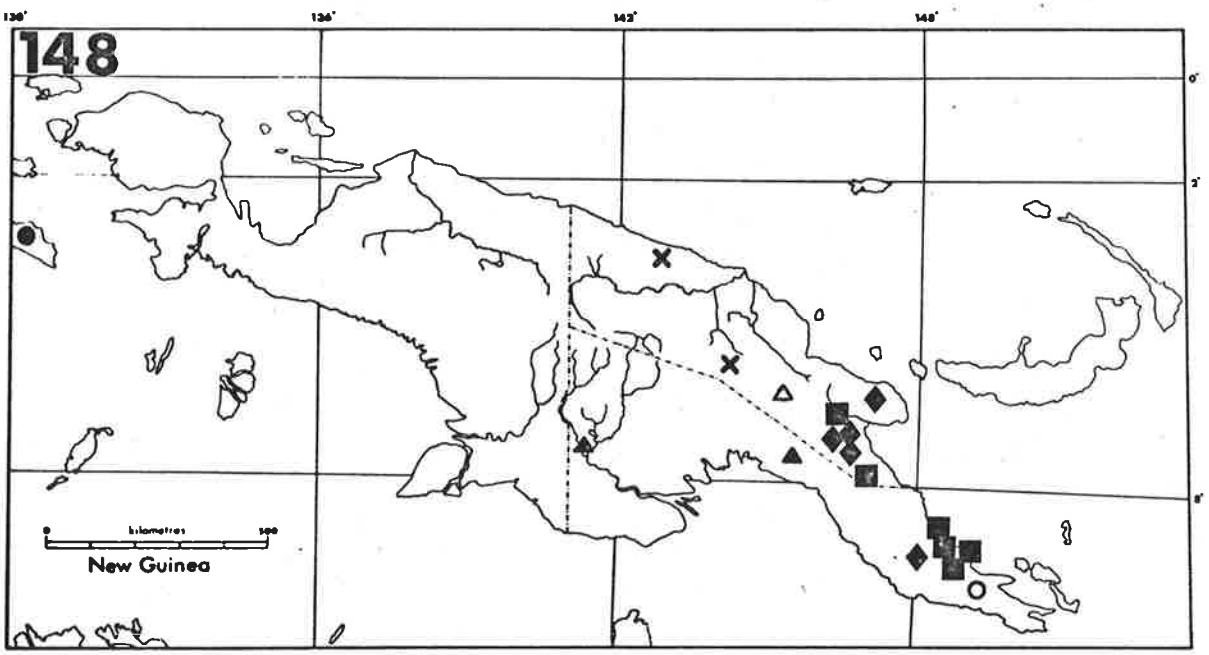
▲ *novo-guineensis*
(see also fig. 152)
◆ *oblanceolata* Ridl.
● *occulta*
■ *creadum*
○ *pannosa*
x *phaeosepala*
△ *pilogyne*

FIGURE 148.

▲ *pleurotricha*
◆ *plurilocularis*
● *polyodon*
■ *poolei*
○ *purgans*
(see also fig. 153)
x *rodatzii*
△ *roemeri*


130°
136°
142°
148°
146
0°
2°
6°
kilometres
500
New Guinea


130°
136°
142°
148°
147
0°
2°
6°
kilometres
500
New Guinea


130°
136°
142°
148°
148
0°
2°
6°
kilometres
500
New Guinea

Region 5 and 6 species.

FIGURE 149.

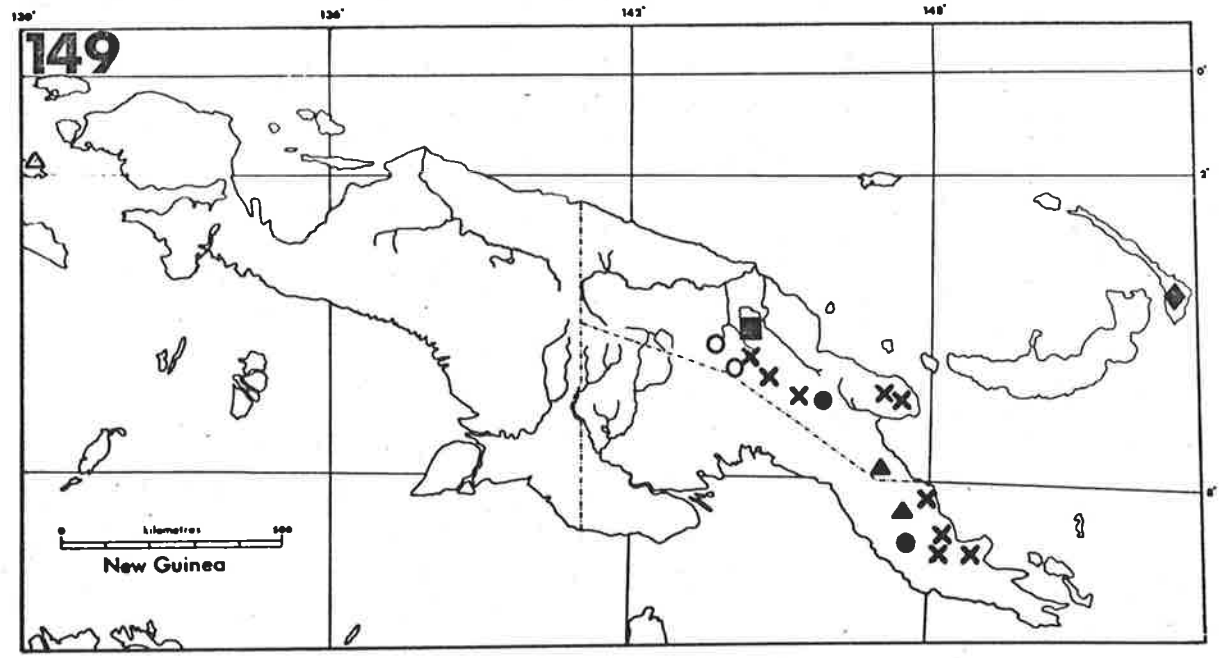
▲ *rubrisquamata*
◆ *rudolfi*
● *rufa*
■ *rupestris*
○ *scaberrima*
x *schumanniana*
(see also fig. 153)
△ *squamellicaula*

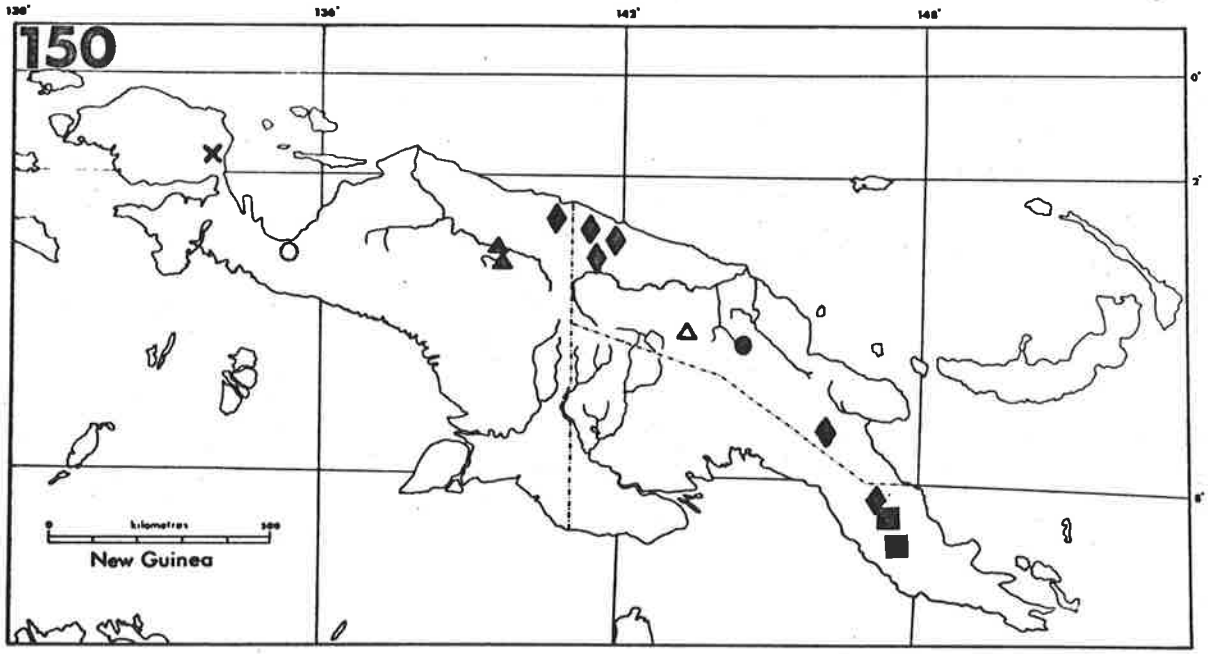
FIGURE 150.

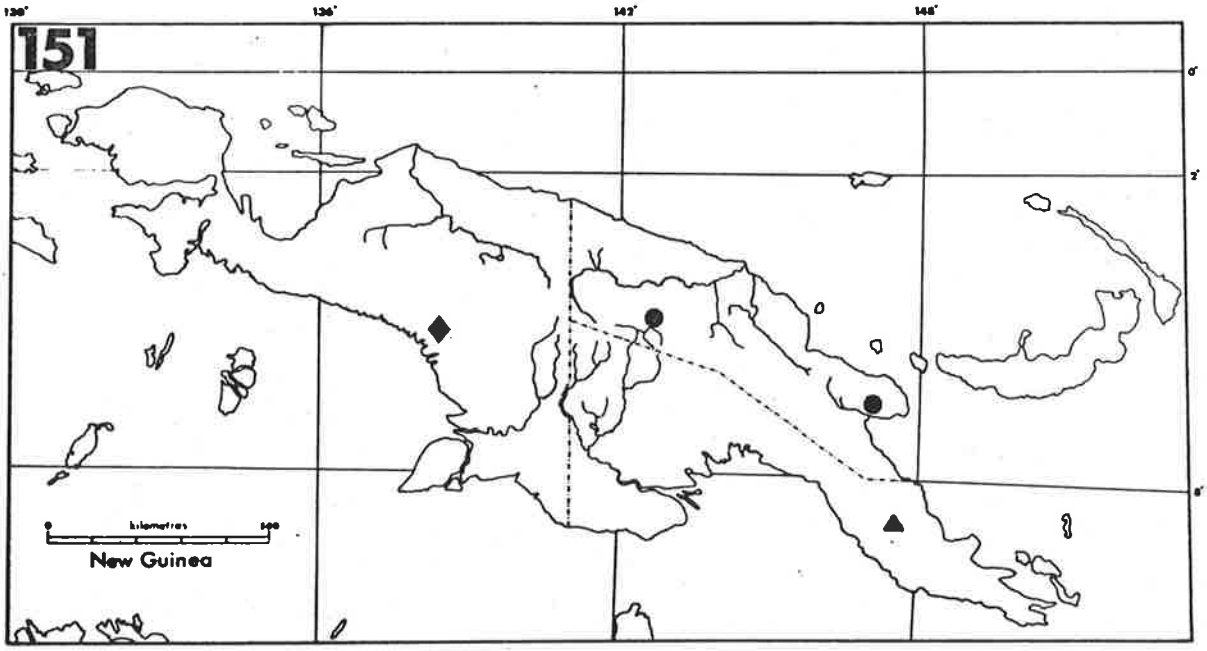
▲ *sterrolepida*
◆ *stichophlebia*
● *submodesta*
■ *tafana*
○ *trachylasia*
x *uniflora*
△ *vagans*

FIGURE 151.

▲ *vallium*
◆ *versteegii*
● *xiphophylla*.


149
New Guinea


150
New Guinea


151
New Guinea

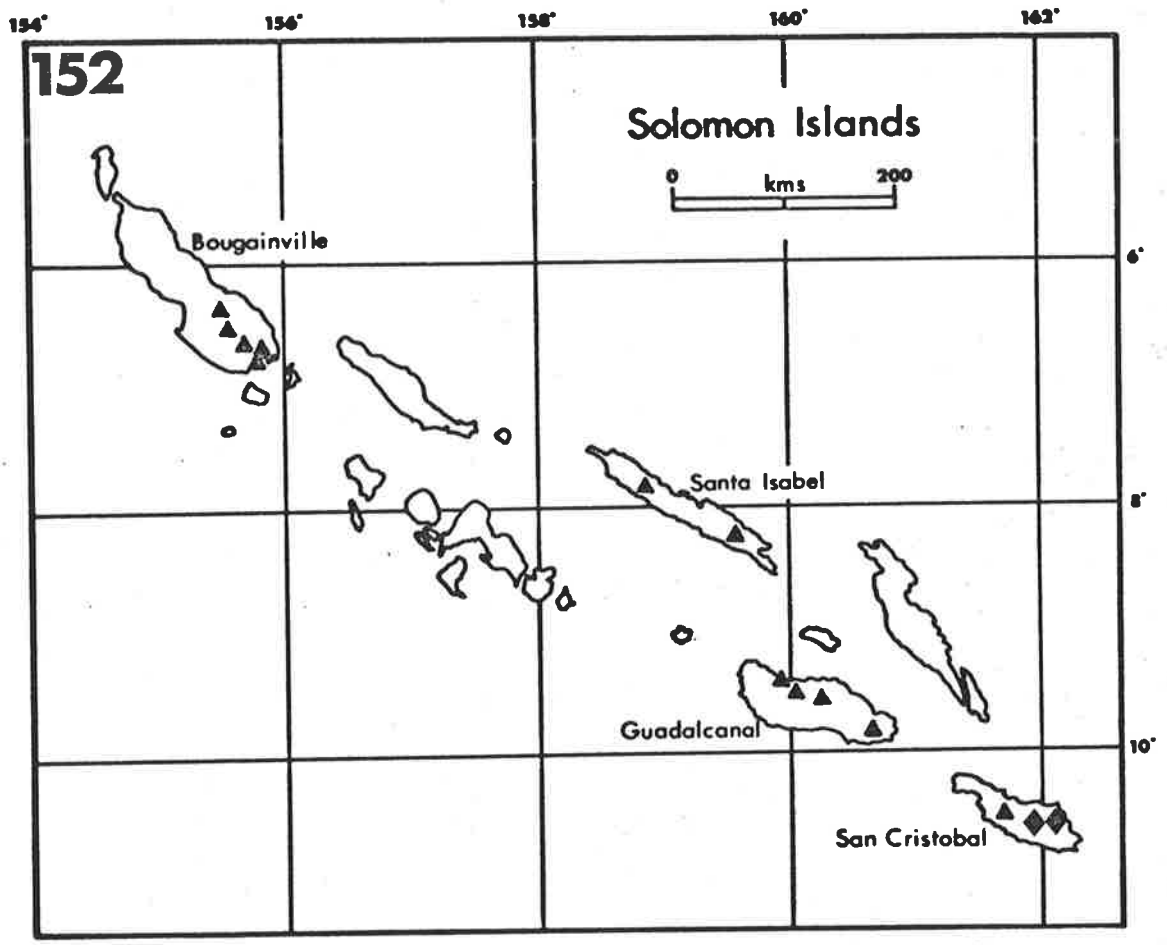
Region 6 species.

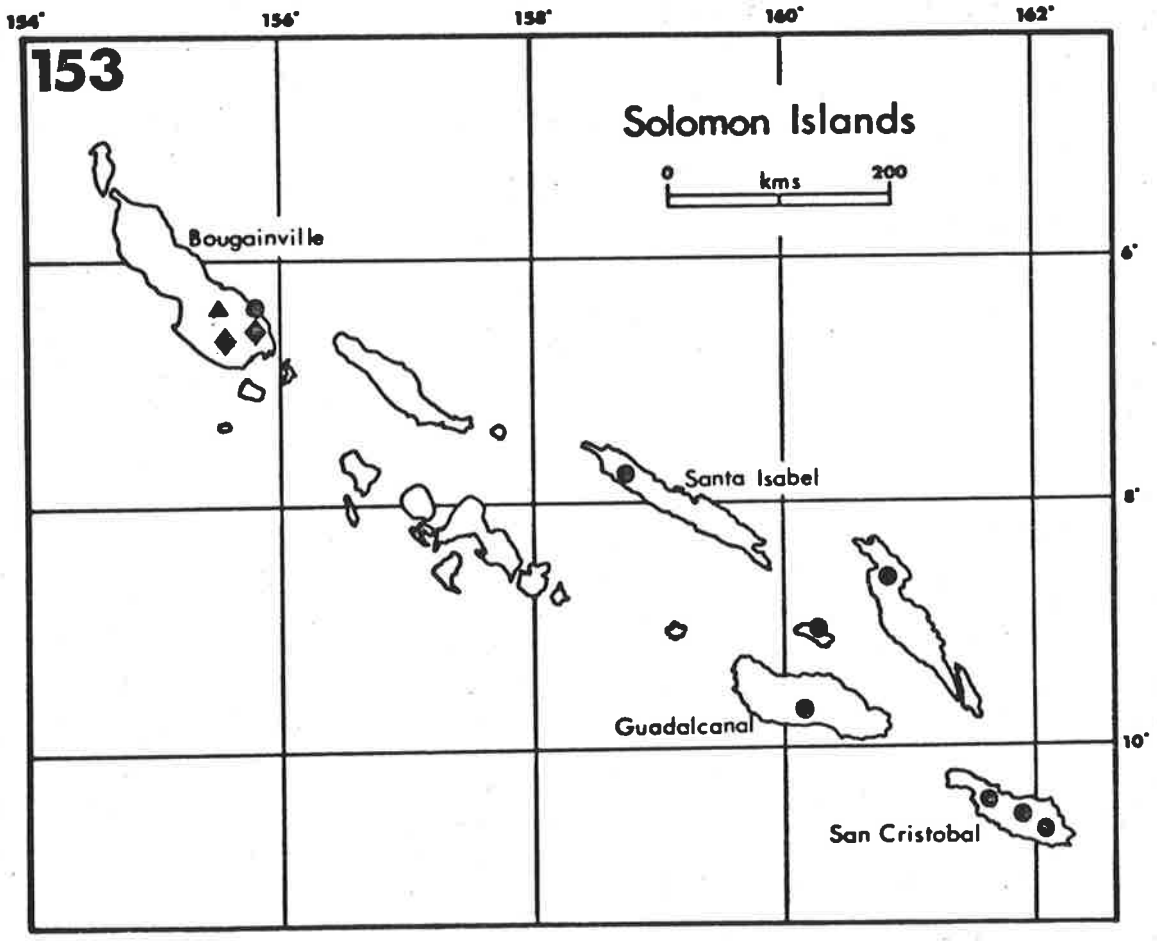
FIGURE 152.

▲ *conferta*
(see also fig. 142)
◆ *novo-guineensis*
(see also fig. 147)

FIGURE 153.

▲ *kajewskii*
◆ *purgans*
(see also fig. 148)
● *schumanniana*
(see also fig. 149).

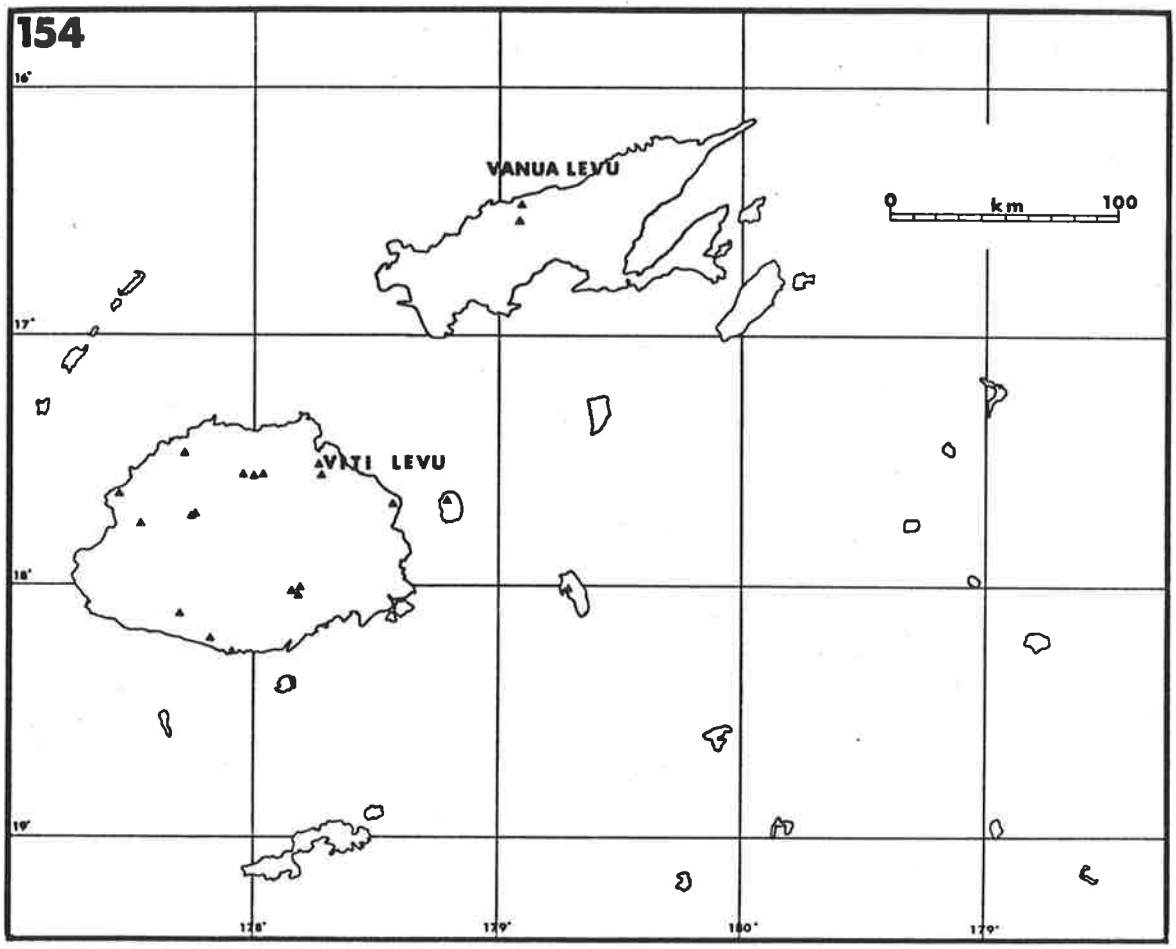

152
Solomon Islands
0 kms 200
Bougainville
Santa Isabel
Guadalcanal
San Cristobal
154°
156°
158°
160°
162°
6°
8°
10°


153
Solomon Islands
0 kms 200
Bougainville
Santa Isabel
Guadalcanal
San Cristobal
154°
156°
158°
160°
162°
6°
8°
10°

Region 6 species (Fiji).

FIGURE 154.

▲ *rubicunda*.


154
16°
17°
18°
19°
178°
179°
180°
179°
VANUA LEVU
VITI LEVU
0
km
100

APPENDIX 8. ILLUSTRATIONS OF CUTICLES OF *SAURAUIA* LEAVES.

This section contains illustrations of cuticles taken from leaves of *Saurauia* species. Species illustrated are firstly those for which cuticular preparations were successfully made and secondly those for which there was little doubt of their taxonomic distinctness at the species level. Cuticles were described in terms of a character set which is defined in Chapter 3 and implemented in Appendix 6 in leaf descriptions.

All photographs unless otherwise indicated are at the same scale. Most of the figures have an unlabelled scale line whose length represents 100µm. Several figures are given at different scales and these are individually labelled.

FIGURE 155. *Saurauia acuminata.*
Upper cuticle from specimen Elmer 20981.

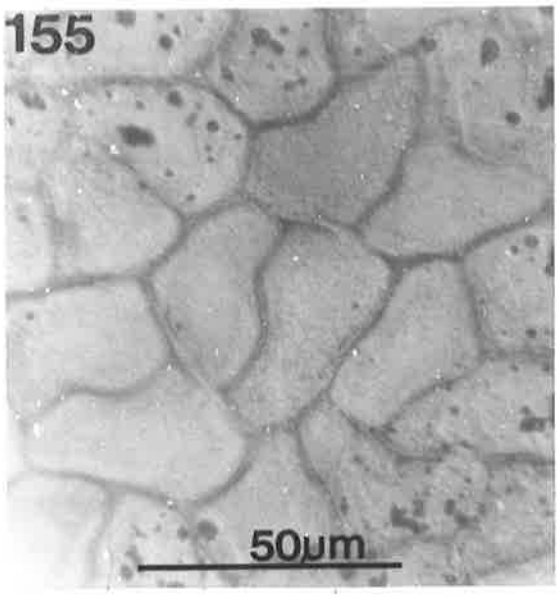
FIGURE 156. *S. acuminata.*
Lower cuticle with hairs from same specimen.

FIGURE 157. *S. albiflora.*
Upper cuticle from holotype specimen Brass 11767.

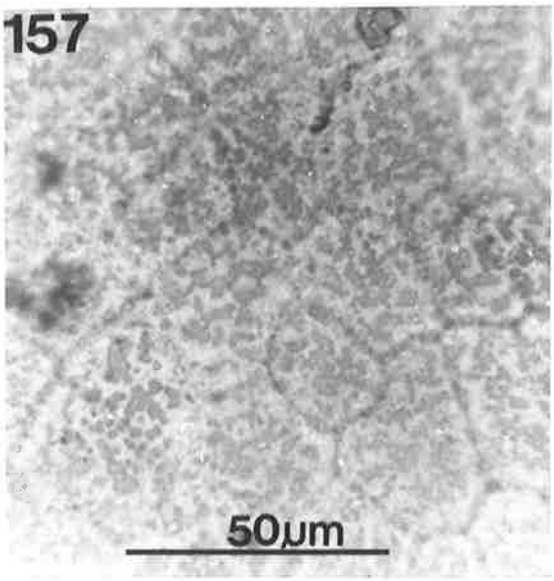
FIGURE 158. *S. alpicola.*
Upper cuticle from holotype, specimen Brass and Myer-Drees 9952.

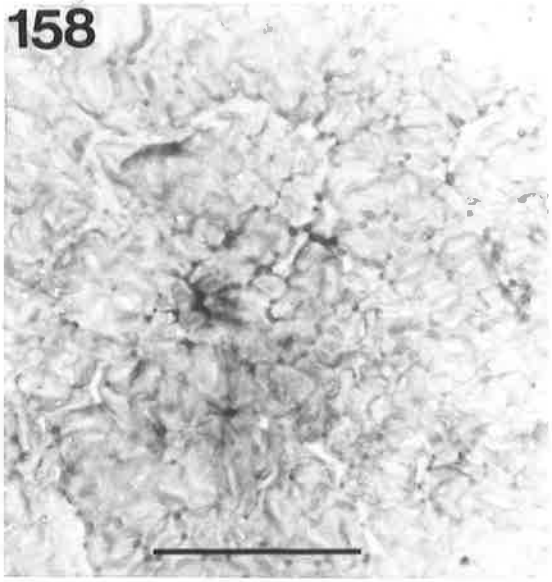
FIGURE 159. *S. alpicola.*
Lower cuticle from same specimen. One multicellular and one simple hair base can be seen.

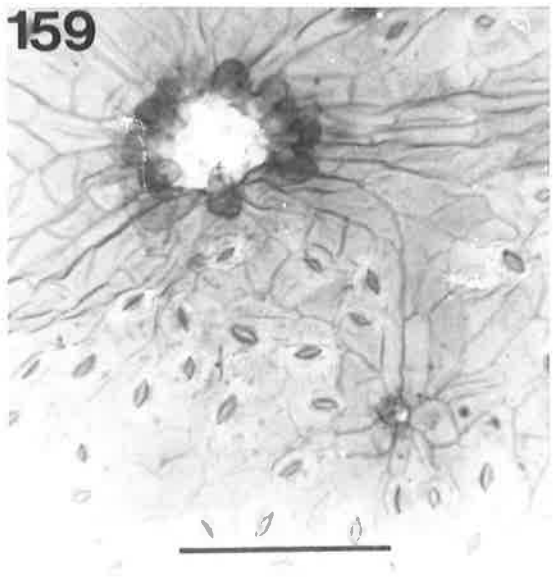
FIGURE 160. *S. ampla.*
Upper cuticle from isotype, specimen Ramos 1694. A simple hair base is visible in the upper right corner.


155
50µm


156


157
50µm


158


159

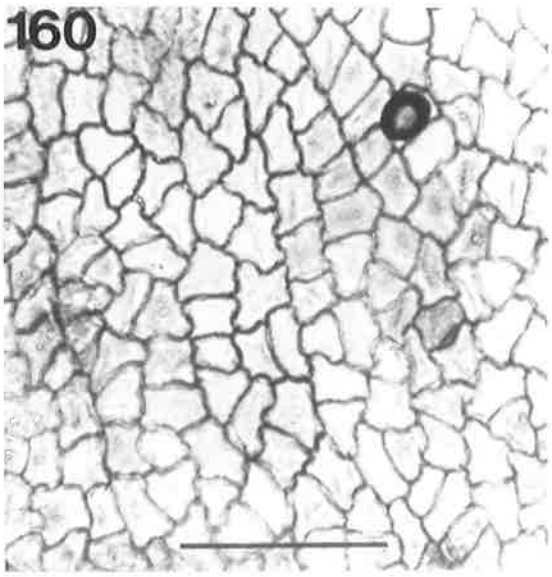

160

FIGURE 161. *S. arcana.*
Upper cuticle from holotype, specimen Brass 12034. Two simple hair bases are visible.

FIGURE 162. *S. archboldiana.*
Upper cuticle from holotype, specimen Brass 11231.

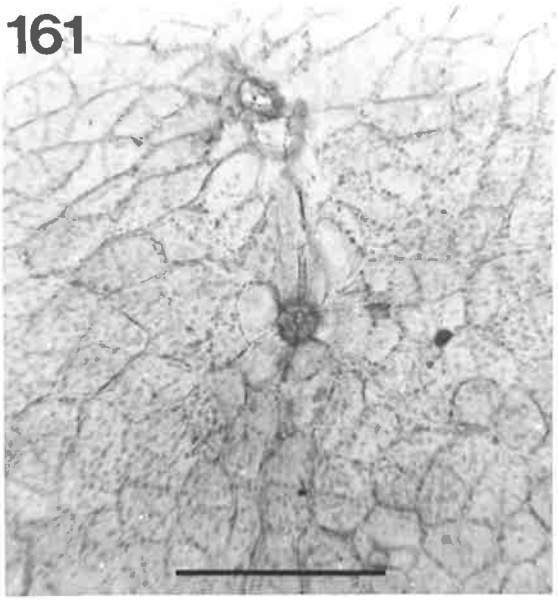
FIGURE 163. *S. avellana.*
Upper cuticle from specimen Edâno 6820. Two simple hair bases are visible.

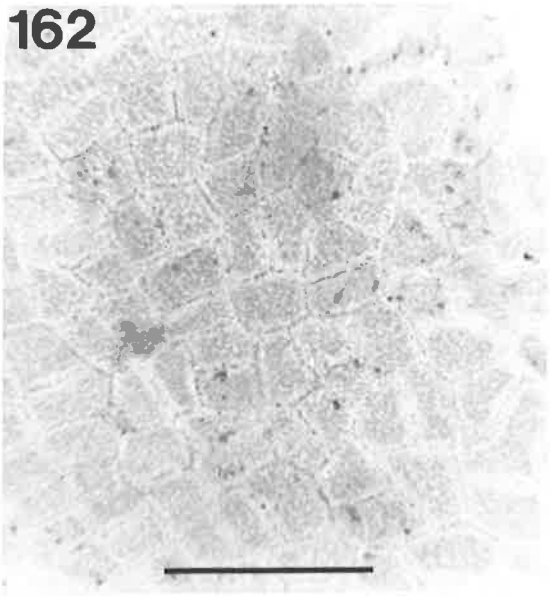
FIGURE 164. *S. avellana.*
Lower cuticle from the same specimen. Stomates and simple hair bases can be seen.

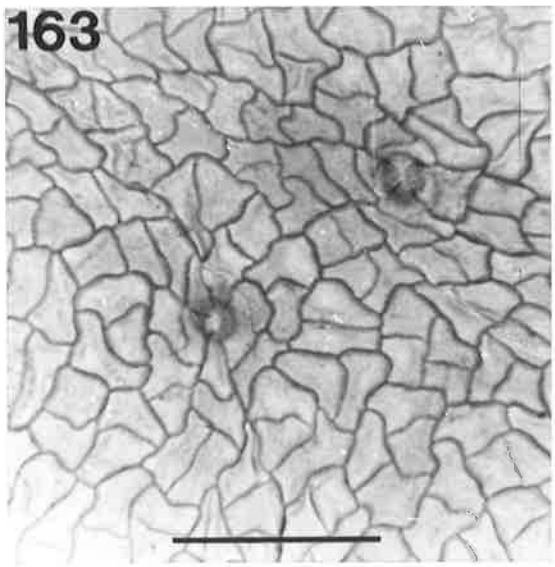
FIGURE 165. *S. bifida.*
Upper cuticle from specimen Kanehira and Hatusima 11879.

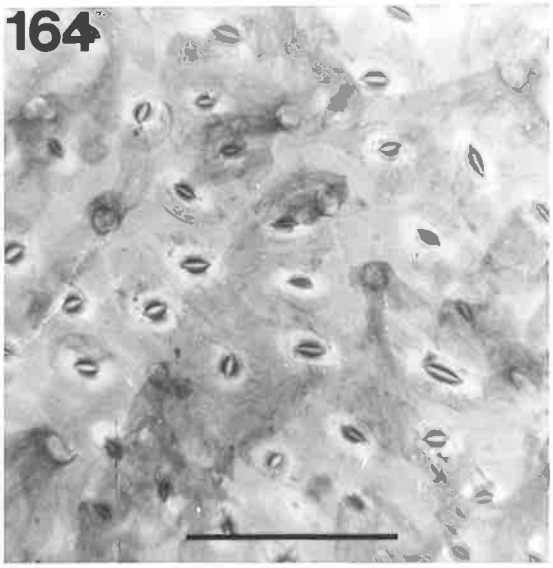
FIGURE 166. *S. bracteosa.*
Upper cuticle from specimen Kobus 179.

FIGURE 167. *S. bracteosa.*
Lower cuticle from the same specimen with a hair base.


161


162


163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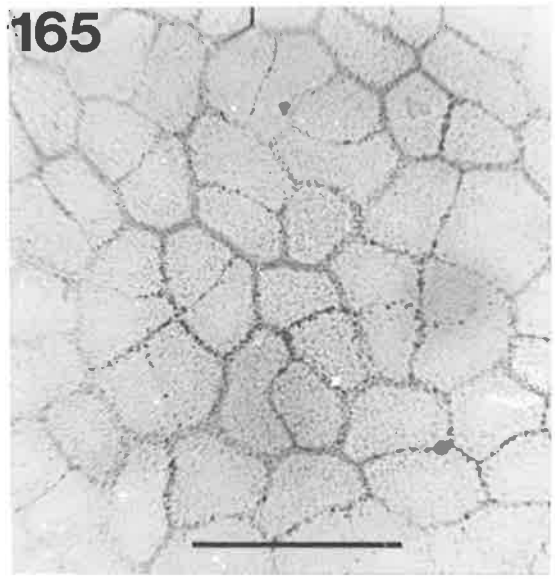

165

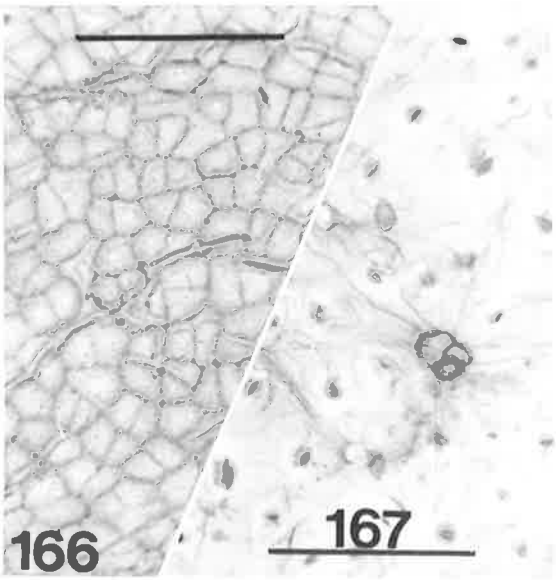

166
167

FIGURE 168. *S. brassii.*
Upper cuticle from isotype, specimen Brass 1060.

FIGURE 169. *S. capitulata.*
Upper cuticle from holotype, specimen Brass 10698.

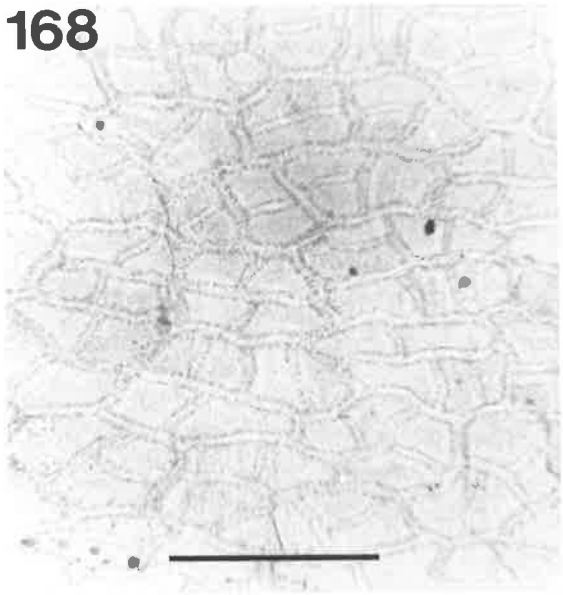
FIGURE 170. *S. cauliflora.*
Upper cuticle from specimen Yates 3015.

FIGURE 171. *S. conferta.*
Upper cuticle from specimen Hartley 10812. One simple hair base is visible.

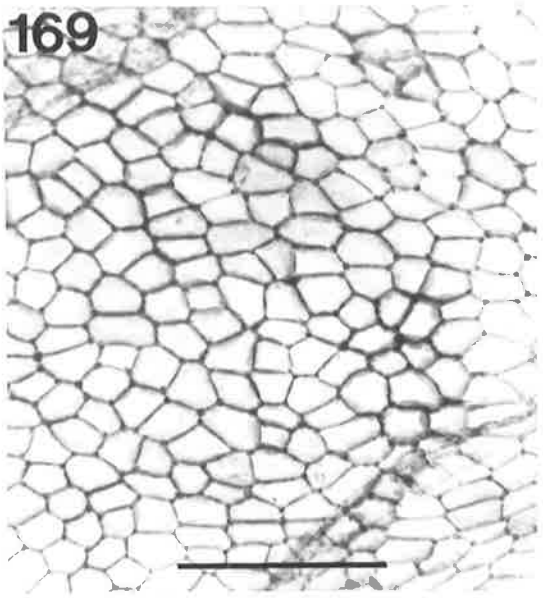
FIGURE 172. *S. glabra.*
Upper cuticle from specimen Daud and Tachan SFH.35714.

FIGURE 173. *S. glabra.*
Lower cuticle from the same specimen.

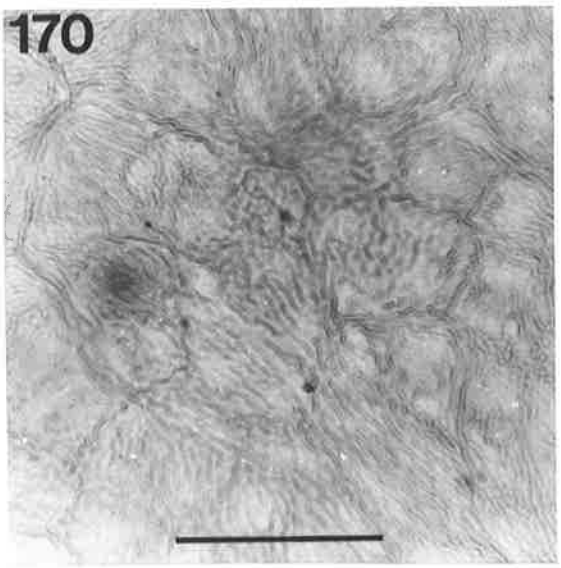
168



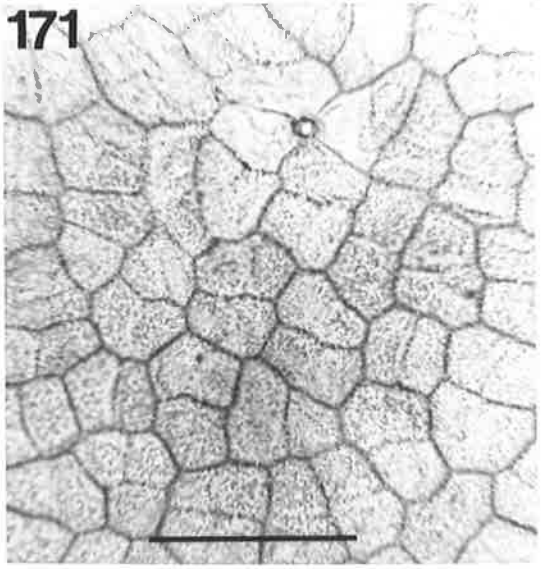
169



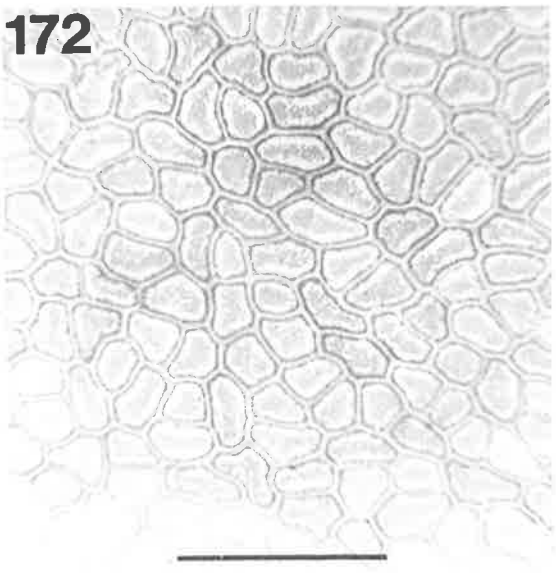
170



171



172



173

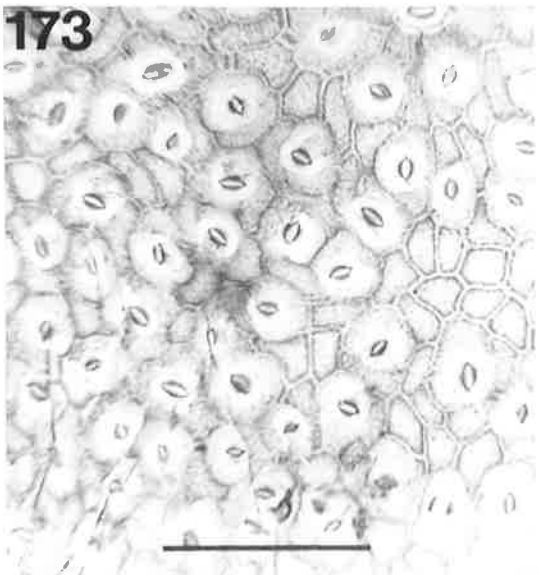


FIGURE 174. *S. grandis.*
Upper cuticle from specimen Henderson 23573.

FIGURE 175. *S. leprosa.*
Upper cuticle from specimen Hoogland 12558.

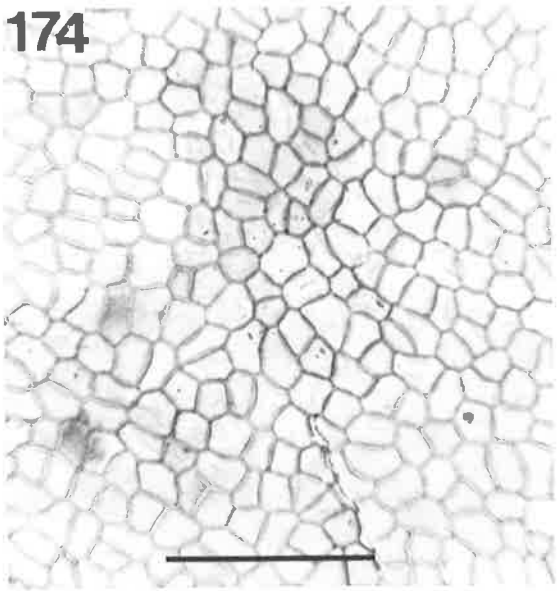
FIGURE 176. *S.* aff. *macrotricha.*
Upper cuticle from specimen Wang 53207. Spinose thickening in the corners of epidermal cells can be seen.

FIGURE 177. *S.* aff. *macrotricha.*
Lower cuticle from same specimen with multicellular hair on vein.

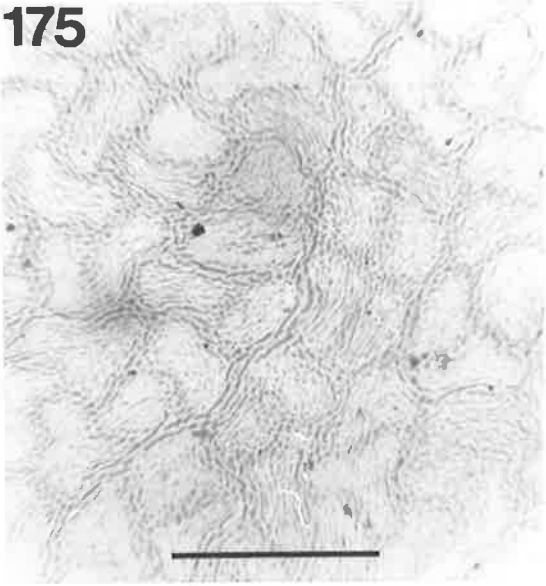
FIGURE 178. *S. malayana.*
Upper cuticle from specimen Hoogland 12586.

FIGURE 179. *S. napaulensis.*
Upper cuticle from specimen Hoogland 12583. One simple hair base is visible.

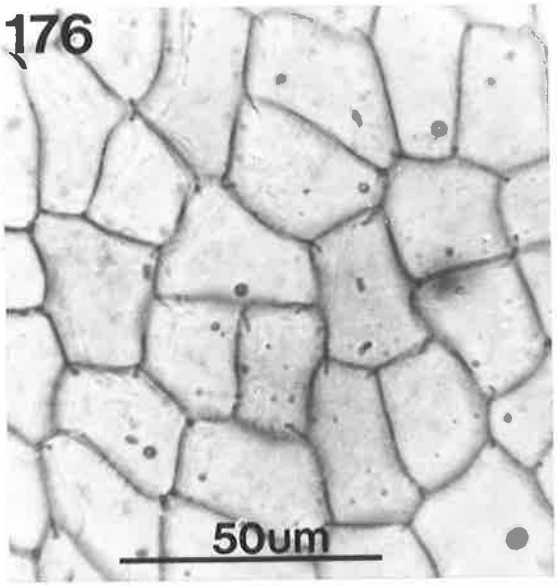
174



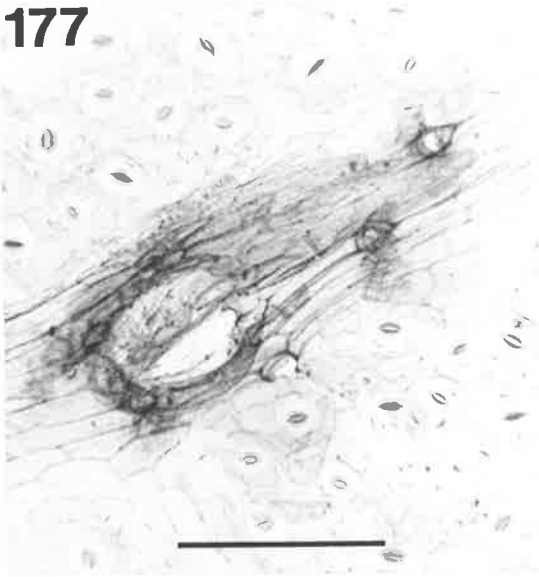
175



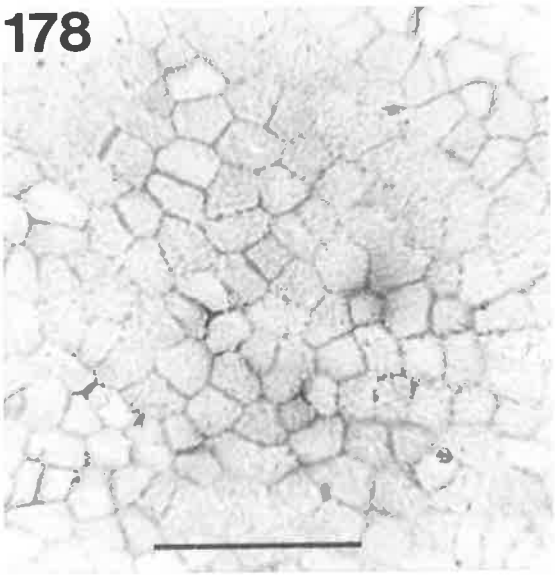
176



177



178



179

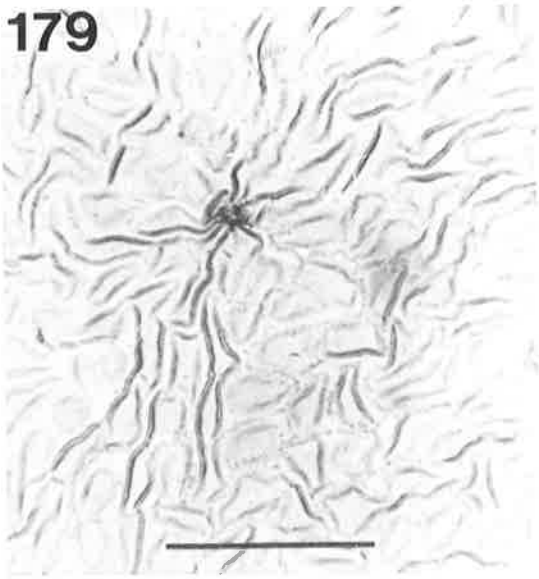


FIGURE 180. *S. nudiflora.*
Upper cuticle from specimen Burkill and Holttum 8585.

FIGURE 181. *S. nudiflora.*
Lower cuticle from specimen v. Balgooy 2160, photographed using Nomarski interference optics.

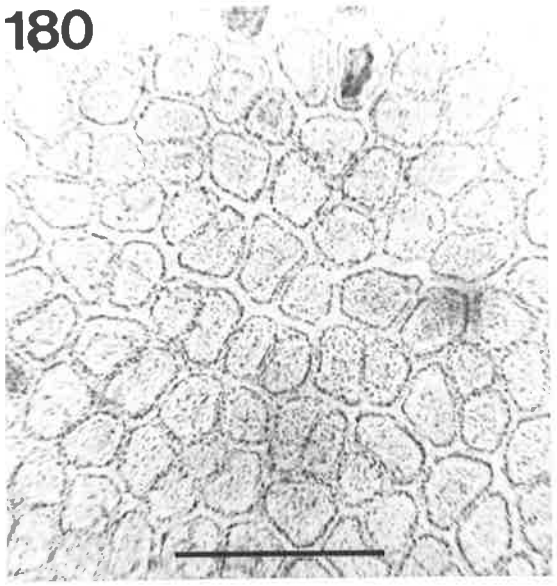
FIGURE 182. *S. nudiflora.*
Upper cuticle from specimen Hoogland 12600.

FIGURE 183. *S. oblancilimba.*
Upper cuticle from specimen Sulit 7686.
A pentamerous hair base may be seen in inset.

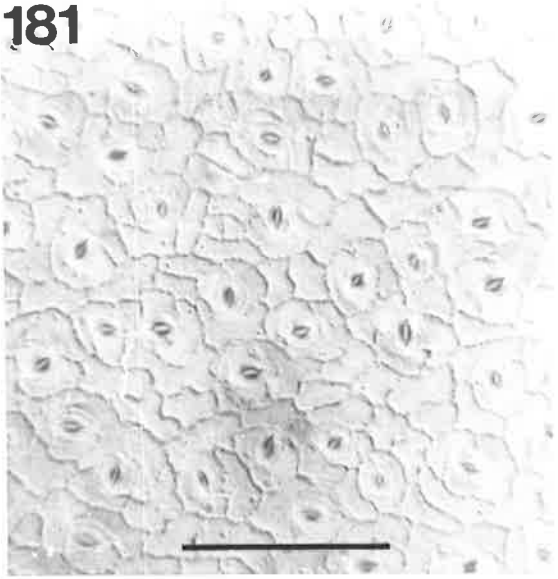
FIGURE 184. *S. occulta.*
Upper cuticle from holotype, specimen Brass 11208. The remains of a multicellular hair base may be seen.

FIGURE 185. *S. panayensis.*
Upper cuticle from specimen Ramos and Edâno 31366.

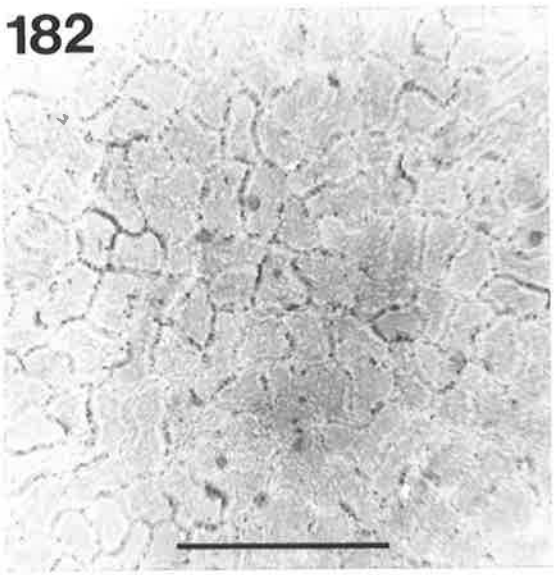
180



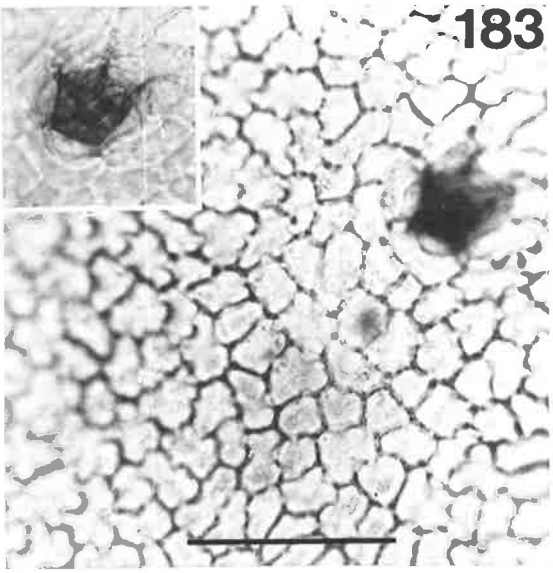
181



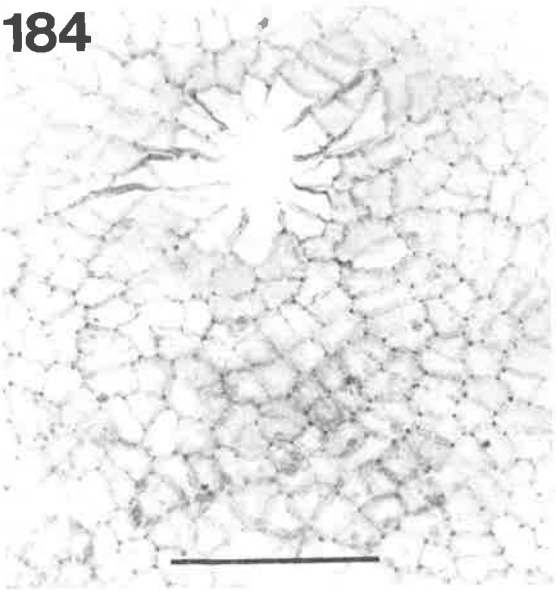
182



183



184



185

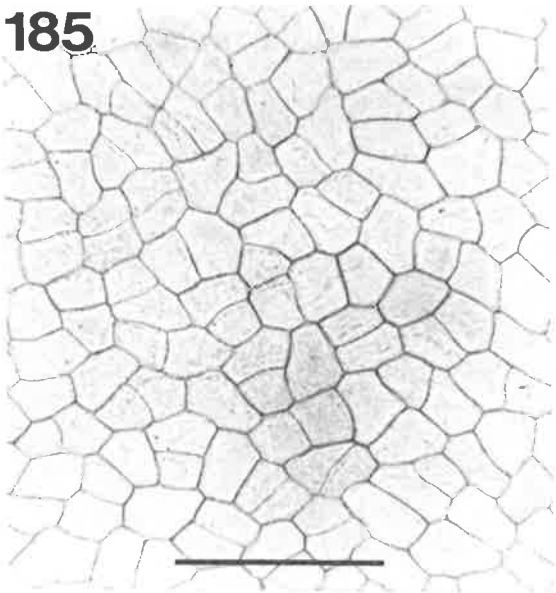


FIGURE 186. *S. papillulosa.*
Upper cuticle from specimen Celestino 7927.

FIGURE 187. *S. pentapetala.*
Upper cuticle from specimen Hoogland 12598.

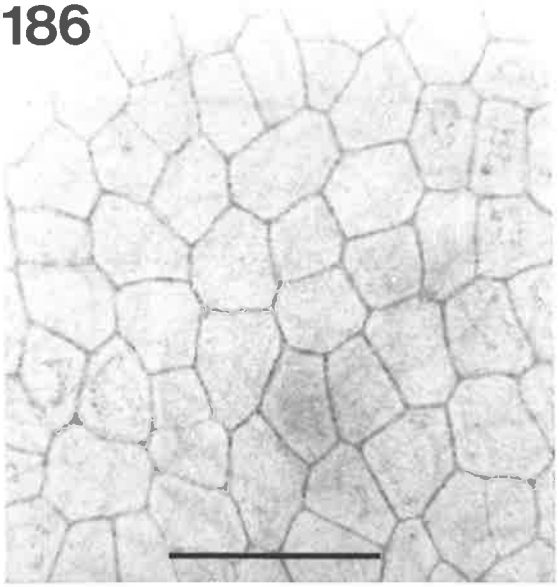
FIGURE 188. *S. pentapetala.*
Lower cuticle from same specimen.

FIGURE 189. *S. polysperma.*
Upper cuticle from specimen Ramos 33123.

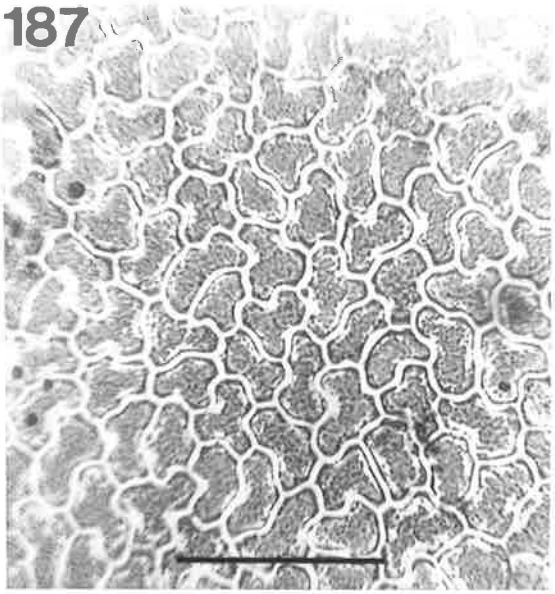
FIGURE 190. *S. punduana.*
Upper cuticle from specimen J.D. Hooker 62C.

FIGURE 191. *S. reinwardtiana.*
Upper cuticle from specimen Winckel 1542B.

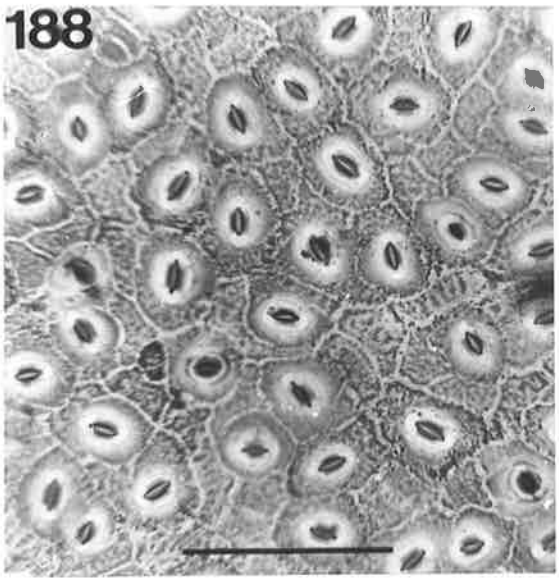
186



187



188



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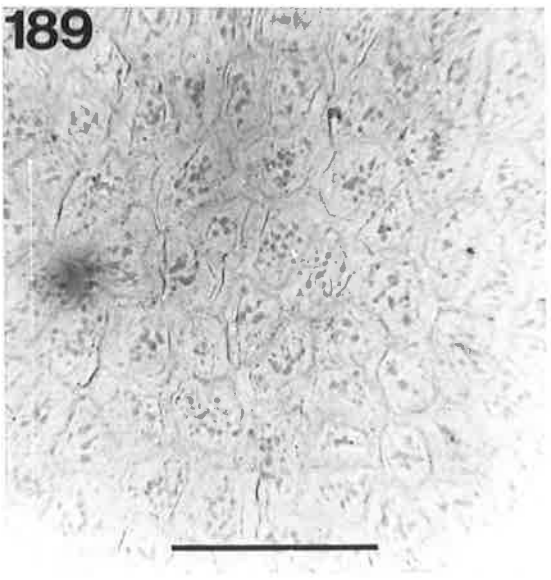

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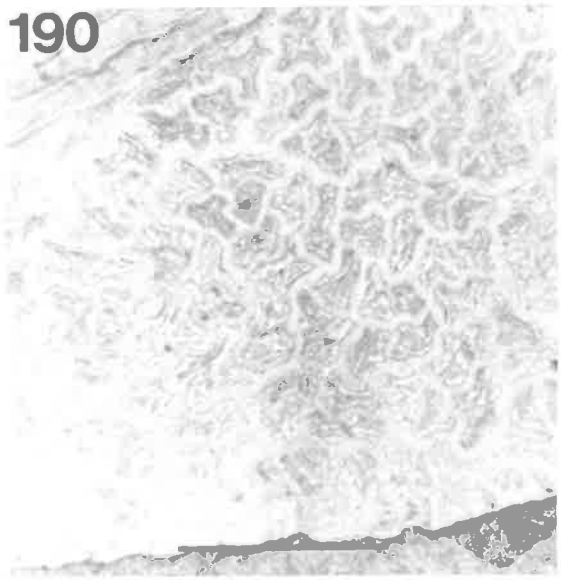

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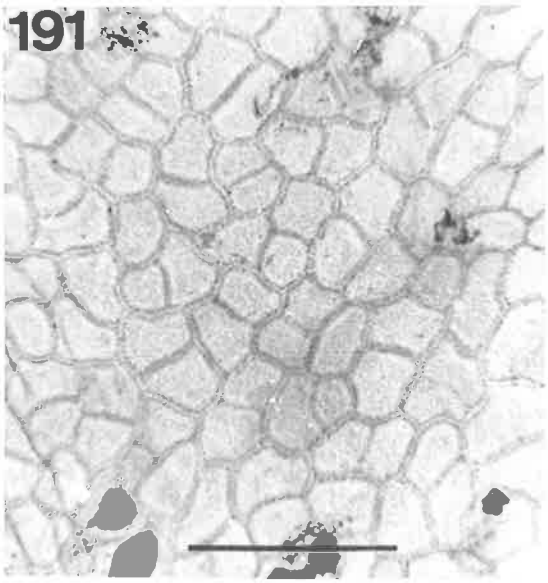


FIGURE 192. *S. roxburghii.*
Upper cuticle from specimen Hoogland 12624.

FIGURE 193. *S. roxburghii.*
Lower cuticle from same specimen. One simple hair base is visible.

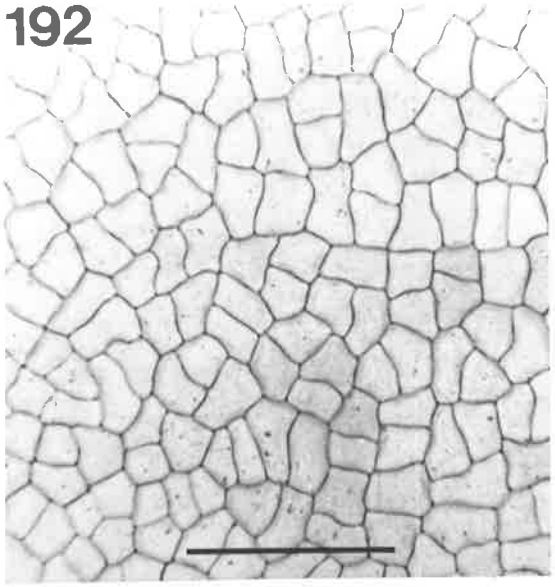
FIGURE 194. *S. rubicunda.*
Upper cuticle from specimen Smith 4790.

FIGURE 195. *S. rubicunda.*
Lower cuticle from specimen Smith 7137.

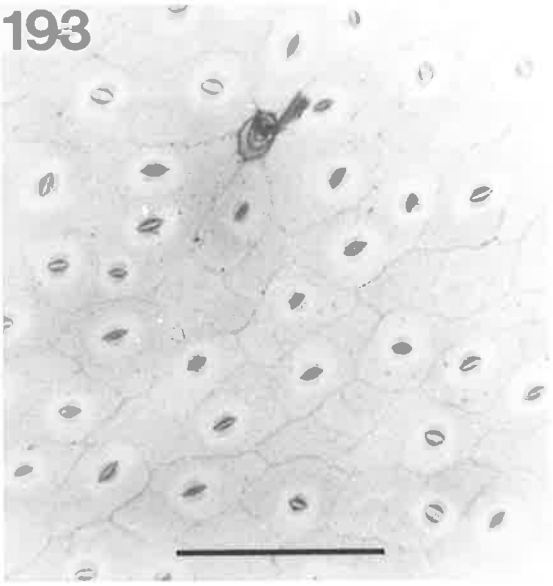
FIGURE 196. *S. rubrisquamata.*
Upper cuticle from holotype Brass 4878.

FIGURE 197. *S. samarensis.*
Upper cuticle from specimen Ramos 1693.

192



193



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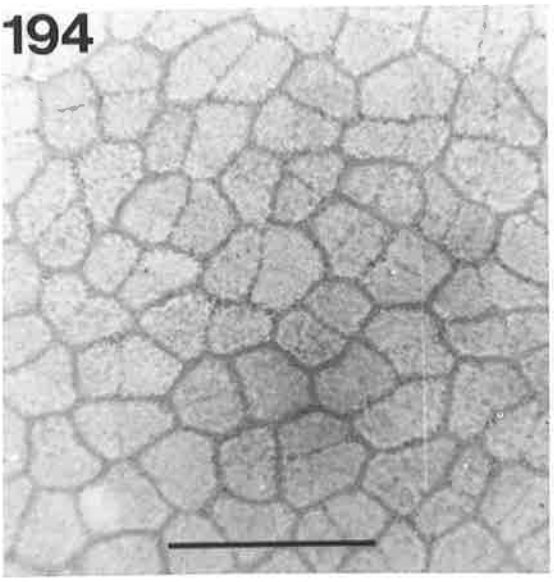

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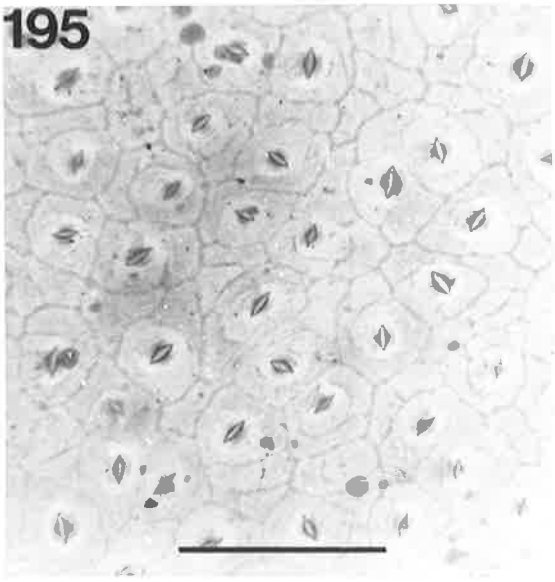

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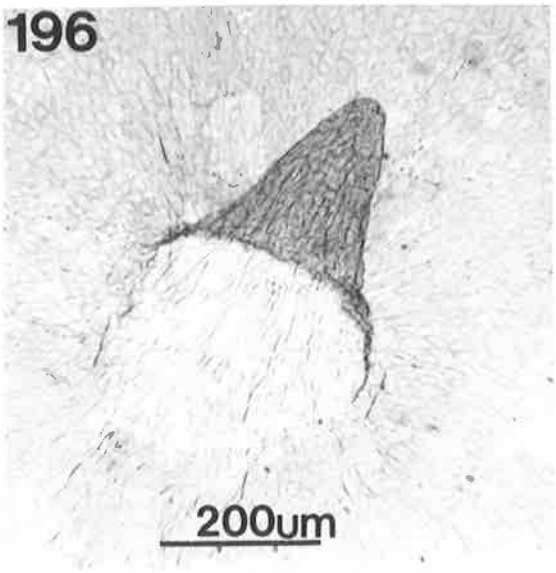

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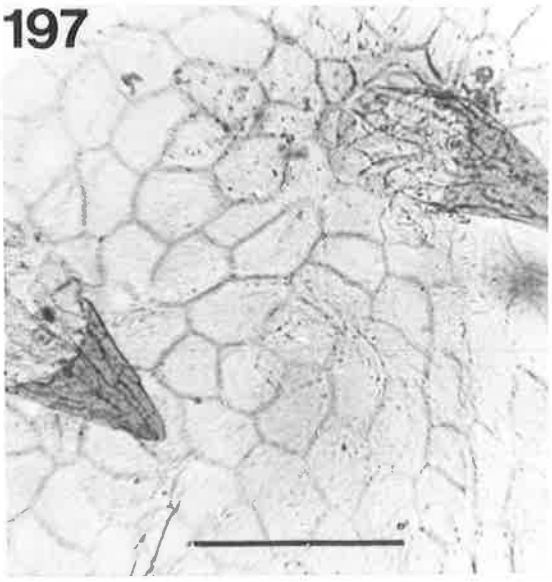


FIGURE 198. *S.* aff.*scaberrima.*
Lower cuticle from specimen Brass 12193.

FIGURE 199. *S.* aff.*scaberrima.*
Upper cuticle from same specimen.

FIGURE 200. *S. schmutzii.*
Lower cuticle from specimen Hoogland 12652 with tufted hairs.

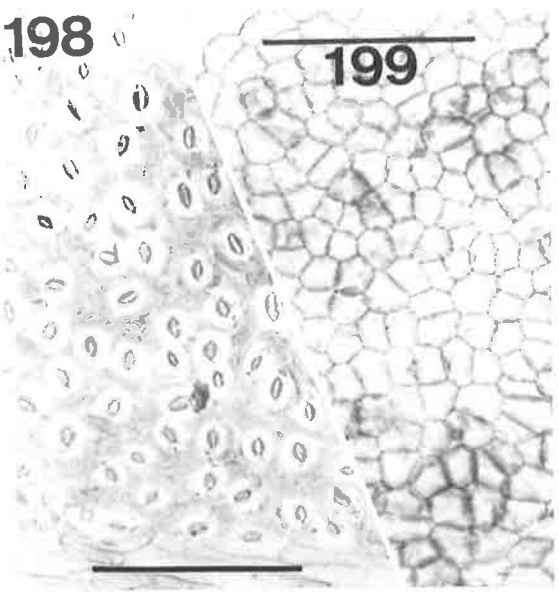
FIGURE 201. *S. schmutzii.*
Upper cuticle from same specimen with a simple hair base.

FIGURE 202. *S. sparsiflora.*
Upper cuticle from specimen Santos 31857.

FIGURE 203. *S. tafana.*
Upper cuticle from specimen Ridsdale and Woods 36905 with long setae.

FIGURE 204. *S. tafana.*
Lower cuticle from same specimen.

FIGURE 205. *S. vulcani.*
Upper cuticle from specimen Krukoff 4417.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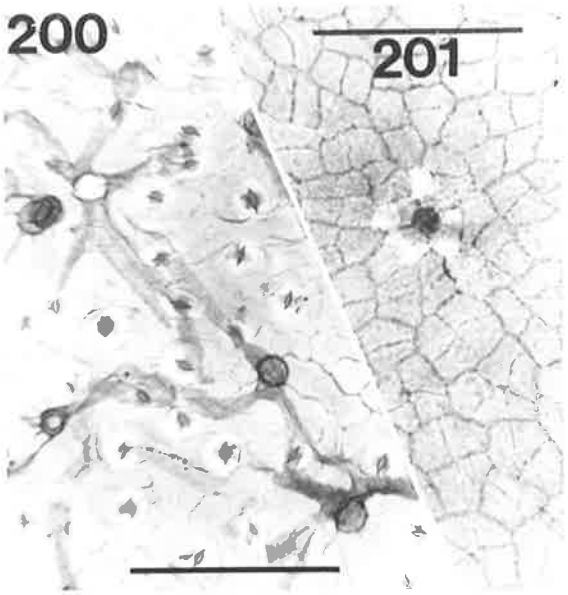
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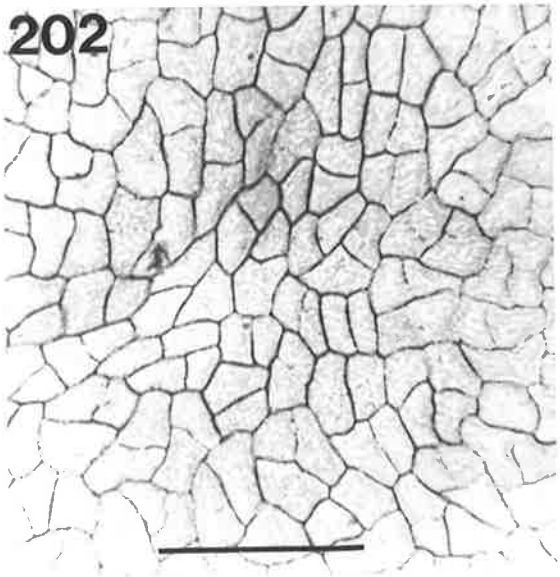
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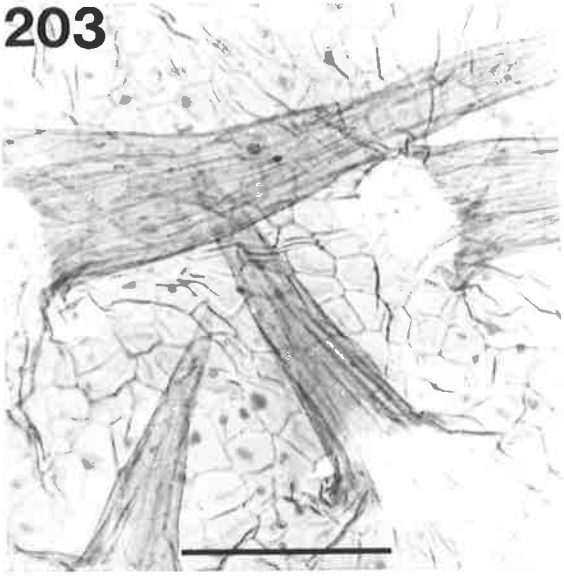
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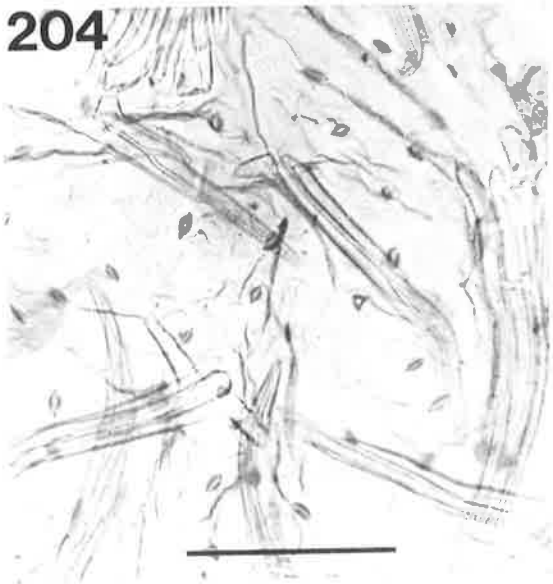
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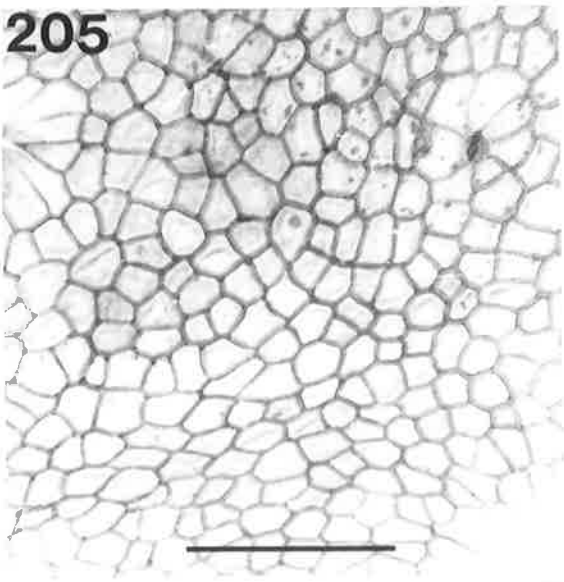
205

APPENDIX 9. LEAF ILLUSTRATIONS.

The leaves of *Saurauia* species are illustrated in this section. The leaf figured for each species was chosen to most closely represent the "mean" leaf for the sample of specimens seen in this study. Wherever possible leaves are illustrated by a composite figure, where half of the leaf has been drawn and the other half is represented by a photograph. Some leaves are given only as drawings. In such cases the poor resolution of veins and hairs on the original photograph did not warrant its inclusion. Drawings have been made directly onto photographs and the background image, then chemically bleached. All secondary veins have been drawn. Only those tertiary veins which could be interpreted unambiguously have been included. In cases where all the tertiaries were clearly visible, a representative field has been illustrated. No attempt has been made to reproduce higher vein orders. Incomplete leaves have been included only where they represent the best available material. For example the only specimen I have seen of *S. ampla* bore a single fragmentary leaf illustrated in figure 211.

All leaf illustrations are reproduced at half natural size. Figure legends include collector or herbarium numbers of illustrated specimens.

FIGURE 206. *S. actinidifolia.*
Chew, Corner and Stainton 1045.

FIGURE 207. *S. acuminata.*
Elmer 20981.

FIGURE 208. *S.* aff. *agamae.*
Chew, Corner and Stainton 241.

FIGURE 209. *S. albiflora.*
Holotype, Brass 11767 (BRI 8547).

FIGURE 210. *S. alpicola.*
Brass 9140.

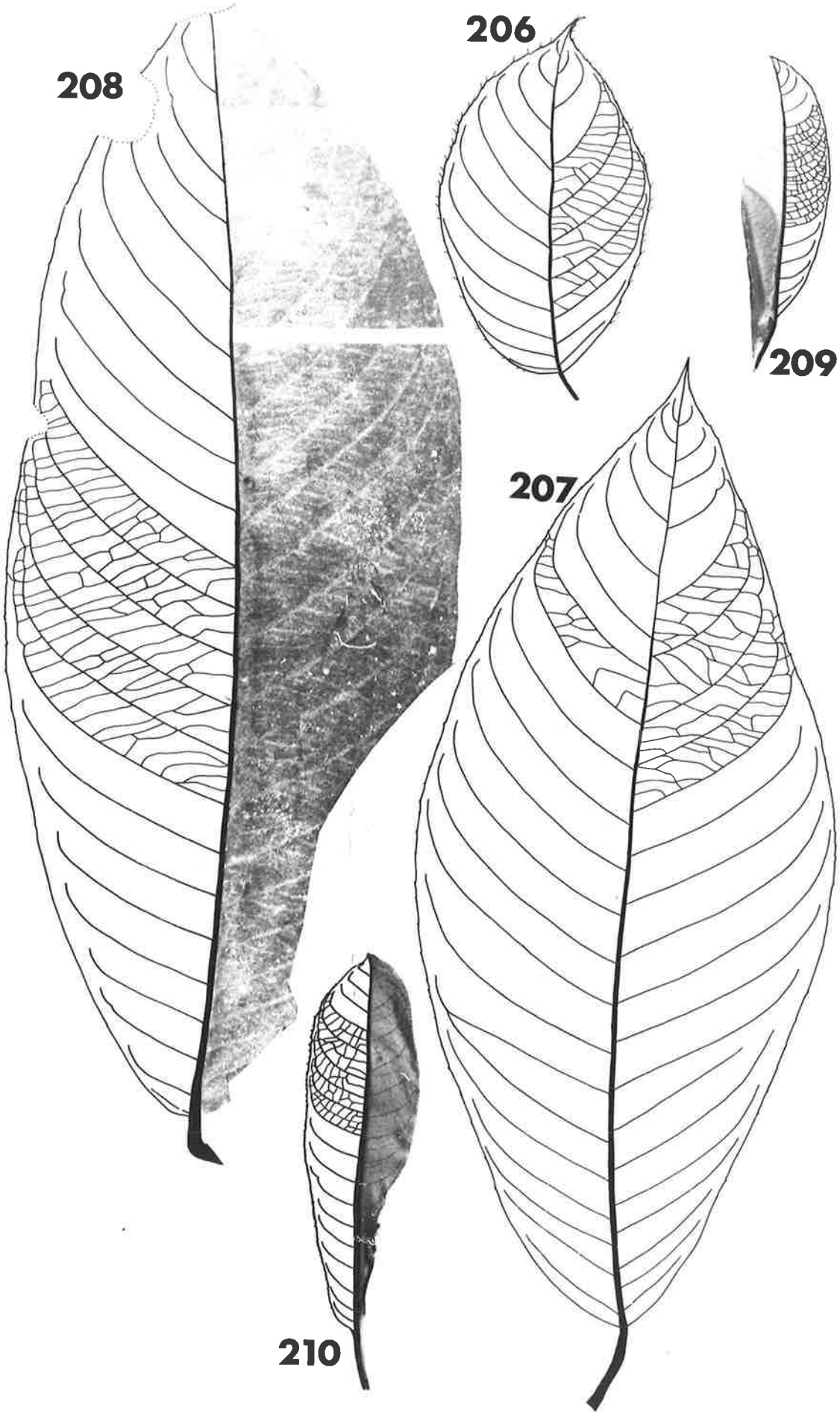
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FIGURE 211. *S. ampla.*
Isotype, Ramos 1694.

FIGURE 212. *S. andreana.*
BRI 191029.

FIGURE 213. *S. arcana.*
Holotype, Brass 12034 (BRI 10238).

FIGURE 214. *S. archboldiana.*
Holotype, Brass 11231. (BRI 8546).

FIGURE 215. *S. avellana.*
Edâno 6820.

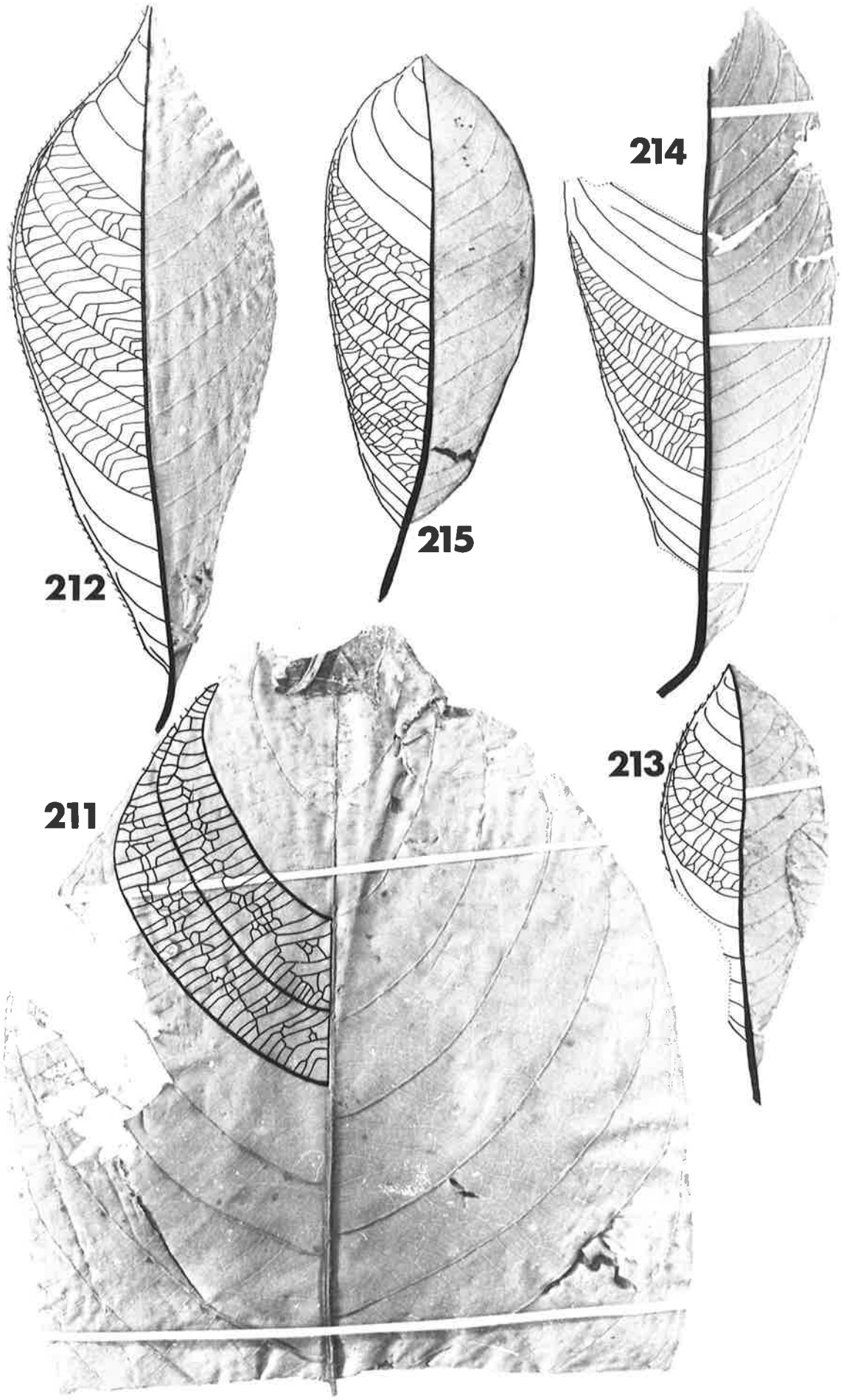
214
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FIGURE 216. *S. bakeri.*
Ramos and Edâno 28536.

FIGURE 217. *S. bifida.*
Hartley 9628.

FIGURE 218. *S. bracteosa.*
Hoogland 12381.

FIGURE 219. *S. brassii.*
Brass 5624.

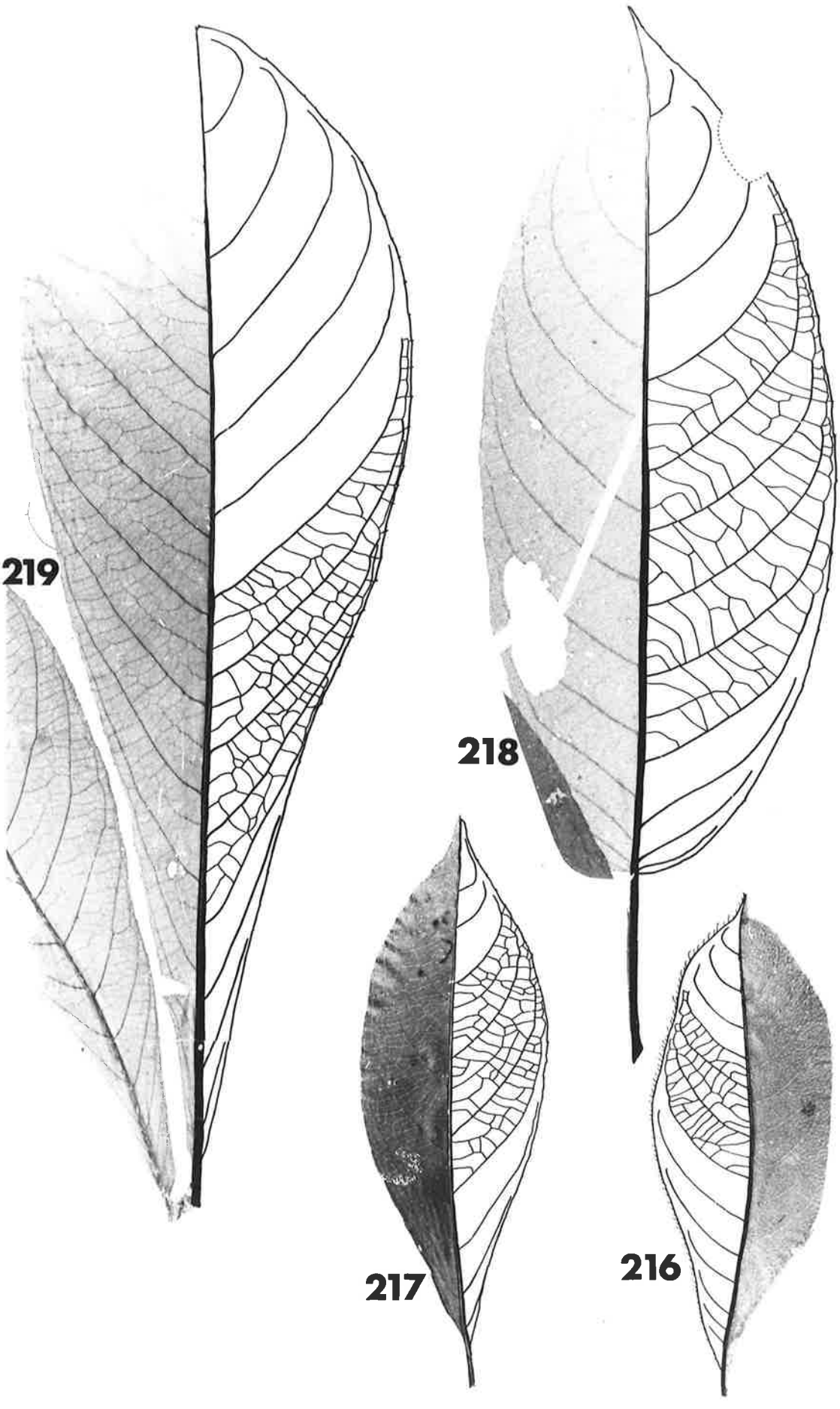
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FIGURE 220. *S. capitulata.*
Holotype, Brass 10698.

FIGURE 221. *S. cauliflora.*
Hoogland 12359.

FIGURE 222. *S. clementis.*
Ramos and Edâno 30697.

FIGURE 223. *S. conferta.*
Brass 7335.

FIGURE 224. *S. congestiflora.*
Craven and Schodde 1423.

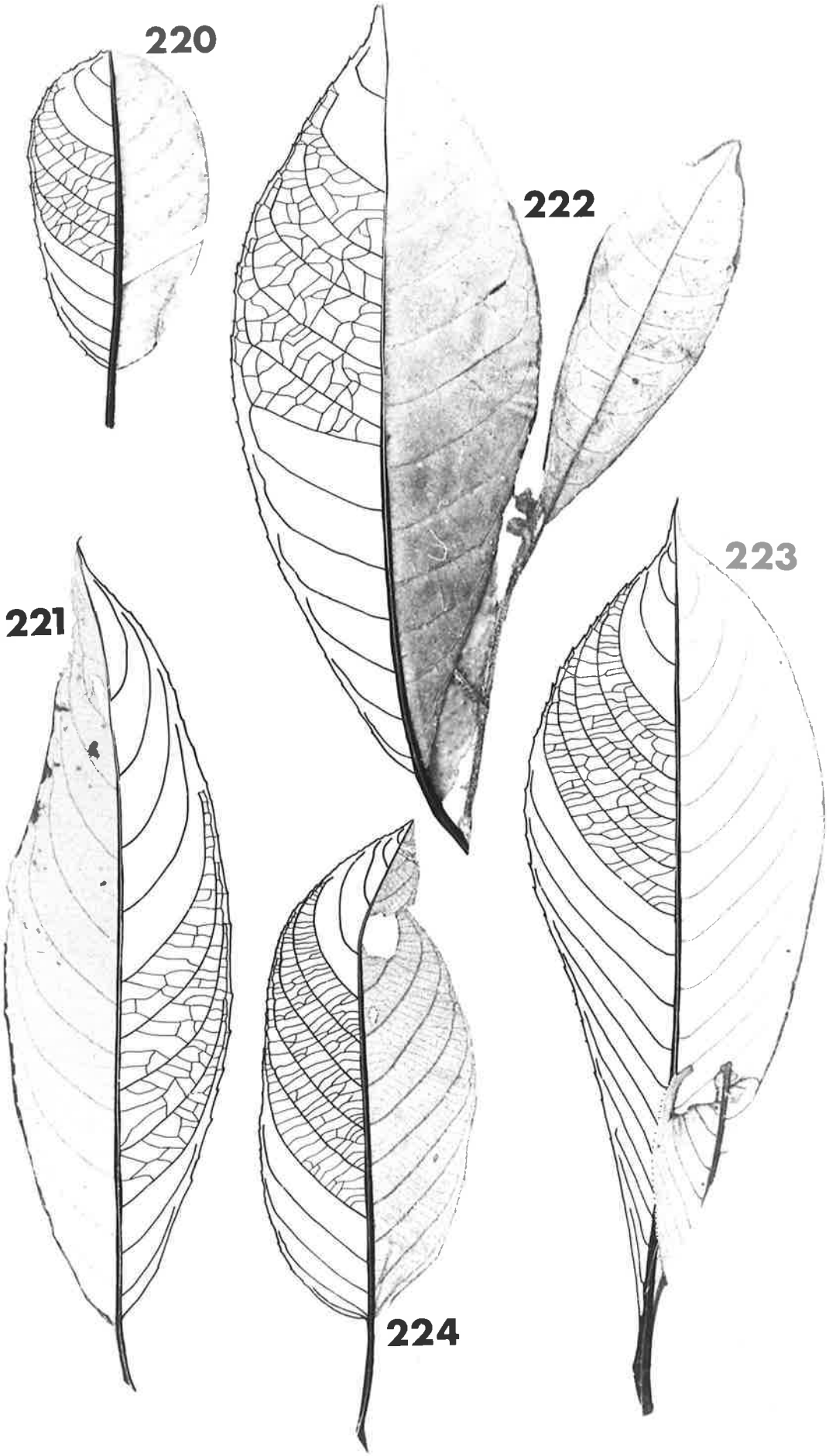
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FIGURE 225. *S. dielsiana.*
Isotype, Brass 5414 (BRI 8550).

FIGURE 226. *S. distasosa.*
Hoogland 12368.

FIGURE 227. *S. dufaurii.*
Carr 12005.

FIGURE 228. *S. eburnea.*
Isotype, Brass 4872 (BRI 8552).

FIGURE 229. *S.* aff. *egregia.*
Hartley 11731.

FIGURE 230. *S. elegans.*
Ramos 33204.

FIGURE 231. *S. emarginata.*
Womersley and Millar NGF 8501.

FIGURE 232. *S. excurrens.*
Holotype, Brass 13265 (BRI 8551).

FIGURE 233. *S. excurrens.*
Inset of same specimen.

FIGURE 234. *S. ferox.*
Richards 1067.

FIGURE 235. *S. fimbriata.*
Brass 13394.

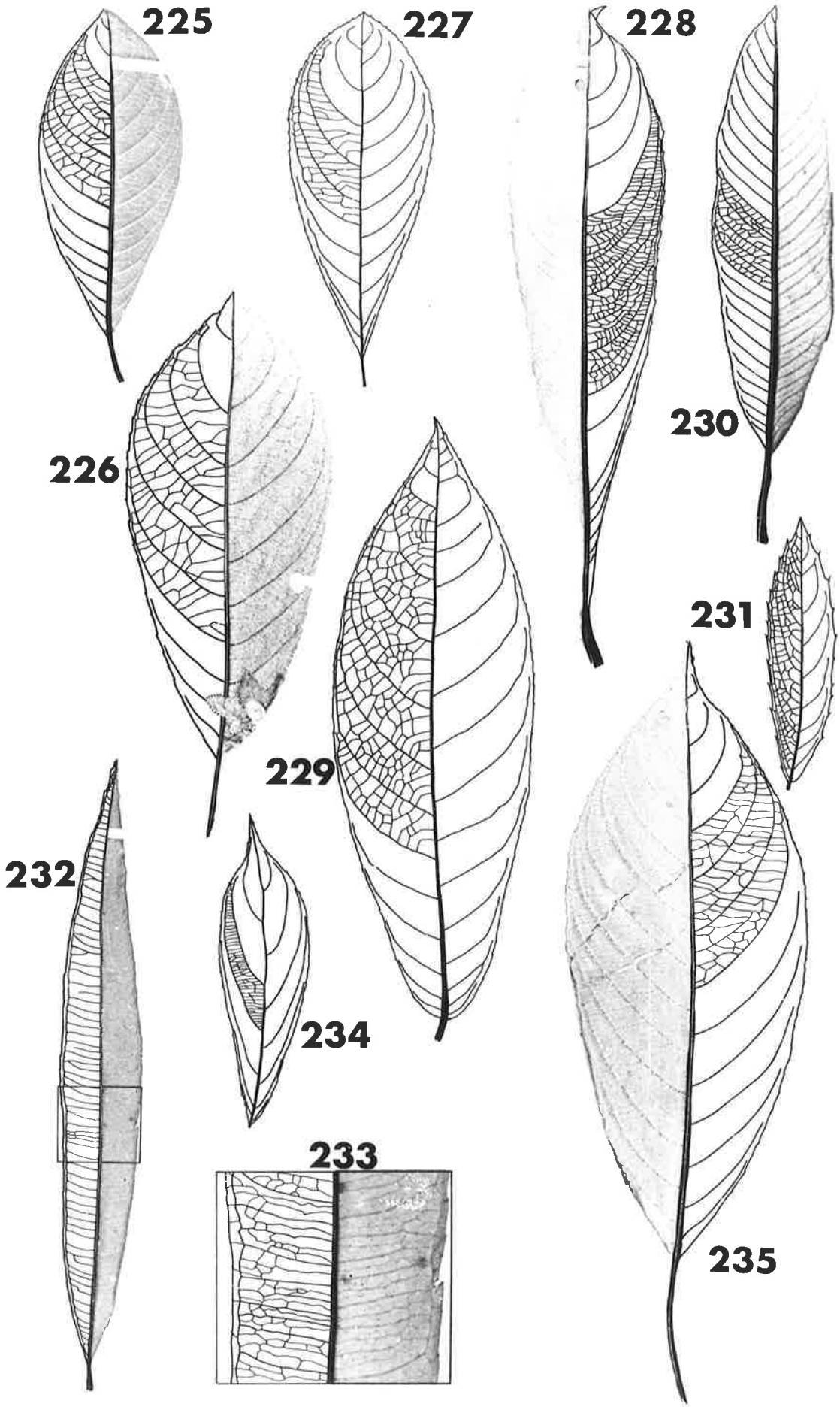
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FIGURE 236. *S. fragrans.*
Hoogland 12572.

FIGURE 237. *S. gjellerupii.*
Kalkman 3393.

FIGURE 238. *S. glabrifolia.*
Edâno 6703.

FIGURE 239. *S. gracilipes.*
Sablaya 104.

FIGURE 240. *S. griffithii.*
Hoogland 12610.

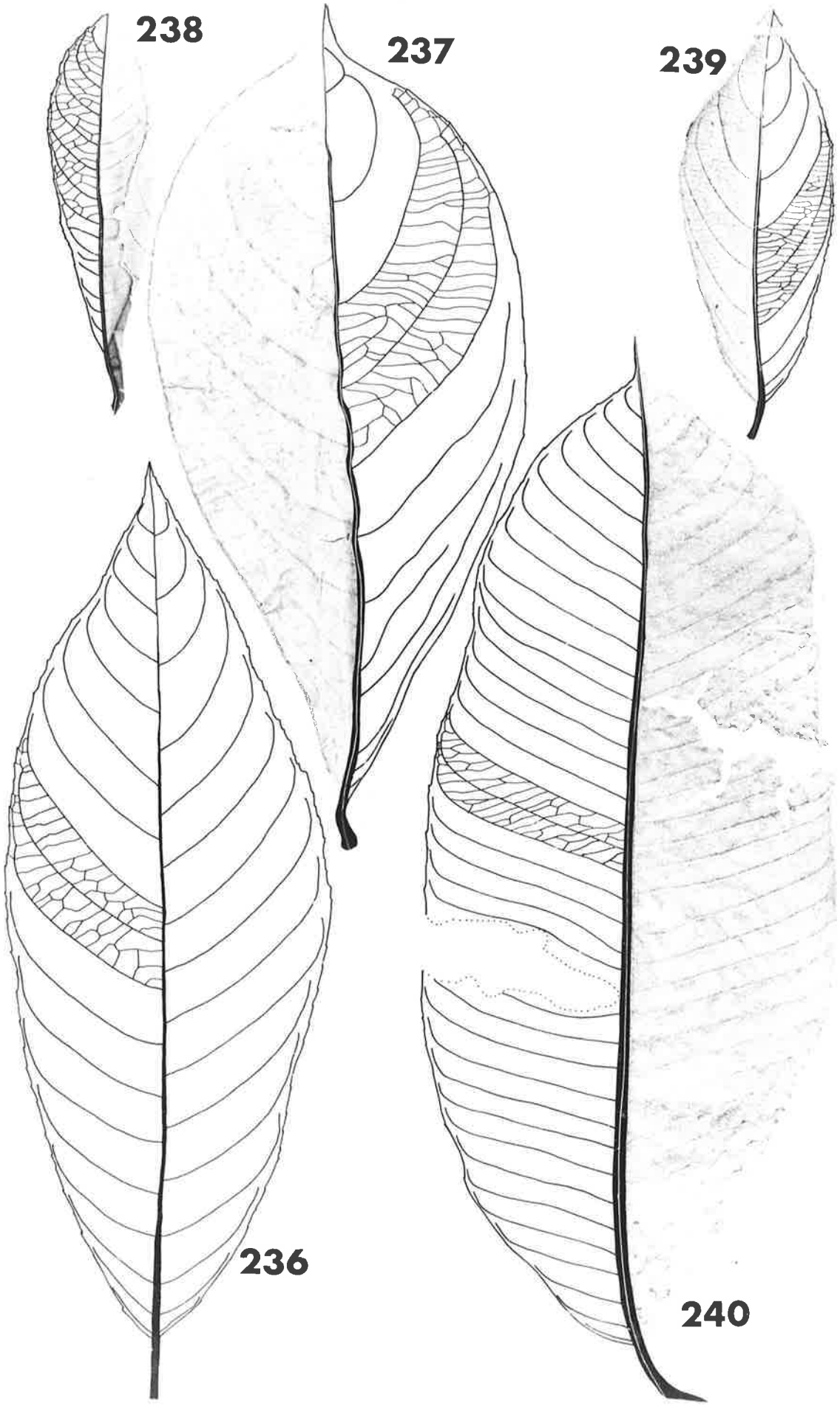
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FIGURE 241. *S. grandis.*
Henderson 23573.

FIGURE 242. *S. holotricha.*
Hartley 11590.

FIGURE 243. *S. horrida.*
Cuadra A2283.

FIGURE 244. *S. javanica.*
Hoogland 12364.

FIGURE 245. *S. kajewskii.*
Isotype, Kajewski 1726 (BRI 8553).

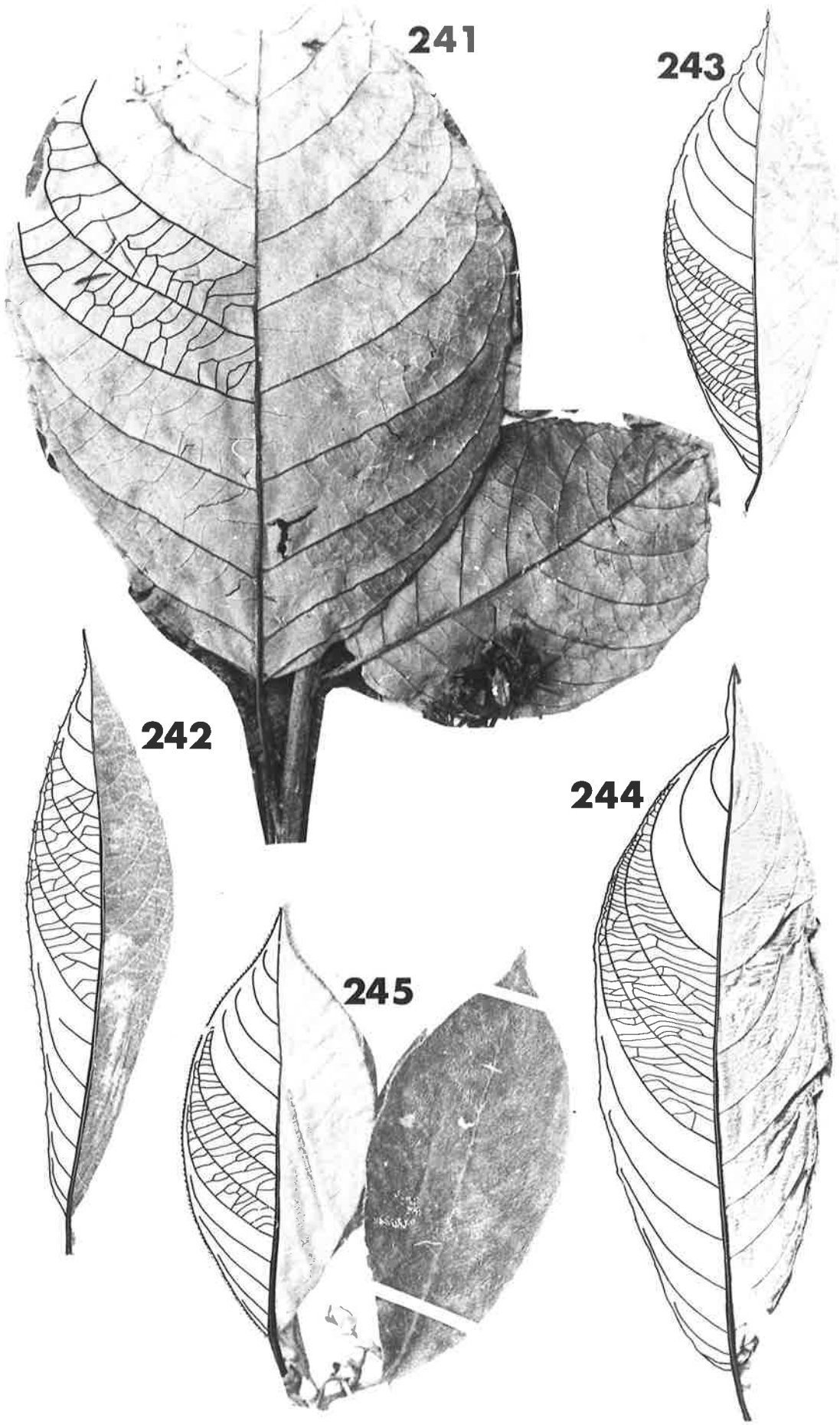
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FIGURE 246. *S. lanceolata.*
Hoogland 12377.

FIGURE 247. *S. latibracteata.*
Ramos 1841.

FIGURE 248. *S. laxa.*
Ramos and Deroy 22645.

FIGURE 249. *S. leprosa.*
Hoogland 12597.

FIGURE 250. *S. leytensis.*
Ramos and Pascasio 35124.

FIGURE 251. *S. luzoniensis.*
Baker 3634.

FIGURE 252. *S. macrantha.*
Holotype, Brass and Versteegh 19497, (BRI 8554).

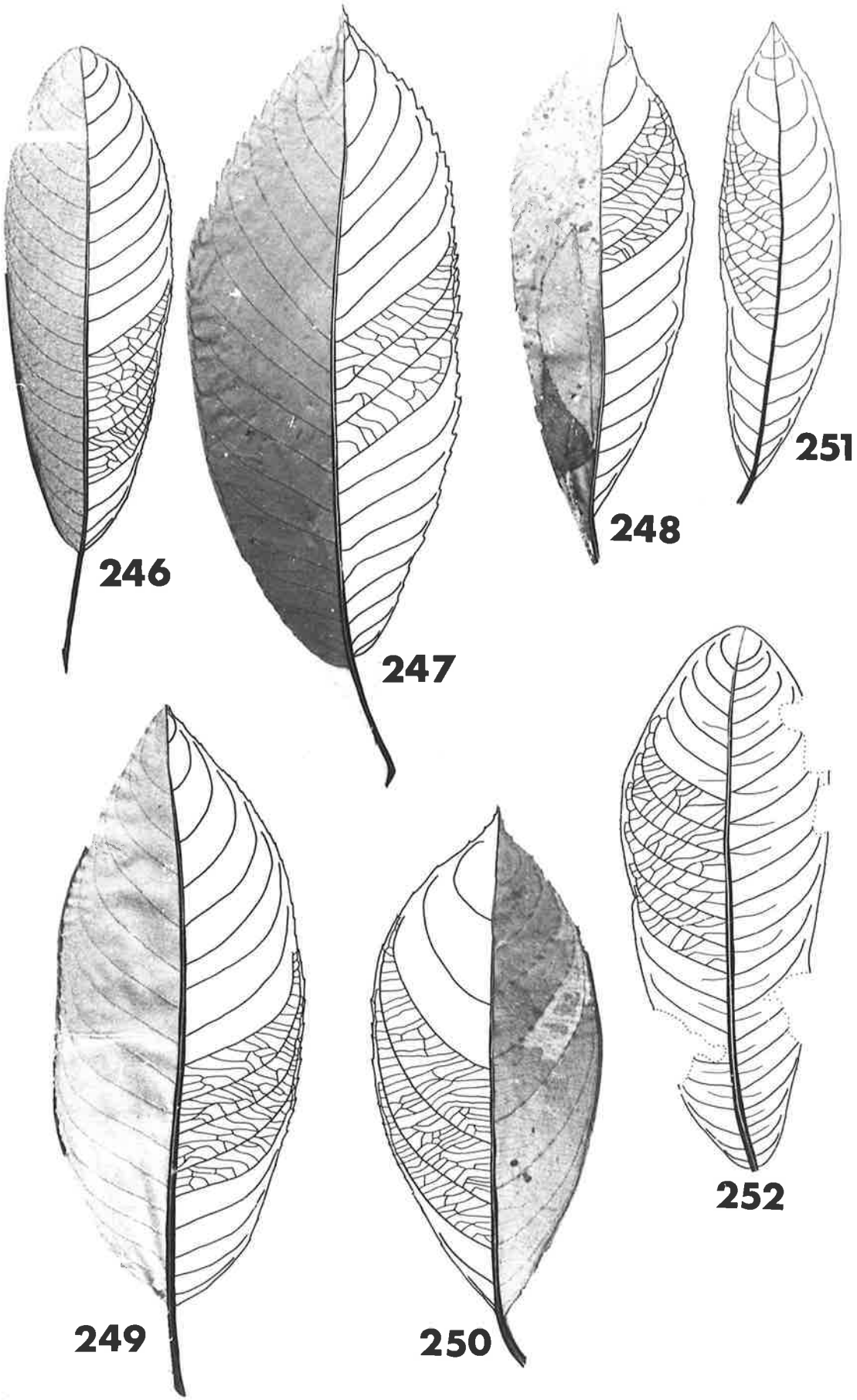
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FIGURE 253. *S. mahmudii*
Hoogland 12579.

FIGURE 254. *S. malayana.*
Hoogland 12588.

FIGURE 255. *S. matthewsii.*
Elmer 20885.

FIGURE 256. *S. merrilliii.*
Ramos 1692.

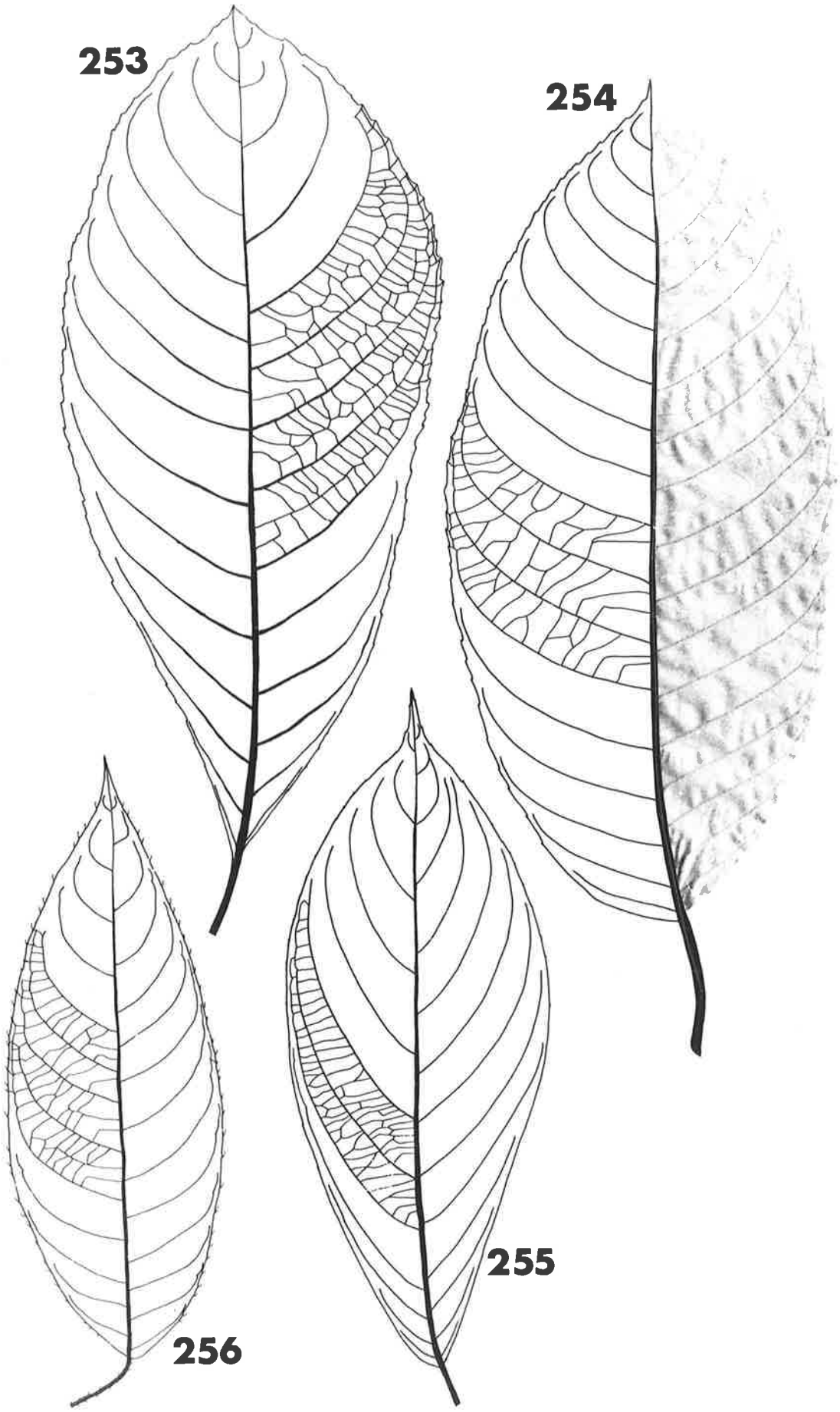
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FIGURE 257. *S. napaulensis.*
Hoogland 11566.

FIGURE 258. *S. nudiflora.*
Van Balgooy 2680.

FIGURE 259. *S. oblancilimba.*
Sulit 7686.

FIGURE 260. *S. occulta.*
Brass 12063.

FIGURE 261. *S. panayensis.*
Martelino and Edâno 35306.

FIGURE 262. *S. papillulosa.*
Celestino 7927.

FIGURE 263. *S. pendula.*
Hoogland 12374.

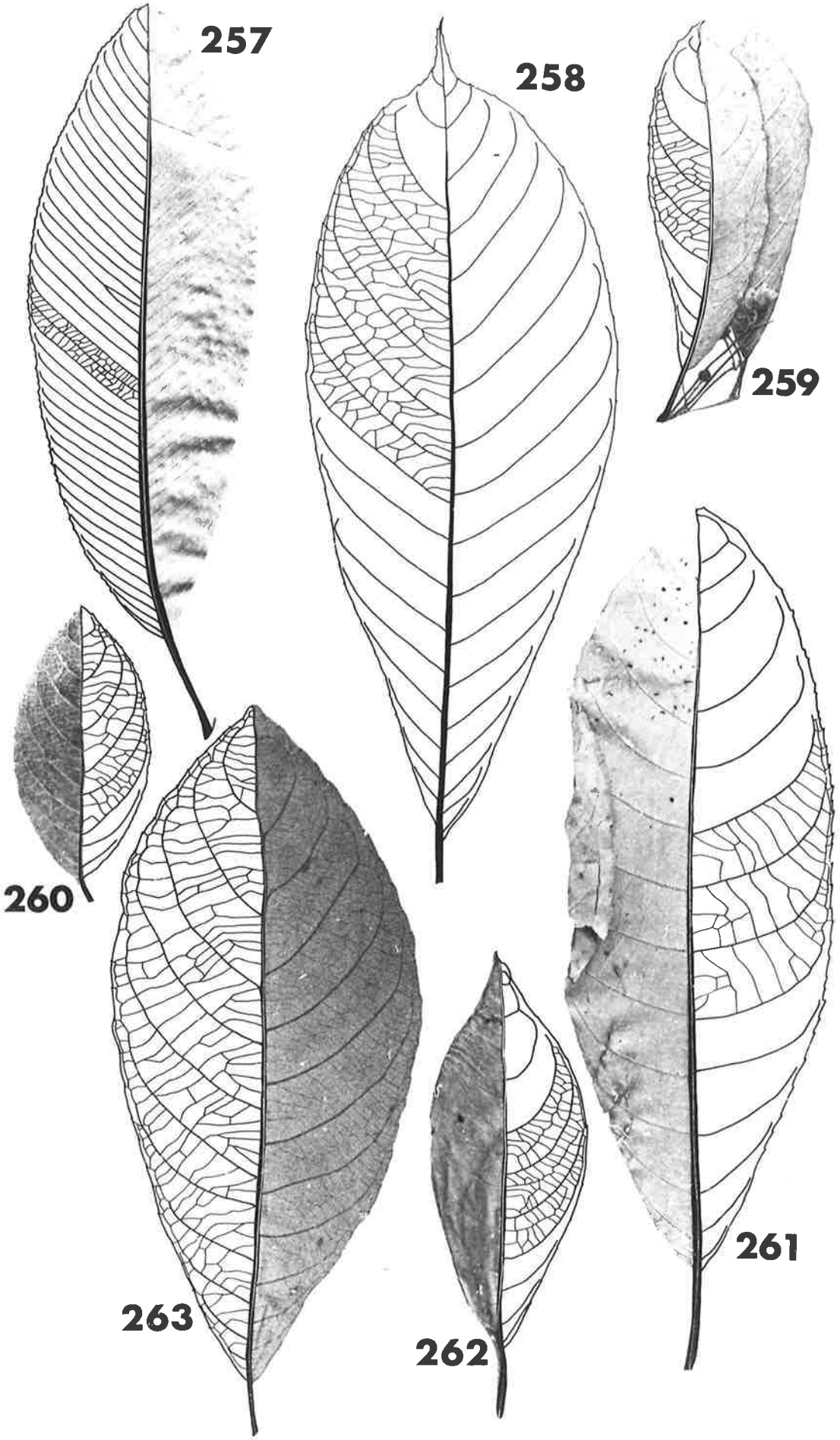
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FIGURE 264. *S. planchonii.*
Native collector 1277.

FIGURE 265. *S. pleurotricha.*
Brass 6851.

FIGURE 266. *S. polyosma.*
Celestino 7836.

FIGURE 267. *S. polysperma.*
Ramos 33123.

FIGURE 268. *S. purgans.*
Ridsdale and Lavarack 31582
(BRI 123832).

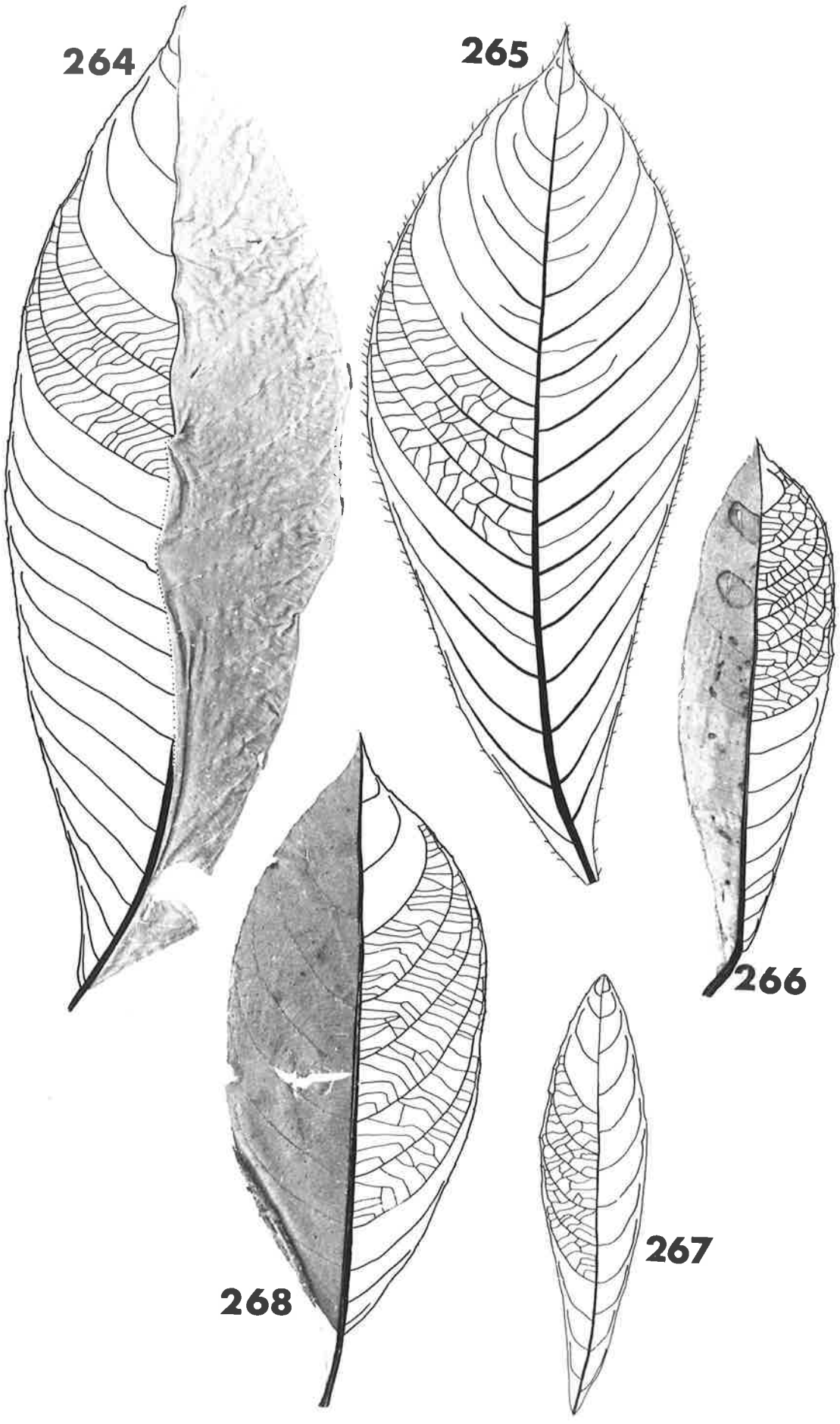
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FIGURE 269. *S. pentapetala.*
Hoogland 12601.

FIGURE 270. *S. pentapetala.*
Hoogland 12574.

FIGURE 271. *S. poolei.*
Hoogland 4428.

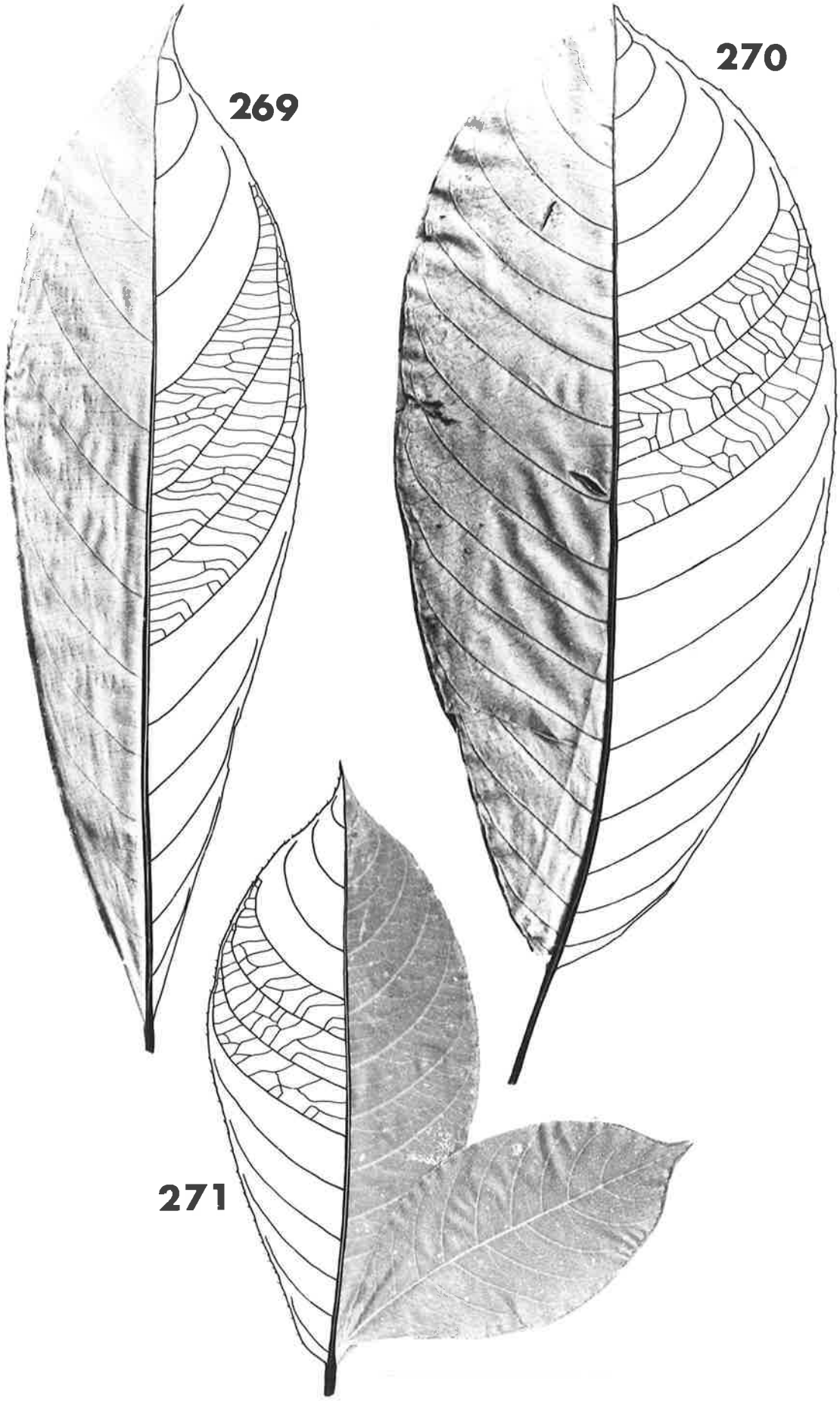
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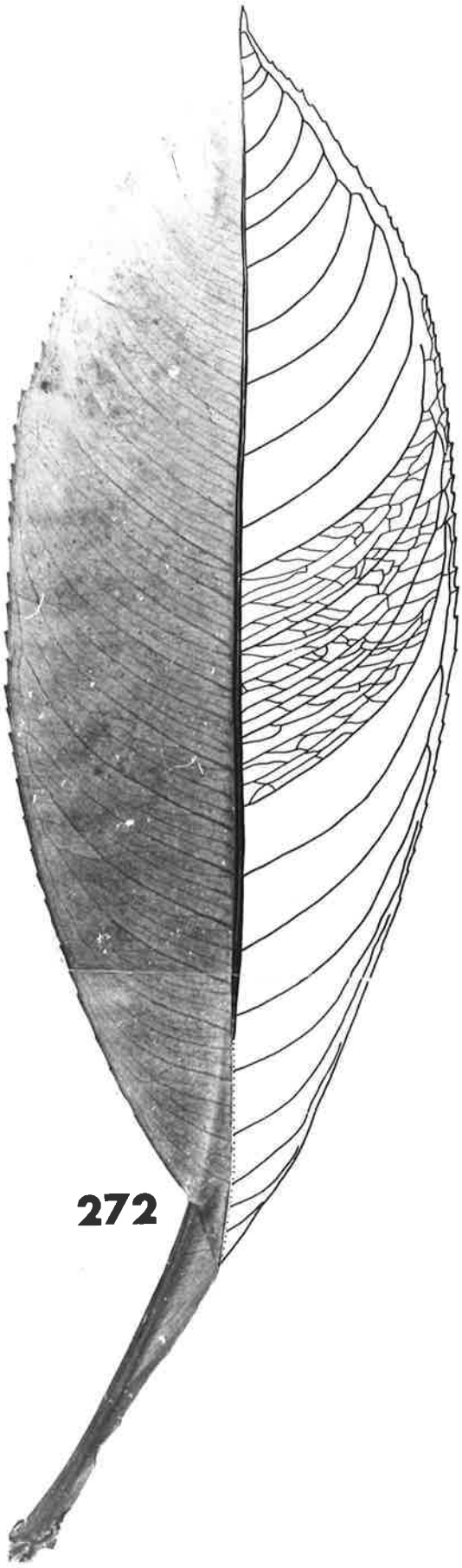
FIGURE 272. *S. plurilocularis.*
Womersley and Millar 8330.

FIGURE 273. *S. punduana.*
J.D. Hooker 62C.



272

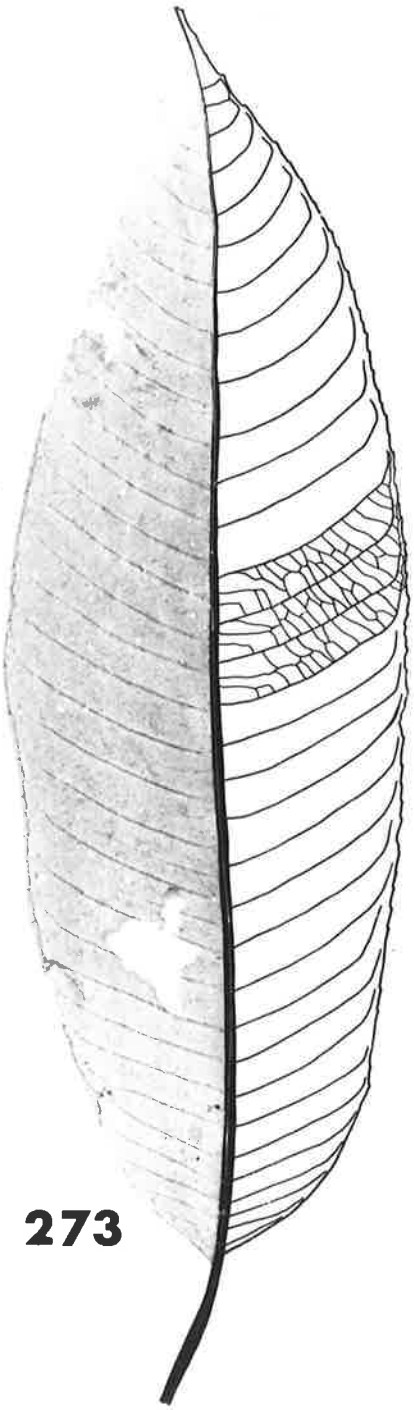


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FIGURE 274. *S. reinwardtiana.*
Herb. Lugd. Bat. 65.

FIGURE 275. *S. roxburghii.*
Hoogland 12599.

FIGURE 276. *S. rubens.*
Hoogland 12567.

FIGURE 277. *S. rubicunda.*
Smith 6909.

FIGURE 278. *S. rubrisquamata.*
Brass 4878 (BRI 8542).

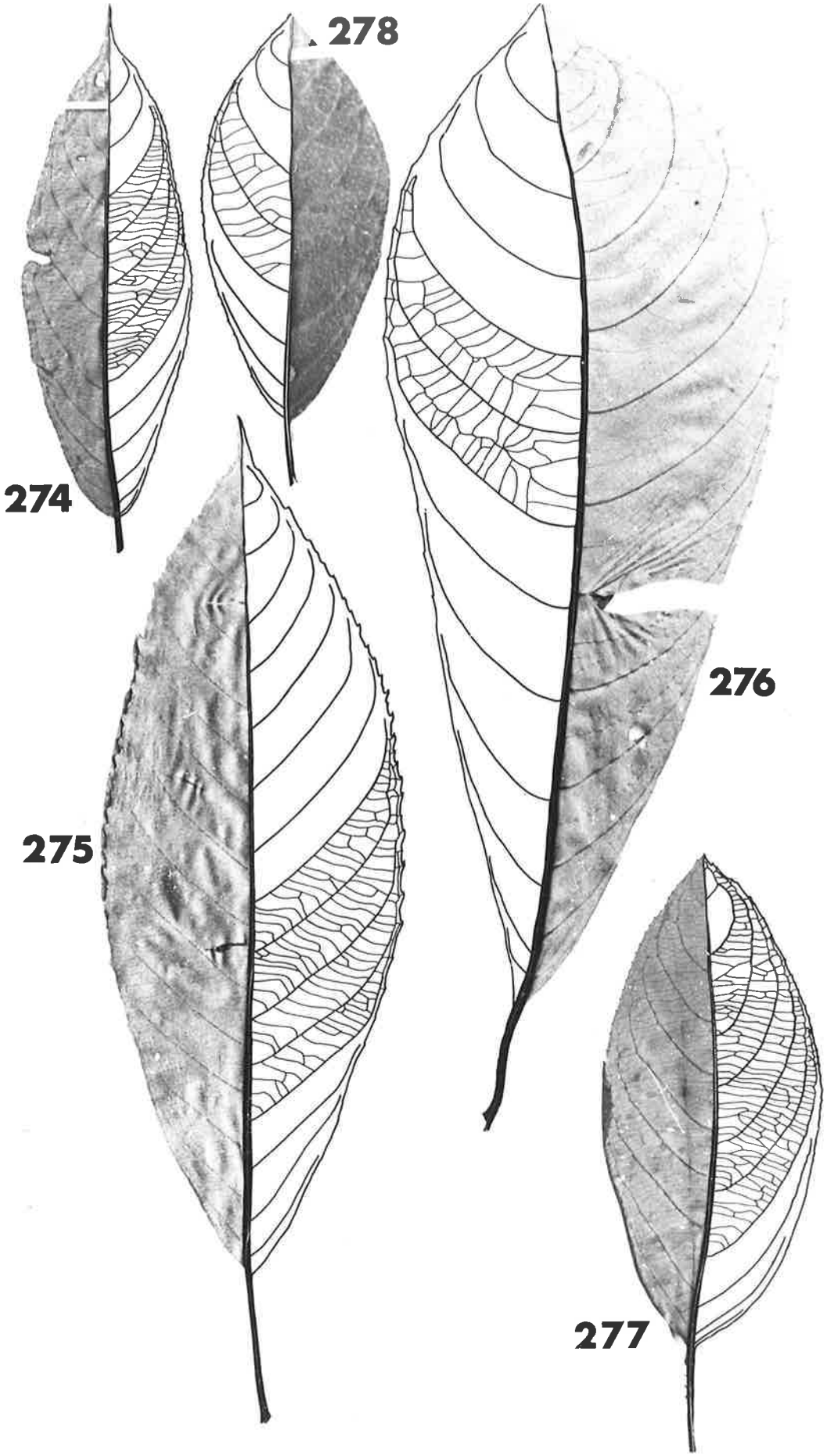
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FIGURE 279. *S. samarensis.*
Ramos 1693.

FIGURE 280. *S.* aff. *scaberrima.*
Brass 12193.

FIGURE 281. *S. schmutzii.*
Hoogland 12652.

FIGURE 282. *S. schumanniana.*
Hoogland 3913.

FIGURE 283. *S. sparsiflora.*
Santos 31957.

FIGURE 284. *S. stichophlebia.*
Van Leeuwen 9332.

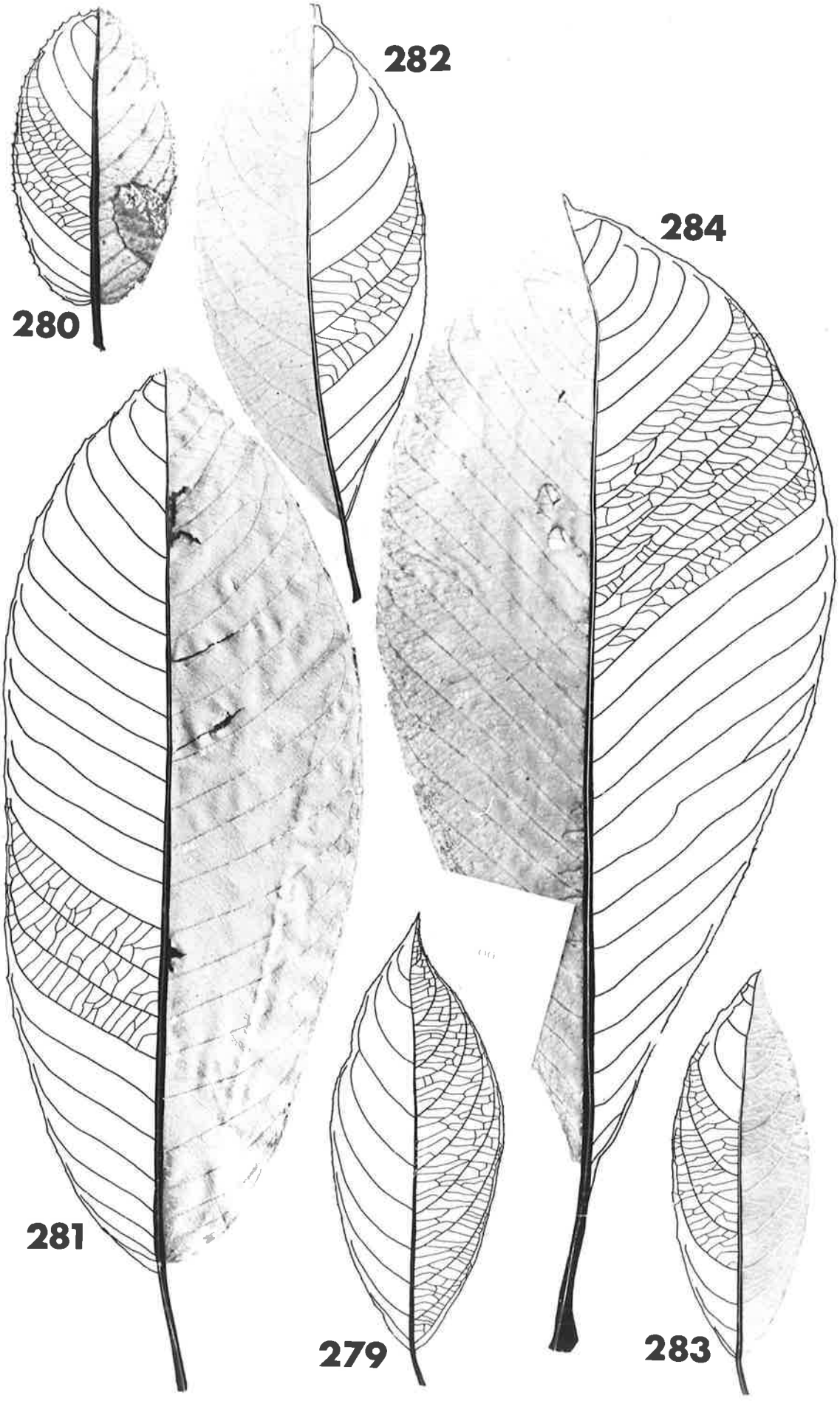
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FIGURE 285. *S. subspinosa.*
Forrest 25084.

FIGURE 286. *S. tafana.*
Isotype, Brass 4963 (BRI 8544).

FIGURE 287. *S. tristyla.*
Lorzing 11865.

FIGURE 288. *S. vallium.*
Holotype, BRI 8543.

FIGURE 289. *S. verheyenii.*
Hoogland 12648.

FIGURE 290. *S. xiphophylla.*
Hartley 9832 (CANB 127945).

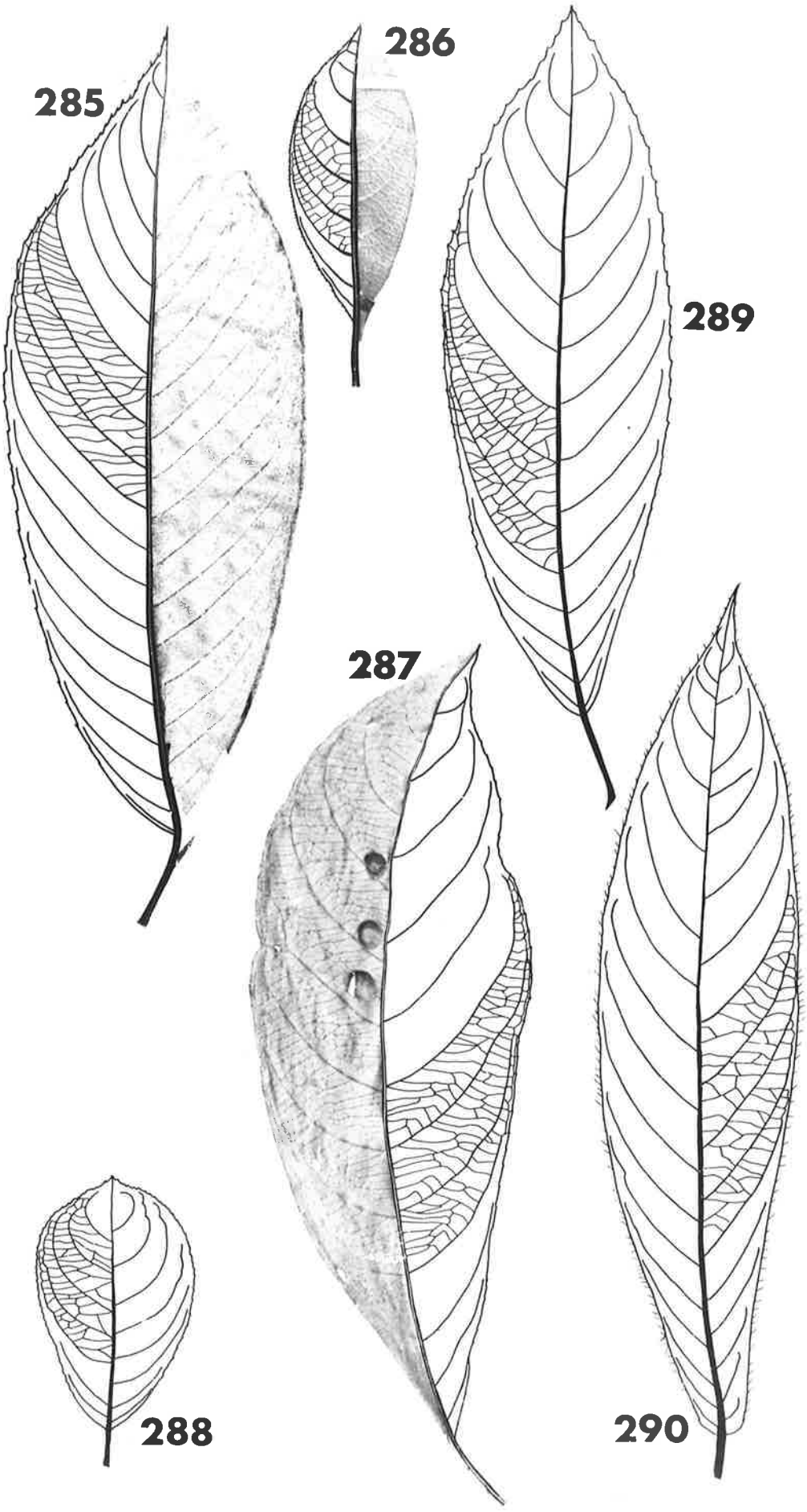
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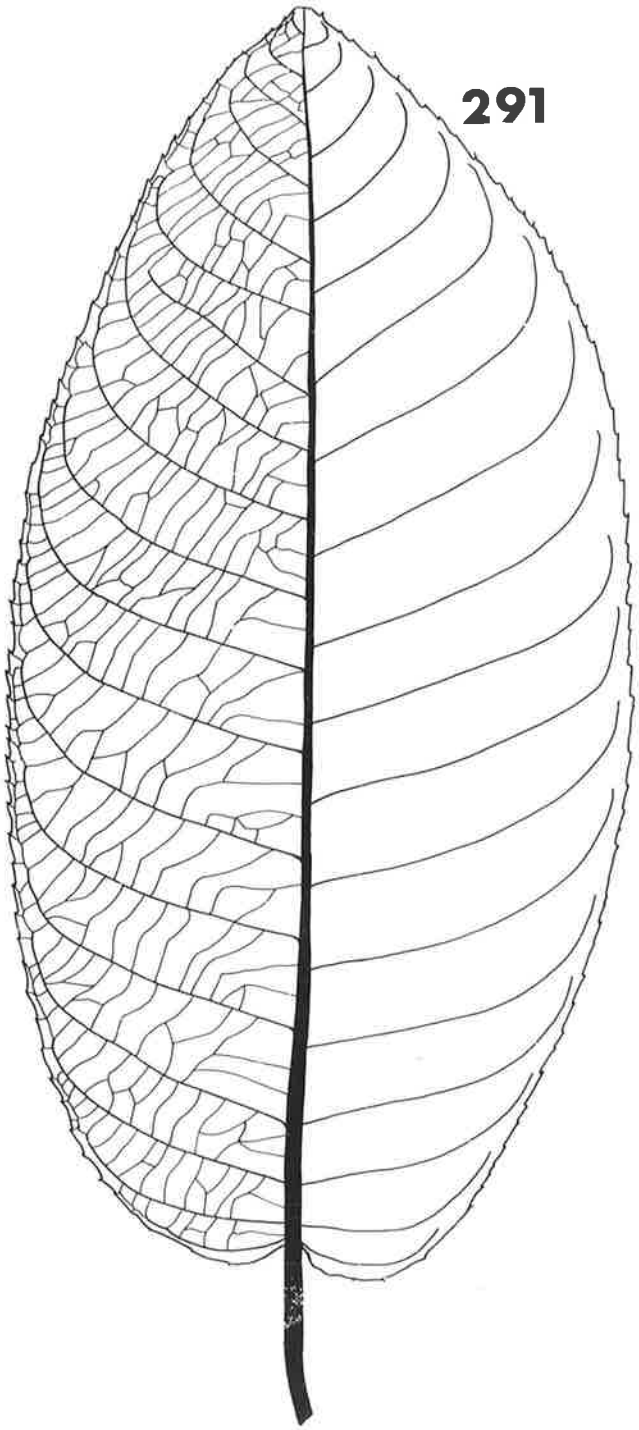
FIGURE 291. *S. vulcani.*
Hoogland 12582.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APPENDIX 10

Annotated bibliography of *Saurauia*

In this section is contained a list of all names ever applied to species of *Saurauia*, that I have been able to trace. The literature for both New and Old World species has been carefully surveyed. As far as possible synonymy has been noted. For the most part judgements of synonymy not previously recorded are made on nomenclatural grounds, rather than taxonomic ones. Each species is listed in the following format. Firstly a number is allocated to all nomenclaturally valid names. Species lacking a number are therefore invalid whether for reasons of prior publication or synonymy. Secondly the author and original place of publication is given. This is followed by a list of synonymous names where applicable. Where an invalid name is synonymous it is listed as "=" the synonymous species. Valid species contain a list of synonymy prefixed by "Syn.". Following this is a list of geographical locations from where the species has been recorded. In general, locations are given only as country, but where a collection has come from a particularly well collected or well known location, this is given as well, e.g. Java, Tjibodas! Where a discussion of synonymy or taxonomy is thought necessary, this is next included. The final item for those species studied in this project is a list of nearest neighbour species and the value of the mulistate similarity index (I_D) for each pair. This indicates, based on type descriptions, the morphologically most similar species to the listed species. The similarity index is discussed in detail in Chapter 2. Journal citations follow standard practice.

The order of the bibliography as a whole is (a) general references to family usage, (b) obsolete generic names, and (c) the species name and literature list. Invalid species names are prefixed by an asterisk.

Bibliography

Families

Actinidiaceae: Smith, J. Arn.Arb. 22:497-528, 1941. Dickison, J. Mitchell Soc. 88:43-54, 1972. Keng.: Fl.Thail. 1:109-111, 139-141, 1972. Agostini: Acta Bot.Venez. 9:265-266, 1973, Taxon. 7:4, 1958, 8:198, 1959, 9:161, 1960, 18:336, 1969, 20:822, 1971.

Saurauiaceae: Taxon. loc.cit.

Ternstroemiaceae: Baillon.Nat.Hist.Pl. v4.242-243, 1875. Henderson.Gard.Bull.St.Settlem. 4:211-361, 1928. Caius.J.Bombay.Nat.Hist.Soc. 42:617-639, 1941. Plus many others.

Saurauia: Gilg. in Engl.Prantl. Naturl. Pflanzenfam. III.6: 125-128. Taxon. 4:188, 1955, 20:822, 1971. Hunter Ann.Miss.Bot.Gnd. 53:57-58, 1966. Hoogl. Gard.Bull. 30:111, 1977.

Saurauja: Taxon. 17:334, 1968, 20:822, 1971.

Sauravia: Taxon. 17:334, 1968.

Genera

SAURAUIA Willd., Ges.Naturf.Fr.(Berlin) Neue Schr. 3:407, 1801. Type: S. excelsa Willd.

Acrotrema Jack, ex Busc., Malphigia 25:187, 1912.

Apatelia DC., Mem.Soc.Phys.Geneve 1:426, 1821.

Blumia Spreng., Syst.Veg. 3:126, 1826, nom.nud.pro syn.

Cleyera Moc.& Sesse., ex Busc., Malphigia 25:187, 1912.

Davya Moc.& Sesse., ex DC.Prodr. 1:525, 1822, nom.nud.pro syn.

Draytonia A. Gray, U.S. Expl.Exped. 1:206,t.15, 1854. Type D.rubicunda A. Gray.

Eurya Thunb., ex Busc., Malphigia 25:187, 1912.

Freziera Sw., ex Busc.loc. cit.

Letstomia Ruiz & Pav., ex Busc., Malphigia 25:187, 1912.

Leucothea Moc. & Sesse., Mem.Soc.Phys.Geneve 1:419, 1821, nom.nud. pro syn.

Marumia Reinsw., ex Blume, Cat.Gew.Buitenz. 79, 1823. Type M.cauliflora Reinw. ex Blume.

Obelanthera Turcz., Bull.Soc.Nat.Mosc. 20(1):148, 1847. Type O. melastomacea Turcz.

Overstratia Deschamps, Benn.Pl.Jav.Rar. 171, 1840, nom.nud.

Palaua Ruiz & Pav., Fl.Peruv.Chil.Prodr. 100, t.22, 1794, non Cav. 1785. Type P.lanceolata Ruiz & Pav.

Reinwardtia Bl., ex Nees, Syll.Ratisb. 1:96, 1824, non Dum. Type P.javanica Bl. ex Nees.

Sauramia (Auct.) ex Busc., Malphigia 25:187, 1912.

Sauravia Spreng., Anleit II, 2:818, 1818

Sauravia Juss., ex Busc., Malphigia 25:187, 1912.

Scapha Noronha, Verh.Batav.Gen.5, ed1, Art. 4:3, 1770, nom.nud.

Synarrhena F.Muell., Fragm. 5:175, 1866, nom.nud.pro syn.

Tonshia Buch.-Ham. ex D.Don, prodr.Fl.Nep. 225, 1825. Type T.polypetala Buch.-Ham. ex D.Don.

Trematanthera F.Muell., Vict.Natural. 3:71, 1886. Type T.dufaurii F.Muell.

Trochostygma Sieb.Zucc. ex Busc., Malphigia 25:187, 1912.

Vanalphimia Lech. ex DC., Mem.Soc.Phys.Genev. 1:419, 1821.

Species

1. achyrantha Diels, Bot.Jahrb. 57:457, 1922. P.N.G.:Sepik! Diels in Lautbch, Beitr.z.Fl.v.Papuasien 8:443; A.C. Smith, J.Arn.Arb. 22:522, 1941. N.n.naumanii .333.

2. actinidifolia Stapf., Trans.Linn.Soc.ser2, 5:122, 1894. Sabah! Merrill, Enum.Born.Pl., J.R.As.Soc.St.Br.Spec.Publ.:384, 1921. N.n.alkmaarensis .4118.

3. aculeata Lautbch. in Lorentz.Nova Guinea Bot. 8:835, 1912. P.N.G.: Mt. Hellwig! Diels, Bot.Jahrb. 57:453, 1922; Diels in Lautbch.Beitr.z.fl. v.Papuasien 8. N.n.thorelii .4615.

4. acuminata Merr., Philipp.J.Sc.Bot. 13:85, 1918. Sabah! Merr., Enum.Born.Pl.J.R.As.Soc.St.Br.Spec.Publ.:384, 1921; Merr., Univ.Cal.Publ.Bot. 15:196, 1929. N.n.meiandra .3684.

5. adenodonta Sleum, Notizbl.Bot.Gart.Berlin 15:372, 1941. Ecuador!

6. aequatoriensis Sprague, Trans.Proc.Bot.Soc.Edinb. 22:426. Ecuador, Peru!
   var.glabrata Busc., Malphigia 25:14, 1912.
   f.gibbosa Busc. loc.cit.
   f.longipetala Busc. loc.cit. Ecuador!

7. aesculifolia D.Vr., Pl.Ind.Bat.Or. 42. Java!

8. agamae Merr., Philipp.J.Sc. 21:529, 1922. Sabah! N.n.zamboangensis .3125.

9. albiflora Smith, J. Arn.Arb. 22:506, 1941. Irian Jaya: Balim River!
N.n.thorelii .4375.

10. alkmaarensis Lautbch., Lorentz.Nova.Guinea Bot. 8:306, 1910. Irian Jaya!
Diels, Bot.Jahrb. 57:450, 1922. N.n.calyptrata .333.

11. alpicola Smith, J. Arn.Arb. 22:516, 1941. Irian Jaya: Lake Habbema!
N.n.arcana .32, macrantha .333. This is doubtfully distinct from S.macrantha Smith.

12. altissima Zipp., ex Miq., Ann.Mus.Bot.Lugd.-bat. 4:108, 1868. Irian Jaya, Moluccas: Bachan, Sibella!
Miq.Ann.Jard.Bot.Buitenz. 1:7, 1876; Diels, Bot.Jahrb. 57: 449, 1922. N.n.echioides .3846.

13. alvarezii Merr., Philipp.J.Sc.Bot. 13:31, 1918. Philippines: Mindanao:Lanao!
N.n.confusa .2253, leytensis .2353.

14. alvaroi Schultes, Bot.Mus.Leafl.Harv.U. 20:221, 1963. Colombia!

15. amoena Stapf., Trans.Linn.Soc.ser2, 4:134, 1894. Sabah: Mt. Kinabalu!
Merrill, J.R.As.Soc.St.Br. 79:31, 1918; Merrill, loc.cit. spec.publ. :384, 1921. N.n.alvarezii .3848, matthewsii .3939.

16. ampla Merr., Philipp.J.Sc.Bot. 9:521, 1914. Philipp:Samar!
This is very close to S.kinabaluensis Merr.

17. amplifolia Diels, Bot.Jahrb. 57:452, 1922. P.N.G.: West Sepik, April River!
Smith, J. Arn.Arb. 22:514, 1941. N.n.lamii .3103. This name has precedence by prior publication over S.amplifolia Merr.

*amplifolia Merr., J.R.As.Soc.St.Br. 86:330, 1922, = euryphylla

Airy Shaw. Sabah:Sandakan. This name was published by Diels, May 23, 1922, preceding Merrill's usage which was published Nov.1, 1922.

18. andreana Oliver., ex F.Muell.Census,Suppl 2:3. Australia: Queensland, P.N.G.:Eastern Division! Bailey, Queensl.Fl.: 106.

19. angica Kanehira & Hatusima, Bot.Mag.Tokyo 57:63, 1943. N.G.!

* angustifolia Becc., Reinw. ex DeVriese, Pl.Ind.Bat.Or. 50 (Becc. without descr.) = lanceolata DC. = ramiflora Koord.

* angustifolia Ridl., J.Fed.Mal.St.Mus. 8:19, 1917, nom.illeg. This name was published after Turcz. and is here given the name S.angustata. Sumatra!

20. angustifolia Turcz., Bull.Soc.Nat.Mosc. 31:242, 1858. Syn: S.anisopoda Turcz., loc.cit.; S.leucocarpa Schlecht. var.stenophylla f.veranii Busc., loc.cit., 107; S.leucocarpa var.anisopoda Busc. loc.cit.; S.leucocarpa var.angustifolia Busc., loc.cit. 112, Mexico, Guatemala. This is the only valid use of this epithet. S.angustifolia Becc. is synon. with S.lanceolata DC. and S.angustifolia Ridl was published after Turcz. description.

* anisopoda Turcz., Bull.Soc.Nat.Mosc. 31:242, 1858 = angustifolia Turcz., Hunter, Ann.Miss.Bot.Gdn. 53:80, 1966. Mexico! Busc., Malphigia 27:134, 1915.

21. anomailensis Schultes & Garc.-Barr., Caldasia 2:27, 1943. Colombia!

22. arcana Smith, J. Arn.Arb. 22:518, 1941. Irian Jaya: Idenburg river. N.n. bicolor .25, alpicola .32.

23. archboldiana Smith, J.Arn.Arb. 22:514, 1941. Irian Jaya: Lake Habbema!
N.n. bontocensis .4118.

* armata Kurz, J. R.As.Soc.Beng. 42:59, 1873. = S.cerea Griff., Kurz.For. Fl. Burma 1:103, 1877. Burma!

24. arnoldi Sleum., Notizbl.Bot.Gart.Berlin 12:143, 1934. Colombia!

25. aromatica Schultes, Caldasia 2:28, 1943. Colombia!

26. aspera Turcz., Bull.Soc.Nat.Mosc. 31:242, 1858. Syn. S.aspera f.delessertiana Busc., Hunter, Ann.Miss.Bot.Gnd. 53:13, 1966; S.englesingii Standl., Hunter, loc.cit.; S.perseifolia Standl. & Steyerm., Hunter, loc.cit. Mexico, Guatemala, Honduras, Nicaragua!
f.delessertiana Busc.Malphigia 27:303, 1916 = S.aspera. Busc.Malphigia 25:10, 1912, loc.cit., 26:110, 1913; loc.cit. 301 & 395; loc.cit. 296, 1915; loc.cit. 300-301; loc.cit. 27:491, 1916.

27. asperifolia Stapf., MS in Hb.Kew., ex Baker, J.Bot.Br.For. 56: 166, 1918. Sumatra: Mt. Singalan!
N.n.punctata .2382.

28. auricoma Ridl., J.Fed.Mal.St.Mus. 8:18, 1917. Sumatra: Siolah Dras!
N.n.rudolfi .2632. This species is very close to S.angustifolia Ridl.

29. avellana Elmer, Leaflets Philipp.Bot. 2:498, 1908. Philippines!

30. bakeri Merr., Philipp.J.Sci.Bot. 9:521, 1915. Philippines: Luzon, Tayabas prov!
N.n.longifolia .25, elmeri .259.

* barbigera Hook., Ic.Pl.t.331. = leucocarpa Schlecht. Hunter, Ann.Miss.Bot.Gard. 53:80, 1966.
f.veranii Busc.Malphigia 28:378, 1919 = leucocarpa Schlecht. Hunter, Ann.Miss.Bot.Gard. 53:80, 1966. Busc.Malphigia 25: 12, 1912, loc.cit. 36:407, 1913.

31. behnickiana Hort. ex Busc. & Muscat. Malphigia 30:360, 1927, sp.dub. Mexico!

32. belensis Smith, J.Arn.Arb. 22:505, 1941. Irian Jaya: Bele

River near Lake Habbema!
N.n.vallium .333, rubrisquamata .333.

33. belizensis Lund., Field & Lab. 13:7, 1945. Brit. Honduras!

34. bibracteata Lauterb. in Schum. & Lauterb.Nachtr.Fl.Deutsch. Sudsee 318, 1905. P.N.G.:Torricelli Mts.!
Diels, Bot.Jahrb. 57:456, 1922; Smith, J.Arn.Arb. 22:518, 1941. N.n.kinabaluensis .3793.

35. bicolor Merr., Philipp.J.Sci.Bot. 13:32, 1918. Philippines: Luzon, Tayabas prov! N.n.arcana .25.

36. bifida Warb., Bot.Jahrb. 13:380, 1891. P.N.G! Lautbch & Schum.Nachtr.Fl.Deutsch.Sudsee 317, 1905; Smith, J.Arn.Arb. 22:505, 1941. N.n.luzonensis .4118.

37. biserrata Spreng. Syst.Veg.4.Cur.Post.:211. Syn.Apatelia biserrata DC, Palaua biserrata P.P. Peru!
Steud.Nom.Bot. 2:516, 1841.

* blumeana Spreng.Syst.Veg.4.Cur.Post.:210 = gigantea Bl. = bracteosa DC. Java!
Steud.Nom.Bot. 2:516, 1841.

* blumia Steud., Nom.Bot. 2:516, 1841 = javanica Spreng. Syn. Blumia javanica Spreng, Reinwardtia javanica Steud. Java!

38. blumiana Benn., Pl.Jav.Rar.:174. Java!
Backer & Bakh.v.d.Brink Fl.Java 1:325, 1963.

39. bontocensis Merr., Philipp.J.Sci.Bot. 9:453, 1914.
Philippines: Luzon, Bontoc, Lepanto, Abra!
N.n.archboldiana .4118.

40. borneensis Merr., Philipp.J.Sci.Bot. 13:86, 1918. Sabah: Kalabukan, Tawao!
Merrill, Enum.Born.Pl.J.R.As.Soc.St.Br.Spec.Publ.:384, 1921.
Merrill, Univ.Calif.Publ.Bot. 15:197, 1929. N.n.roseata .3571.

* brachybotrys Turcz., Bull.Soc.Nat.Mosc. 31:245, 1858 = humboldtiana Busc.Malphigia 27:309, 1916 = excelsa Willd. var.scabra Busc. loc.cit. Syn.?. Busc., Malphigia 25:398, 1912; loc.cit. 26:123, 1913; loc.cit. 412; loc.cit. 727:310 & 318, 1916. Pollen descr. Erdtman, Pollen Morph. & Taxonomy:35, 1952. Reproductive biol. descr. Soejarto, J.Arn.Arb. 50: 180-194, 1969.

* bracteolata DC., Mem.Soc.Phys.Genev. 1:422, 1822 = cuneata Bl. Java!

41. bracteosa DC., Mem.Soc.Phys.Genev. 1:423, 1822. Syn.S.blumeana Spreng., S.gigantea DC., S.reinwardtiana Bl. Steud.Nom.Bot. 2:516, 1841. Java: Tjibodas!
DC.Prod. 1:526; Hopsfield, Pl.Jav.Rar.:170.t.36.; DeVriese, Plant.Reinwardt.:34.; Zoll.Verzeichn.Ind.Archipel.:144, 1855; Miq., Fl.Ind.Bat. 1:479; Teysm.& Binn.Cat.Bog.:203; Koord. & Val., Bijdr.Boschb.Fl.Javae 3:251; Boerlage,Cat.Bog.:89; Koord.Flora v.Tjibodas:181, 1923; Backer & Bakh.v.d.Brink, Fl.Java 1:326, 1963. N.n. napaulensis .6144.

42. brassii Diels, J.Arn.Arb. 10:81, 1929. P.N.G.:Central Div.! White, J.Arn.Arb., 10:240, 1929; Smith, loc.cit. 22:512-513, 1941, descr. inflorescence. N.n.altissima .4286.

43. brevipes Rusby, Descr.New.Sp.S.Am.Pl.:57, 1920. Bolivia!

44. brevirostris Zipp. ex Miq., Ann.Mus.Bot.Lugd.-bat. 4:106, 1868. Irian Jaya!
Miq., Ann.J.Bot.Buitenz. 1:7, 1876; Diels, Bot.Jahrb. 57: 445, 1922. N.n.meiandra .4737, oreadum .4737.

45. briqueti Busc., Malphigia 30:140, 1927. Peru!
Busc., loc.cit. 25:15, 1912; loc.cit. 26:425, 1913; loc.cit. 27:352, 1916, descr. anat.

46. buddleifolia Diels, Bot.Jahrb. 57:455, 1922. P.N.G.:Finisterre Range!
Smith, J.Arn.Arb. 22:517, 1941. N.n.bicolor .4545.

47. bullosa Wawra, Mont.Fl.Brasil 12:286, 1886. Colombia! Busc., Malphigia 25:8, 1912; loc.cit. 26:17, 1913; loc.cit. 20; loc.cit. 21; loc.cit. 299. Reproductive biol., Soejarto, J.Arn.Arb. 50:180-194, 1969.

* bulusanensis Elmer ex Merrill, Enum.Philipp.Fl.Pl. 3:65, 1923 in obs.pro syn.; Elmer, Leafl.Philipp.Bot. 10:3726, 1939, descr.angl. Philippines: Luzon!
The status of this species is uncertain.

* buscalioniana Blake, Contrib.Gray Herb.n.s. 52:74, 1917. = pringlei Rose, Hunter, Ann.Miss.Bot.Gard. 53:70, 1966. Mexico!

48. callithrix Miq., Ann.Mus.Bot.Lugd.-bat. 4:111, 1869. Celebes: Menado!
N.n.macrotricha .4286.

49. calyptrata Lauterb., Lorentz.Nova Guinea Bot. 8:838, 1912. Syn. eximia Ridl., Smith, J.Arn.Arb. 22:503, 1941. See eximia. P.N.G.: Mt. Hellwig!
Diels, Bot.Jahrb. 57:446, 1922. N.n.oligophlebia .28, alkmaarensis .333.

* camptodonta Miq., Fl.Ind.Bat.Suppl.:482 = media Korth. Miq. Ann.Mus.Bot.Lugd.-bat. 4:107.

50. capitulata Smith, J.Arn.Arb. 22:521, 1941. Irian Jaya: Bele river, Lake Habbema! N.n.macrantha .3448.

51. caquetensis Schultes, Caldasia 2:32, 1943. Colombia!

52. caroli Diels, Engl.Jahrb. 57:451, 1923. P.N.G.:Sepik. Schraderberg!
N.n.submodesta .2941.

53. castanifolia Ridl., J.Fed.Mal.St.Mus. 8:20, 1917. Sumatra! Baker, J.Bot. 56:162, 1918. N.n.confusa .3846.

54. cauliflora DC., Mem.Soc.Phys.Genev. 1:425, 1822. Syn.Marumia cauliflora Reinw. ex Blume, Cat.Gew.Buitenz.:79, 1823; Scapha cauliflora Noronh Steud., Nom.Bot. 2:516, 1841. Java:Tjibodas!

var.calycina DC. = leprosa Korth., Hoogl. Gard.Bull. 30:118, 1977.

var. crenulata Boerl., Cat.Bog.:89, 1921. Syn. S.crenulata DC. Java!

var.rubrocalyx Boerl., Cat.Bog.:89-90, 1921.

DC., Prod. 1:526; Korth., Nat.Gesch.Bot.:126; Blume, Bijdr.: 126; Miq., Fl.Ind.Bat. 1:486; Miq.Ann.Mus.Bot.Lugd.-bat. 4: 106; Teysm. & Binn., Cat.Bog.:203; Koord. & Val., Bijdr. Boschb,Fl.Javae 3:276; Koord., Fl.v.Tjibodas:181, 1923; Henders., Gar.Bull.St.Settlem. 4:226, 1928. = leprosa.

N.n.bicolor .4.

55. ceramica Miq., Ann.Mus.Bot.Lugd.-bat. 4:111-112, 1869. Ceram!

N.n.dicalyx .333.

56. cerea Griff. Itin.Notes:20. Syn. S.armata Kurz. Bhutan, Burma!

Dyer, Hook.Fl.Brit.Ind. 1:288, 1874; Finet & Gagnepain, Mem.Soc.Bot.Fr. 4:13, 1905. Craib.Fl.Siam.Enum. 1:127-128, 1925.

57. chaparensis Soejarto, Bot.Mus.Leafl.Harv.Univ. 22:270, 1969. Bolivia!

58. chiliantha Schultes, Caldasia 2:32, 1943. Colombia!

59. choriophylla Schultes & Gutierr, Caldasia 3:251, 1945. Colombia!

60. cinnamomea Merr., Philipp.Gov.Lab.Bur.Bull. 35:42. Philippines!

61. clementis Merr., Philipp.J.Sci.1,suppl.:208, 1906. Philipp.: Mindanao!

N.n.gracilipes .2778.

62. collina Smith, J.Arn.Arb. 22:513, 1941. P.N.G.:Central Div.!

N.n.dielsiana .2432. This differs from dielsiana only in having somewhat smaller flowers and fewer stamens.

63. comitis-rossei Schultes, Bot.Mus.Leafl.Harv.Uni. 16:112, 1953. Mexico!
Hunter, Ann.Miss.Bot.Gard. 53:62-63, 1966.

64. conferta Warb., Bot.Jahrb. 13:379, 1891. P.N.G., Solomon Is.! Schum. & Lauterb., Fl.Deutsch.Schutzg.Sudsee:445, 1901; loc.cit. Nachtr.:317, 1905; Lauterb., Nova Guinea Bot. 8: 305, 1910; loc.cit. 8:835, 1912; Diels, Bot.Jahrb. 57:458, 1922; Diels, Nova Guinea Bot. 14:84, 1924; Lane-Poole, Rep. For.Res.Papua:116, 1925; White & Francis, Proc.R.Soc.Qld. 39:65, 1928; White, J.Arn.Arb. 10:241, 1929. Floral biol. Dickison, J.Mitchell.Soc. 88:44, 1972. N.n.rubens .4857. This appears to be a heterogeneous species, showing wide variation, especially in size and indument of inflorescence.

65. confusa Merr., Philipp.J.Sc.Bot. 9:522, 1915. = vulcanica Merr. Philippines:Luzon!
N.n.alvarezii .2253, ramosii .2571.

66. congestiflora Smith, J.Arn.Arb. 22:519, 1941. P.N.G.:Morobe Dist.!
N.n.occulta .3091. The inflorescences of this species and S.occulta are very similar.

67. consimilis Sleum., Notizbl.Bot.Gart.Berlin 15:373, 1941. Ecuador!

68. conzattii Busc., Malphigia 25:403, 1913. Syn. S.matudai Lund., S.cuchumatanensis Stand. & Steyerm. Mexico, Gutemala!
var.arthuriana Busc., Malphigia 30:430, 1927. Mexico. Busc., loc.cit. 25:403, 406-409, 1912.

69. copelandii Elmer, Leafl.Philipp.Bot. 7:613, 1915. Philipp.: Mindanao!

70. cordata Quis., Philipp.J.Sci. 76:48, 1944. Philipp.:Catanduanes! N.n.spinulosos-setosa .375.

71. coroicana Busc., Malphigia 30:197, 1927. Bolivia!

Busc., Malphigia 25:15, 1912; loc.cit. 26:425, 1913; loc.cit. 27:352, 1916, descr. anat.

* corynotricha Diels, Bot.Jahrb. 57:456, 1922, in obs.nom. seminud. Celebes!

* costaricensis Don.Sm., Coult.Bot.Gaz. 23:236. = veraguasensis Seem., Hunter Ann.Miss.Bot.Gard. 53:64, 1966. Costa Rica!

var.scabrida Busc., Malphigia 27:10, 1914. A dubious taxon.

var.brachitricha Busc., loc.cit. 12 = veraguasensis Seem., Hunter, Ann.Miss.Bot.Gard. 53:64, 1966.

var.dolicotricha Busc., Malphigia 27:15, 1914. = veraguasensis Seem., Hunter, Ann.Miss.Bot.Gard. 53:64, 1966. Busc., Malphigia 25:10, 1912; loc.cit. 27:19-27, 1915; loc.cit. 27: 136, 1915.

72. costata Reinw. ex DeVries, Pl.Ind.Bat.Or.:56. Syn. S.warburgii Koord. Celebes!
Merrill, J.Arn.Arb. 35:143-144, 1954.

* crenulata DC., Mem.Soc.Phys.Geneve. 1:424, 1822. = cauliflora var.crenulata Boerl. Syn.Vanalphimia djinote Leschen., Steud., Nom.Bot. 2:516, 1841. Java!

* crenulata Wight ex Wall., Cat.n.1459. = Gordonia obtusa.

73. crenata Busc. Syn. S.pauciserrata
var.crenata Busc. See pauciserrata Hemsl.

74. cuatrecasana Schultes, Caldasia 2:315, 1944.

* cuchumatenensis Stand. & Steyerm., Publ.Field.Mus.Nat.Hist. Bot. 23:215, 1947 = conzatii Busc. Guatemala!

* cumingia D.Vr., Pl.Ind.Bat.Or.:38 = latibracteata Choisy.

* cuneata Bl., Bijdr.:127. = bracteolata DC., Steud., Nom.Bot. 2:516, 1841.

75. cuspidella Miq., Ann.Mus.Bot.Lugd.-bat. 4:108, 1869. Sumatra: Priaman!

var.latifolia Miq., Fl.Ind.Bat.suppl. 1:189 & 480. Sumatra! Baker, J.Bot.Brit.For. 56:164, 1918; Ridley, J.R.As.Soc.Mal. Br. 1:54, 1923; Jacobs, Ann.Bog. 3:72, 1958. N.n.echioides .333.

76. dasyantha D.Vr., Pl.Ind.Bat.Or.:49 Sumatra!
Baker, J.Bot.Brit.For. 56:163, 1918.

77. decurrens Lautbch ex Lorentz, Nova Guinea Bot. 8:836, 1912.
Irian Jaya!
N.n.stichophlebia .3913.

78. dempoensis Baker, J.Bot.Brit.For. 56:166, 1918. Sumatra!
N.n.asperifolia .4737.

79. denticulata C.B.Robinson, Philipp.J.Sci. 3:205, 1908.
Philippines:Mindanao, Davao prov.!
N.n.havilandii .3529.

80. desquamulata Diels, Bot.Jahrb. 57:447, 1922. P.N.G.:Sepik!
Smith, J.Arn.Arb. 22:504, 1941. N.n.rodatzii .2258,
pilogyne .3125.

81. dicalyx Miq., Ann.Mus.Bot.Lugd.-bat. 4:112, 1869. Ceram!
N.n.leytensis .3143, ceramica .333, lactea .333.

82. dielsiana Smith, J.Arn.Arb. 22:510, 1941. P.N.G.:Central Div!
N.n.collina .2432.

83. dillenioides Gagnep., Bull.Soc.Bot.Fr. 85:171, 1938. Indo-China:Tonkin. Humbert, Suppl.Fl.Gen.Indo-Chine 1:25, 1938.
N.n.knemaefolia .4483.

84. distasosa Korth., Verh.Nat.Gesch.Bot.:131. Java!
Backer & Bakh.v.d.Brink, Fl.Java 1:326, 1963.

85. drimytiflora Diels, Bot.Jahrb. 57:445, 1922. P.N.G.:Morobe Dist.!
N.n.vallium .25.

* dubia Busc., Malphigia 25:12, 1912. A dubious species as the name suggests. Guatemala, Mexico!
Busc., loc.cit. 26:426, 1913; loc.cit. 27:352, 1916, descr. anat.; loc.cit. 30:229, 1927, descr.; Hunter, Ann.Miss.Bot. Gard. 53:87, 1966.

86. dufaurii (F.Muell) Diels, Bot.Jahrb. 57:447, 1922. Syn. Trematanthera dufaurii F.Muell, Vict.Natur. 3:71, 1886. P.N.G.:Central Div., Owen Stanley Range! Diels, Bot.Jahrb. 62:459, 1922; White, J.Arn.Arb. 10:241, 1929. N.n.albiflora .4483.

87. eburnea Smith, J.Arn.Arb. 22:520, 1941. P.N.G.:Central Div. Mt. Tafa! N.n.oblancifolia .3889. This species is very close to S.plurilocularis White & Francis, differing from it only in the more numerous flowers on recurved pedicels and smaller elliptic leaves. A number of specimens incl. T.G.Hartley 11797 & Womersley N.G.F11807 are intermediate.

88. echinosepala Schultes, Caldasia 2:34, 1943. Colombia!

89. echioides Diels, Bot.Jahrb. 57:452, 1922. P.N.G.:Sepik! N.n.cuspidella .333, stichophlebia .333.

90. egregia Diels, Bot.Jahrb. 57:456, 1922. P.N.G.:Kani Mts.! Smith, J.Arn.Arb. 22:511, 1941. Bougainville! N.n.rupestris .2381.

91. elegans F.Vill., Noviss.App.Fl.Philipp. 19, 1880. Syn. Scapha elegans, Saurauia rugosa Turcz. Philippines:Luzon! Merrill, loc.cit. 42; Merr., Philipp.J.Sc.Bot. 2:282, 1907; Merr. J.Arn.Arb. 35:143-144, 1954. Pollen descr. Erdtman, Pollen Morph.Plant Taxon.:35, 1952.

92. elmeri Merr., Philipp.J.Sc.Bot. 9:523, 1915. Philippines: Luzon, Tayabas prov.! N.n.bakeri .2593, gracilipes .2903.

93. emarginata White & Francis, Proc.R.Soc.Qld. 39:61-70, 1928. P.N.G.:Highlands Dists.! N.n.alkmaarensis .375. This is a widespread but rarely recognised species, distinguishable by pale appressed, acute scales on the midrib, small conspicuously toothed leaves and solitary calyptrate flowers.

* engleriana Busc., Malphigia 27:131, 1916 = veraguasensis Seem. Hunter, Ann.Miss.Bot.Gard., 53:64, 1966. Costa Rica! Busc., Malphigia 27:134-137, 1916.

94. engleri Busc., Malphigia 25:10, 1912. Mexico!

* englesingii Stand., Tropical Woods 17:21, 1929 = aspera Turcz. Hunter, Ann.Miss.Bot.Gard., 53:73, 1966. Nicaragua! Standley, Publ.Field.Mus.Nat.Hist.Bot. 4:223, 1929.

95. erythrotricha Elmer, Leafl.Philipp.Bot. 7:2614, 1915. Philipp.:Mindanao!

96. euryolepis D.Vr., Pl.Ind.Bat.Or.:48. Celebes! N.n.desquamulata .4167.

97. euryphylla Airy-Shaw, Kew Bull.:248, 1940. Syn. amplifolia Merr. Borneo!
Although euryphylla was published after amplifolia Merr., the latter name is invalid by prior publication of amplifolia Diels.

* exasperata D.Vr., Pl.Ind.Bat.Or.:56 = latibracteata Choisy, Merrill, J.Arn.Arb. 35:144, 1954. Philippines!

98. excavata Korth., Verh.Nat.Gesch.Bot.:130. Borneo! Merrill, Enum.Born.Pl.J.R.As.Soc.St.Br.Spec.Publ. 1921. N.n.desquamulata .3571.

99. excelsa Willd., Ges.Naturf.Fr.Neue.Schr. 3:407, 1801. Syn. Palaua scabra H.B., Steud., Nom.Bot. 2:516, 1841. Saurauia humboldtiana Busc., Busc., Malphigia 27:305, 1916 = S.brachybotrys Turcz. Busc. loc.cit. 309. Venezuela!
var.xanthotricha Busc., Malphigia 25:232, 1912. Venezuela!
var.moritziana Busc., loc.cit.
Busc., Malphigia 25:7, 1912; loc.cit. 390; loc.cit. 26:300, 1913; reproductive biol.Soejarto.J.Arn.Arb. 50:194, 1969.

100. excurrens Smith, J.Arn.Arb. 22:503, 1941. Irian Jaya:Idenburg River!
N.n.tristyla DC. .4737. A very distinct species with lorate leaves bearing about 60 pairs of secondary veins.

101. eximia Ridl., Trans.Linn.Soc.Bot. 9:14, 1916. P.N.G.: Marafunga!
Smith, J.Arn.Arb. 22:503, 1941, considers that this is synonymous with S.calyptrata Lautbch. The specimen described by Ridley appears somewhat aberrant in possessing seven petals, but differs in the following features from calyptrata; leaves ovate-elliptic not distinctly obovate, midrib and veins beneath with appressed deciduous scales, not scabrid, bracteoles ovate, rotund, not acute, bracteoles with appressed strigose indument not scabrid, petals spathulate not oblong, stamens 25 not 40, ovary conical not subglobose and styles mostly fused not free. The following specimens are assigned to S.eximia; T.G.Hartley 13268; Stevens, Lae 51096.

102. fasciculata Wall., ex Dyer Pl.As.Rar. 2:40. Syn. Ternstroemia fasciculata Wall., Steud., Nom.Bot. 2:516, 1841. Nepal!
Dyer, Hook.Fl.Brit.Ind. 1:287; Finet & Gagnep., Mem.Soc. Bot.Fr. 4:14, 1905. N.n.roxburghii .3013, gjellerupii .333.

103. fasciculiflora Merr., Philipp.J.Sci.Bot. 9:524, 1915. Philippines:Palawan!
N.n.gracilipes .375.

104. ferox Korth., Verh.Nat.Gesch.Bot.:132. Sabah:Palembang, Tawao!
var.latifolia Miq., Fl.Ind.Bat.suppl. 1:189 = S.cuspidella Miq., Ann.Mus.Bot.Lugd.-bat. 1:108.
Stapf., Trans.Linn.Soc.Lond.Bot. 3:134, 1896; Merrill, Enum.Born.Pl.J.R.As.Soc.St.Br.Spec.Publ.:385; Merrill, J.R.As.Soc.St.Br. 79:31, 1918; Baker, J.Bot.Brit.For. 56: 163, 1918; Ridley, J.R.As.Soc.Mal.Br. 1:54, 1923; Merrill, Univ.Calif.Publ.Bot. 15:197, 1929.
* ferruginea Griff., Itin Notes:120, sp.dub. Bhutan!
Dyer, Hook.Fl.Brit.Ind. 1:288, 1875.

105. fimbriata Smith, J.Arn.Arb. 22:508, 1941. Irian Jaya: Idenburg River!
N.n.occulta .333.

106. floccifera Triana & Planch., Ann.Sc.Nat.Ser.4, 18:267, 1862. Colombia!
Busc., Malphigia 25:15, 1912; Schultes, Caldasia 2:316, 1944.

107. floribunda Linden & Planch., Trois.Voy.Linden.Bot., Pl. Colomb. 1:57, 1863. Venezuela!
Sprague, Kew Bull.:43, 1926.
* floribunda Benth. ex Sprague, Trans.Proc.Bot.Soc.Edinb. 22: 426. Ecuador!
var.laevigata Busc., Malphigia 25:7, 1912. Ecuador!
var.barbata Busc., loc.cit. Peru!
This name is invalid having been published after Lind. & Planch. use of the epithet.
* fluviatilis Rose ex Busc. Malphigia 28:380, 1919 = serrata DC. Hunter, Ann.Miss.Bot.Gard. 53:77, 1966. Mexico!

108. forbesii Baker, J.Bot.Brit.For. 56:164, 1918. Sumatra:Mt. Dempo, Atjeh!
Merrill, Contrib.Arn.Arb. 8:104-105, 1934. N.n.longi-petiolata .4737.

109. formosa Sleum., Notizbl.Bot.Gart.Berlin 12:144, 1934. Peru!

110. fragrans Hoogl., Gard.Bull.Sing. 30:113-114, 1977. Malaya: Selangor Sumatra!
As tristyla in King, J.As.Soc.Beng. 59:197, 1890; Ridley Fl.Mal.Pen. 1:202, 1922; Burkill, Dict.Econ.Prod.Mal.Pen. :1967, 1935; Burk. loc.cit.ed2:2002, 1966.

111. fraseri Ridl., Kew Bull.:262, 1929. Sabah:Banguey Is.!
N.n.stichophlebia .4286.

112. garcia-barrigae Schultes, Mutisia 3:1, 1952. Colombia!
gigantea Bl.Bijdr. 129 = bracteosa DC., Boerlage, Cat.Bog.: 88-90.

113. gigantea DC., Mem.Soc.Phys.Geneve 1, 1822. Syn.Scapha gigantea Noronh., Steud.Nom.Bot. 2:516, 1841. Ternstroemia racemosa Don., Steud. loc.cit. Java!

114. gigantifolia Quis., Philipp.J.Sci. 76:49, 1944. Philippines: Mindanao!
N.n.clementis .6111, papillulosa .6111.

115. gjellerupii Lautbch ex Lorentz, Nova Guinea Bot. 8:838, 1912. Jaya:Humboldt Bay!
Diels, Bot.Jahrb. 57:448, 1922; Smith, J.Arn.Arb. 22:497-528, 1941. N.n.fasciculata .333.

116. glabra Merr., J.R.As.Soc.St.Br. 79:31, 1918. Borneo!
N.n.glabrifolia .3158.

117. glabrata Steud., Nom.Bot.ed.2:516, 1841. Syn.Apatelia glabrata DC., Palaua glabrata R.P., Saurauia serrata DC. in part (Peru). Steud., loc.cit. Peru!
Choisy, Mem.Soc.Phys.Geneve. 14:119, 1855.

118. glabrifolia Merr., Philipp.J.Sci.Bot. 13:33, 1918. Philippines:Mindanao!
N.n.glabra .3158.

119. goudotiana Linden & Planch. Trois.Voy.Linden.Bot.,Pl.Colomb. 1:58, 1863. Colombia!

120. gracilipes Merr., Philipp.J.Sci.Bot. 9:524, 1915. Philippines:Mindanao, Lake Lanao!
N.n.clementis .2778, elmeri .2903.

* grandifolia Zoll. & Mor., Syst.Verz.Zoll.:26 = nudiflora DC., Boerlage,Cat.Bog.:89. Java!

* grandis Ridl., J.Fed.Mal.St.Mus. 4:6, 1909 = vulcani Korth., Hoogl., Gard.Bull.Sing. 30:122, 1977. Malaya!
Ridley, Fl.Mal.Pen. 1:207-208, 1925; Henderson, J.R.As.Soc. St.Br. 5:243, 1927. N.n.kinabaluensis .4.

121. griffithii Dyer, Hook.Fl.Brit.Ind. 1:286. India:Assam!
Finet & Gagnep., Mem.Soc.Bot.Fr. 4:16, 1905.

122. hasskarliana Miq., Fl.Ind.Bat. 2:484. Java!

123. havilandii Merr., J.R.As.Soc.St.Br. 79:34, 1918. Sarawak!
Merrill Enum.Bor.Pl.J.R.As.Soc.St.Br.Spec.Publ. 1921.
N.n.ridleyi .3333, denticulata .3529.

124. herbert-smithii Rusby, Descr.New.Sp.S.Am.Pl.:57, 1920.
Colombia!

125. herthae Sleum. ex Fedde, Repert. 45:9, 1938. Ecuador!

126. heterosepala Merr., Philipp.J.Sci.Bot. 13:87, 1918. Sabah:
Mt. Kinabalu!
Merrill, Enum.Born.Pl.J.R.As.Soc.St.Br.Spec.Publ. 1921.
Merr., J.R.As.Soc.St.Br. 79:31, 1918. N.n.longistyla .3,
tristyla .3182.

127. hirsuta Bl., Bijdr.:128. Excl. specimens cult. Hort.Bog.
which are Saurauia reinwardtiana Bl., Boerlage,Cat.Bog.:
88 = bracteosa DC., Steud.Nom.Bot. 2:516, 1841. Java!
Miq., Ann.Mus.Bot.Lugd.-bat. 4:111; Baker, J.Bot.Brit.For.
56:167, 1918; Merrill, Contrib.Arm.Arb. 8:105, 1934.
N.n.sorsogonesis .3571.

128. holotricha Diels, Bot.Jahrb. 57:450, 1922. P.N.G.:Sepik.
Irian Jaya:Idenburg River!
Smith, J.Arn.Arb. 22:511, 1941. N.n.gracilipes .3488.

129. hoeveniana Koord., Meded.'s Lands Plantent. 19:643. Celebes!

130. horrida Hook., Trans.Linn.Soc. 23:162, 1860. Borneo!
Merrill, Enum.Born.Pl.J.R.As.Soc.St.Br.Spec.Publ.:385,
1921.
* horrida Kanehira & Hatusima, Bot.Mag.Tokyo 57:73, 1943.
P.N.G. This name is invalid because of prior publication
by Hooker.

131. hosei Merr., Philipp.J.Sci.Bot. 13:87, 1918. Borneo!
Merrill, Enum.Born.Pl.J.R.As.Soc.St.Br.Spec.Publ.:381,
1921. N.n.trichophora .419.
* humboldtiana Busc., Malphigia 25:11, 1912 = brachybotrys

Turcz., Busc. loc.cit. 27:305, 1916 = excelsa Willd., Busc. loc.cit. 309. Syn. Palaua scabra H.B.K., Busc., loc.cit. 305. Peru!

var.bomplandi Busc., loc.cit. 25:1, 1912. Venezuela!
Busc., loc.cit. 391, 398, 424; loc.cit. 27:309-311, 1916; Reproductive biol. Soejarto, J.Arn.Arb. 50:180-194, 1969.

* hypomalla R.Ben., Bull.Soc.Bot.Fr. 80:334, 1933. sp.dub. S. Amer.!

132. hystrix Ridl., Trans.Linn.Soc.Bot. 9:15, 1916. Irian Jaya: Carstenz!
Diels, Bot.Jahrb. 57:457, 1922; Smith, J.Arb.Arb. 22:522, 1941. N.n.cordata .44.

133. iboana Diels, Bot.Jahrb. 57:448, 1922. P.N.G.:Morobe Dist.!
Smith, J.Arn.Arb. 22:509, 1941. N.n.desquamulata .3889.

134. idenburgensis Smith, J.Arn.Arb. 22:514, 1941. Irian Jaya: Idenburg River!
N.n.poolei .3684.

* inflexidens Miq., Fl.Ind.Bat.suppl.:481 = media Korth., Miq., Ann.Mus.Bot.Lugd.-bat. 4:107. Sumatra!

* intermedia Busc., Malphigia 25:13, 1912 = kegeliana Sclecht., Hunter, Ann.Miss.Bot.Gard. 53:83, 1966. Guatemala!

var.granulosa Busc., Malphigia 25:13, 1912. Guatemala!
Busc., loc.cit. 26:327, 1913, loc.cit. 27:342, 1916, descr. anat.

135. intonsa Schultes, Caldasia 2:318, 1944. Colombia!

136. involucrata Merr., Philipp.Gov.Lab.Bur.Bull. 35:41. Philippines!

* irosinensis Elmer ex Merrill, Enum.Philipp.Fl.Pl. 3:64, 1923 in obs.pro syn. Philippines:Luzon!
Elmer, Leafl.Philipp.Bot. 10:3727, 1939.

137. isoxanthotricha Busc., Malphigia 25:410, 1912. Mexico!
Busc. loc.cit. 413-414; loc.cit. 26:15, 1913.

* jackiana Korth., Verh.Nat.Gesch.Bot.:127 = rubiginosa Merr. Sumatra!

138. javanica Spreng. Syn.Blumia javanica Spreng., Reinwardtia javanica Bl., Saurauia blumia Steud., Nom.Bot. 2:516, 1841. Java!
Steud.'s name is invalid. The species must be given the epithet javanica. I do not know if this is the same species that Hoogl. calls javanica in MS.

139. junghuhnii Choisy ex Zoll., Syst.Verz.Ind.Archip.:148. Java: Tjibodas!
Koord., Fl.v.Tjibodas 1:181, 1923.

140. kajewskii Smith, J.Arn.Arb. 22:511, 1941. Solomon Is.: Bougainville!
Foreman, Bot.Bull.,Terr.P.N.G. 5:7, 1971. N.n.purgans .3846. This species is close to poolei, fimbriata, macgregorii, dielsiana and holotricha.

141. kallima Schultes, Mutisia 3:5, 1952. Colombia!

142. kawagoeana Hatusima, J.Jap.Bot. 26:373, 1951. Ryukyu Is.!

143. kegeliana Schlecht., Bot.Zeit. 11:694, 1853. Syn. Saurauia pauciserrata Hemsl., S.maxoni Donn.Sm., S.pauciserrata var.kegeliana (Schlecht.) Busc., S.pauciserrata f.kegeliana (Schlecht.) Busc., S.pauciserrata f.crenata Busc., S.pauciserrata f.veranii Busc., S.intermedia Busc. Hunter, Ann.Miss.Bot.Gard. 53:82-83, 1966. Mexico, Guatemala, El.Salvador!
Floral biol., Dickison, J.Mitchell.Soc. 88:44, 1972.

144. kinabaluensis Merr., Philipp.J.Sci.Bot. 8:88, 1918. Sabah: Mt. Kinabalu!
Merrill, Enum.Born.Pl.J.R.As.Soc.St.Br.Spec.Publ. 1921. N.n.pleurotricha .333. This is very close to ampla Merr.

145. klemmei Merr., Philipp.J.Sci.Bot. 9:525, 1915. Philippines: Luzon!
N.n.macgregorii .35.

146. klinkii Schum. & Lautbch, Fl.Deutsch.Sudsee:447. P.N.G.: Kani Range!
var.rufescens Lautbch. & Schum., loc.cit. Nachtr.:317-318, 1905. P.N.G.:East Sepik Dist., Madang Dist.!
Diels, Bot.Jahrb. 57:449, 1922. N.n.mamberamana .4615.

147. knemaefolia Quis., Philipp.J.Sci. 76:50, 1944. Philippines: Palawan!
N.n.mamberamana .3571, plurilocularis .3793.

* korthalsii Zoll. & Mor., Syst.Verz.Zoll.:26 = leprosa Korth.

148. lactea Lautbch ex Lorentz, Nova Guinea Bot. 8:837, 1912. P.N.G.:Begowri River!
Diels, Bot.Jahrb. 57:451, 1922. N.n.dicalyx .333.

149. laevigata Triana & Planch., Ann.Sc.Nat.ser.4,Bot. 18:267, 1862. Syn.Saurauia yasicae Loes., S.herbert-smithii Rusby, S.leucocarpa Schlecht
var.Smithiana Busc., S.yasicae
var.laevigata Busc., S.yasicae
var.laevigata f.veranii Busc., S.smithiana Busc., S.pseudopittieri Busc., S.zetekiana Standl., S.belizensis Lund. Hunter, Ann.Miss.Bot.Gard. 53:84, 1966. Mexico, British Honduras, Guatemala, Honduras, Nicaragua, Costa Rica, Panama, Colombia!
Hunter, loc.cit. 52:595-596, 1965.

150. lamii Diels, Nova Guinea Bot. 14:82, 1924. Irian Jaya: Mamberamo River!
N.n.amplifolia .3103. Diels also considers this to be close to amplifolia.

151. lanaensis Merr., Philipp.J.Sci. 17:286, 1921. Philippines: Mindanao!
N.n.elmeri .333.

* lanceolata DC., Mem.Soc.Phys.Genev. 1:421, 1822 = ramiflora Koord. & Valet.Boerlage,Cat.Bog.:90. Syn.Saurauia angustifolia (Becc.) Reinw., S.spadicea Bl., Vanalphimia lanceolata Leschen., Steud.Nom.Bot. 2:516, 1841. Java:Gunong Gedeh!

DC.Prodr. 1:526, 1824, D.Vriese, Pl.Ind.Bat.Or.:39, 1856. DeCandolle's figure does not represent the species of his description but is close to S.ruiziana Steud. from Peru. See Merrill, J.Arn.Arb. 35:144, 1954.

152. latibractea Choisy ex Zoll.Syst.Verz.Ind.Archip.:148. Syn. Saurauia exasperata D.Vr., S.cumingia D.Vr. Philippines! Merrill, Govt.Lab.Publ. 35:41, 1906, Merr., Philipp.J.Sci. Bot. 2:282, 1907, Merr., J.Arn.Arb. 35:143, 1954, floral biol. Dickison, J.Mitchell.Soc. 88:44, 1972.

* latipetala Hemsl., Diagn.Pl.Nov.4. = oreophila Hemsl., Hunter, Ann.Miss.Bot.Gard. 53:71, 1966. Mexico, Guatemala! Busc., Malphigia 25:9, 1912; loc.cit. 407; loc.cit. 26: 124-130, 136, 1913; loc.cit. 27:9, 1914.

153. lehmanii Hier., Bot.Jahrb. 49:47, 1895. Ecuador! Busc., Malphigia 25:7, 1912; loc.cit. 245; loc.cit. 390; loc.cit. 26:9, 1913.

154. leoi Busc., Malphigia 25:15, 1912. Colombia! Busc., loc.cit. 26:422, 1913; loc.cit. 30:121, 1927.

155. lepidicalyx Miq., Ann.Mus.Bot.Lugd.-bat. 4:109, 1869. Celebes:Menado prov.!
N.n.punduana .333.

156. leprosa Korth., Verh.Nat.Gesch.Bot.:131, 1842 excl.cult.Hort. Bog. which are syn. with S.nudiflora DC.
var.tetragyna Boerl. Syn.Saurauia cauliflora
var.calycina King, S.korthalsii Zoll. & Mor. Hoogl., Gard. Bull.Sing. 30:118, 1977. As S.cauliflora in Burk. & Henders., Gard.Bul.St.Settlem. 3:336 & 349, 1925; Henders, loc.cit. 4:226, 1928; Burk., Dict.Ecom.Prod.Mal.Pen.: 1967, 1935; loc.cit.ed. 2:2002, 1966. As leprosa in Backer & Bakh.v.d.Brink,Fl.Java, 1:326:1963. Malaya, Thailand, Sumatra, Java!
Miq., Verh.Nat.Gesch.Bot.:479; Miq., Ann.Mus.Bot.Lugd.-bat. 4:110. N.n.reinwardtiana .3684.

157. leucocarpa Sclecht., Linnaea 10:249, 1836. Syn.Saurauia barbigera Hook., Ic.Pl.4,t.331, 1841, S.pedunculata Hook. var.pringleana Busc., Malphigia 25:12, 1912, S.pseudopringlei Busc., loc.cit. 28:378, 1919, S.leucocarpa f.veranii Busc., loc.cit. 29:104, 1911, S.leucocarpa f.wildemannii, loc.cit. 111. Hunter, Ann.Miss.Bot.Gard. 53:82, 1966.
var.stenophylla Busc., Malphigia 25:13, 1912 = angustifolia Turcz., Hunter, Ann.Miss.Bot.Gard. 53:80, 1966.
var.stenophylla f.veranii Busc., Malphigia 25:13, 1912 = angustifolia Turcz., Hunter, Ann.Miss.Bot.Gard. 53:80, 1966.
var.smithiana Busc., Malphigia 25:13, 1912 = angustifolia Turcz., Hunter, Ann.Miss.Bot.Gard. 53:80, 1966.
var.willdemanii Busc., Malphigia 25:13, 1912 = angustifolia Turcz., Hunter, Ann.Miss.Bot.Gard. 53:80, 1966.
var.anisopoda Busc., Malphigia 25:13, 1912 = angustifolia Turcz., Hunter, Ann.Miss.Bot.Gard. 53:80, 1966. Mexico, Guatemala, Honduras!

* leucophloea Korth., Verh.Nat.Gesch.Bot.:125 = tristyla DC., Miq., Fl.loc.cit.suppl. 1:487.
f.longifolia Miq., loc.cit.suppl.1:189 & 481. Syn. Saurauia teysmanniana Miq., Ann.Mus.Bot.Lugd.-bat. 4:107.
f.oxyphylla Miq., Fl.loc.cit.suppl.1:189 & 480. Syn. S.oxyphylla Miq., Ann.Mus.Bot.Lugd.-bat. 4:107. Sumatra: Mt. Singalan!
Baker, J.Bot.Brit.For. 56:165, 1918.

158. leytensis Merr., Philipp.J.Sci.Bot. 7:306, 1912. Philippines:Leyte!
N.n.alvarezii .2353, purgans .2778.

159. lindeni Regel, Ind.Sem.Hort.Petrop.:90, 1868. Java!

160. loeseneriana Turcz. ex Busc., Malphigia 25:7, 1912. Peru, Ecuador!
Busc., loc.cit. 399.

161. loheri Merr., Philipp.J.Sci. 27:36, 1925. Philippines: Luzon!
N.n.vanoverberghii .2353.

162. longifolia Oliv., J.Linn.Soc. 85:98, 1876. Celebes: Menado prov.!
N.n.bakeri .25.

163. longipedicellata Merr., Philipp.J.Sc. 20:407, 1922. Philippines:Mindanao; Zamboanga prov.!
N.n.philippinensis .333.

164. longipetiolata Merr., Philipp.J.Sc.Bot. 13:89, 1918. Sabah:Mt.Kinabalu!
Merr., Enum.Bor.Pl.,J.R.As.Soc.St.Br.Spec.Publ.:385, 1921.
N.n.amplifolia .4615, forbesii .4737.

165. longistyla Merr., Philipp.J.Sci.suppl. 1:209, 1906. Philippines:Palawan, Jolo; Sabah:Tawao!
Merr., Univ.Calif.Publ.Bot. 15:197, 1929. N.n.heterosepala .3, trunciflora .3177.

166. lorentzii Lautbch ex Lorentz Nova Guinea Bot. 8:305, 1910. P.N.G.:W.Highlands!
Diels, Bot.Jahrb. 57:447, 1922. N.n.desquamulata .4118.

167. luzoniensis Merr., Philipp.J.Sci.suppl. 1:209, 1906. Philippines:Luzon, Rizal prov.!
N.n.rosea .3529, schumanniana .3939, zamboangensis .3939.

168. macgregorii Merr., Philipp.J.Sc.Bot. 7:306, 1912. Philippines:Luzon, Nueva Vizcaya prov.!
N.n.versteegii .3023.

169. macrantha Smith, J.Arn.Arb. 22:507, 1941. Irian Jaya:Lake Habbema!
N.n.alpicola. This species is doubtfully distinct from alpicola Smith.

170. macrophylla Lem. ex Hort., Vanhoutt 1, fasc. 2:35, 1846. Java!
Hort. ex Regel, Ind.Sem.Hort.Petrop:102, 1866.

171. macrotricha Kurz., J.As.Soc.Beng. 42:60, 1873. Burma, Malaya, China; Yunnan. Indo-China:Tonkin!
Dyer ex Hook., Fl.Brit.Ind. 1:287, 1875; Finet & Gagnep., Mem.Soc.Bot.Fr. 4:15, 1905; Merrill J.Arn.Arb. 23:183, 1942. N.n.caroli .3939.

172. mahmudii Hoogl., Gard.Bull.Sing. 30:118, 1977. Malaya: Cameron Highland!

173. malayana Hoogl., Gard.Bull.Sing. 30:120, 1977. Malaya: Cameron Highland!

174. mamberamana Diels, Nova Guinea 14:82, 1924.
var.bruynii Diels, loc.cit. Irian Jaya:Mamberamo River!
N.n.knemaefolia .3571.

175. matthewsii Merr., Philipp.J.Sci.Bot. 13:90, 1918. Sabah: Tawao!
Merrill, Enum.Bor.Pl.J.R.As.Soc.St.Br.Spec.Publ.:385; Merr., Univ.Calif.Publ.Bot. 15:197-198, 1929. N.n.amoena .3939.

* matudai Lund., Contrib.Univ.Mich.Herb. 7:27, 1942 = conzattii Busc., Hunter, Ann.Miss.Bot.Gard. 53:77, 1966. Mexico!

176. maxoni Donn.Sm., Coult.Bot.Gaz. 42:292, 1906. Guatemala!
Busc., Malphigia 25:14, 1912.

* media Korth., Verh.Nat.Gesch.Bot.:125 = ?tristyla DC., Index Kew.7, 1921-1929 or = ?nudiflora DC., Boerlage,Cat.Bog.:89. Syn. Ternstroemia serrata Roxb, Saurauia camptodonta Miq., S.inflexidens Miq. Fl.Ind.Bat. 2:486; Miq., Ann.Mus. Bot.Lugd.-bat. 4:107. Sumatra!
Baker, J.Bot.Brit.For. 56:166, 1918; Merrill, Enum.Born. Pl.J.R.As.Soc.St.Br.Spec.Publ.:386; Merr., J.Arn.Arb. 33: 248, 1952. The synonymy of Saurauia media, S.camptodonta and S.inflexidens is uncertain. Index Kew. lists them under S.tristyla DC., while Boerlage lists the first two under S.nudiflora. To further complicate, Miq. in Fl.Ind. Bat.2 places Ternstroemia serrata in S.media while Steud., Nom.Bot. 2:516, 1841 considers the former to be synonymous with S.roxburghii Wall.

177. meiandra Diels, Bot.Jahrb. 57:445, 1922. P.N.G.:Sepik Dists!
N.n.oligantha!

178. melastomacea (Turcz.) Hunter, Ann.Miss.Bot.Gard. 53:57, 1966. Syn. Obelanthera melastomacea Turcz., Bull.Soc.Nat.Mosc. 20:148, 1847. Mexico!
Floral biol., Dickison, J.Mitchell Soc. 88:44, 1972.

179. melegritoi Merr., Philipp.J.Sci. 29:396, 1926. Sabah: Balambangan Is., Banguey Is.!
N.n. amplifolia .3571. Merrill compares this species to amplifolia Merr.

180. meridensis Steyerm., Fieldiana Bot. 28:368, 1952. Venezuela!

181. merrillii Elmer, Leafl.Philipp.Bot. 1:321, 1908. Philippines!

182. mexiae Killip ex Soejarto, Bot.Mus.Leafl.Harv.Univ. 22:268, 1969. Ecuador!

183. micayensis Killip, J.Wash.Acad.Sci. 16:570, 1926. Colombia!

184. micrantha Bl., Bijdr.:127. Java:Gunong Gedeh!
Miq., Fl.Ind.Bat. 1:2; Miq., Ann.Mus.Bot.Lugd.-bat. 4:106; Koord., Fl.v.Tjibodas 7:181, 1923; Baker & Bakh.v.d.Brink, Fl.Java 1:326, 1963. Steud,Nom.Bot. 2:516, 1841 places this species in synonymy with Saurauia napaulensis DC. It is unlikely that this is correct since napaulensis hardly reaches Malaya and then possibly only as an introduction (Hoogl., Gard.Bull.Sing. 30:120, 1977). It is certainly not known from Sumatra. S.micrantha also lacks the dense indument on the lower surface of the leaves, which is well developed in napaulensis. N.n.asperifolia .4444.
* micrantha Griff., Itin Notes:71 = ?roxburghii Wall., Hook., Fl.Brit.Ind. 1:288.

185. microphylla D.Vr., Pl.Ind.Bat.Or.:49. Java!

186. minahassae Koord. ex Meded.'s Lands Plantent. 19:643. Celebes!

187. mindorensis Merr., Philipp.J.Sc. 17:284, 1921. Philippines: Mindoro!
N.n.ceramica .3846.

* mojandensis R.Ben., Bull.Soc.Bot.Fr. 80:334, 1933, sp.dub. Colombia!

* mollis Hassk., Cat.Hort.Bog.Alt.:210 = bracteosa DC. Miq., Fl.Ind.Bat. 1:480. Java!
Boerlage,Cat.Bog.:88-90.

188. mollissima Rid., Trans.Linn.Soc.Bot. 9:15, 1916. Irian Jaya!
Smith, J.Arn.Arb. 22:514, 1941. N.n.pannosa .222.

189. momiensis Kanehira & Hatusima, Bot.Mag.Tokyo 57:64, 1943. P.N.G.!

190. monadelpha Scheff., Ann.Jard.Buitenz. 1:8, 1876. Irian Jaya: Geelvink Bay, Dore, Andai!
Ridley, Trans.Linn.Soc.Bot. 9:15, 1916; Diels Bot.Jahrb. 57:447, 1922. N.n.melegritoi .3913.

* montana Seem., Bot.Voy.Herald:87,t.16 = veraguasensis Seem, Hunter, Ann.Miss.Bot.Gard. 53:64, 1966.

191. multinervis Soejarto, Bot.Mus.Leafl.Harv.Univ. 22:266, 1969. Colombia!

192. moritziana Turcz., Bull.Soc.Nat.Mosc. 31:243, 1858. Venezuela!

193. muricata Reinw. ex DeVr., Pl.Ind.Bat.Or.:46. Syn. Marumia muricata Reinw. Celebes, Java!
Steud.Nom.Bot. 2:516, 1841.

194. myrmecoidea Merr., Philipp.J.Sci.Bot. 13:91, 1913. Sarawak!
Merr., Enum.Bor.Pl.,J.R.As.Soc.St.Br.Spec.Publ.:386.
N.n.cordata .3939.

195. nabirensis Kanehira & Hatusima Bot.Mag.Tokyo 57:68, 1943. Irian:Jaya!

196. napaulensis DC. Mem.Soc.Phys.Geneve 1:421, 1822. Syn. Ternstroemia paniculata Wall.; Saurauia paniculata (Wall.) G.Don.; Zanthoxylum serra Turcz., Bull.Soc.Nat.Mosc. 1:440, 1854; ?Saurauia micrantha Bl.syn.dub. Nepal, India: Himachal Pradesh, Uttar Pradesh, Assam, Khasia, Shillong, Bhutan. Burma, China:Yunnan. Indo-China:Laos, Thailand, Vietnam. Malaya, poss.cult. Cult.S.India, Ceylon! Wall.Pl.As.Rar. 2:40,t.7 & 178, 1829-1832; Dyer ex Hook. Fl.Brit.Ind. 1:286, 1875; Clark, J.Linn.Soc.Lond. 15:133, 1876; Crambe, Man.Ind.Timb.ed.2:65, 1902; Finet & Gagnep., Mem.Soc.Bot.Fr. 4:15, 1905; Lushington, Vern.n.190, 1915; Craib.Fl.Siam.Enum. 1:128, 1925; Chitt.Dict.Gard.:1874, 1951; Banerji, Rec.Bot.Surv.India 19:28, 1965; Matthew, loc.cit. 20:45, 1969; Mukerjee, loc.cit. 20(2):42-43, 1973. N.n. roxburghii .3793, thorelii .4074, vulcani .4074.

197. narcissifragrans Schultes, Caldasia 2:39, 1943. Colombia!

198. natalicia Sleum., Notizbl.Bot.Gart.Berlin 12:144, 1934. Peru!

199. naumanii Diels, Bot.Jahrb. 57:458, 1922. Irian Jaya:Geelvink Bay!
Diels originally published the locality as Bismarck Is. but subsequently excluded this collection from the species and corrected the locality to that above. Diels, Nova Guinea Bot. 14:84, 1924. N.n.achyrantha .333.

200. negrosensis Elmer, Leafl.Philipp.Bot. 2:499, 1908. Philippines:Negros!

* nelsoni Rose, U.S.Dept.Agric.Contrib.Nat.Herb. 8:52 = scabrida Hemsl., Hunter, Ann.Miss.Bot.Gard. 53:69, 1966. Mexico!
Busc., Malphigia 25:9, 1912; loc.cit. 406; loc.cit. 26:114-119, 1913.

201. nigrescens Korth., Verh.Nat.Gesch.Bot.:128. Borneo!

Miq., Fl.Ind.Bat. 2:482, 1858-1859; Miq., Ann.Mus.Bot. Lugd.-bat. 4:107.

* noronhiana Bl., Bijdr.:127 = nudiflora DC., Hassk.Pl.Jav.Rar. :272. Java!

202. nudiflora DC., Mem.Soc.Phys.Geneve 1:422,t.5, 1822. Syn. Saurauia noronhiana Bl.; S.rosea Jungh.non Schum. & Lautbch; ?S.camptodonta Korth.; S.grandifolia Zoll.; S.pendula Hort.Bog.cult.non Blume.

var.sumatrana Baker, J.Bot.Brit.For. 56:165, 1918.

var.tetragyna Boerl.,Cat.Bog.:90. Syn. Saurauia leprosa Hort.Bog.cult.non Korth.; S.pendula Hort.Bog.cult.non Blume.

var.media Boerl., Cat.Bog.:90. Syn. ?S.media Korth.

Malaya, Sumatra, Java!

Finet & Gagnep., Mem.Soc.Bot.Fr. 4:15, 1905; Koord., Fl.v. Tjibodas 7:182-183, 1923; Burkill, Gard.Bull.St.Settlem. 3:36, 1923; Ridley, Fl.Mal.Pen 1:207, 1922-1925; Henderson, J.R.As.Soc.St.Br. 5:243, 1927; Henderson, Gard.Bull.St. Settlem. 4:226, 1928; Merrill, Contrib.Arn.Arb. 8:105, 1934; Jacobs, Ann.Bog. 3:72, 1958. N.n.melegritoi .5.

203. novo-guineensis Scheff., Ann.Jard.Buitenz. 1:7, 1876. Irian Jaya:Andai. Solomon Is.:Bougainville!

Diels.Bot.Jahrb. 57:457, 1922. N.n.lepidicalyx .4444.

This closely resembles some conferta specimens.

* obelanthera Turcz., Bull.Soc.Nat.Mosc. 30:245, 1858 = villosa DC., Hunter, Ann.Miss.Bot.Gard. 53:58, 1966.

204. oblanceolata Ridl., Trans.Linn.Soc.Bot. 9:14, 1916. Irian Jaya!

N.n.loheri .2727.

205. oblancifolia Merr., J.R.As.Soc.St.Br. 79:31, 1918. Syn. Saurauia oblanceolata Merr. Sabah:Mt.Kinabalu!

Merr., Enum.Born.Pl.,J.R.As.Soc.St.Br.Spec.Publ.:386.

N.n.eburnea .3889.

206. oblancilimba Quis., Philipp.J.Sci. 4:332, 1930. Philippines: Luzon!

N.n.tayabensis .4194.

207. obvallatoides Kanehira & Hatusima, Bot.Mag.Tokyo 57:66, 1943. N.G.!

208. occulta Smith, J.Arn.Arb. 22:523, 1941. Irian Jaya:Bele River near Lake Habbema, Idenburg River!
N.n.congestiflora .3091.

209. oldhami Hemsl. ex Forbes & Hemsl., J.Linn.Soc. 23:79, 1886. Syn. Saurauia tristyla
var.oldhami Finet & Gagnep. Formosa. Indo-China:Tonkin! Hayata, Ic.Pl.Formos. 1:88, 1911. This does not belong with tristyla since that species is not found in Indo-China (Hoogl. Gard.Bull.Sing. 30:112, 1977). Hoogland (pers.comm.) considers that it is syn. with S.roxburghii.
N.n.sapotoides .5.

210. oligantha Merr., Philipp.J.Sci.Bot. 11:18, 1916. Philippines:Luzon!
N.n.meiandra .28.

211. oligolepis Miq., Ann.Mus.Bot.Lugd.-bat. 4:109. Celebes: Menado prov.!
Pollen descr.Erdtman, Pollen Morph. & Taxonomy 1952.

212. oligophlebia Merr., Philipp.J.Sci.Bot. 13:308, 1918. Philippines:Catanduanes!
N.n.calyptrata .28.

213. omichlophila Schultes, Caldasia 2:319, 1944. Colombia!
Reproductive biol., Soejarto, J.Arn.Arb. 50:180-194, 1969.

214. oreadum Diels, Bot.Jahrb. 57:458, 1922.
var.humilis Diels, loc.cit. 459. P.N.G.:Sepik dists.!
N.n.desquamulata .3793.

215. oreophila Hemsl., Diagn.Pl.Nov.:3, 1878. Syn. Saurauia latipetala Hemsl., loc.cit. 4; S.pauciflora Rose; S.subalpina Donn.Sm.; S.oreophila f.genuina Busc., Malphigia 26:142, 1913; S.oreophila f.rubra Busc., loc.cit.

S.pauciflora
var.ghiesbreghtii Busc., loc.cit. 291; S.parviflora
var.ghiesbreghtii Busc., loc.cit. 27:302, 1916. Syn. in
Hunter, Ann.Miss.Bot.Gard. 53:71, 1966. Mexico, Guatemala!
Busc., Malphigia 25:9, 1912; loc.cit. 406; loc.cit. 26:118,
1913; loc.cit. 128; loc.cit. 135; loc.cit. 139; loc.cit.
285; loc.cit. 288.

* ovalifolia Donn.Sm., Coult.Bot.Gaz. 42:292, 1906 =
veraguasensis Seem., Hunter, Ann.Miss.Bot.Gard. 53:64, 1966.
Costa Rica!
Busc., Malphigia 25:10, 1912; loc.cit. 27:21, 1914.

* oxyphylla Miq., Fl.Ind.Bat.suppl.:480 = leucophloea f.
oxyphylla Miq., Ann.Mus.Bot.Lugd.-bat. 4:107 = tristyla DC.

216. palawanensis Merr., Philipp.J.Sci.Bot. 9:527, 1915.
Philippines:Palawan!
N.n.mollissima .3793.

217. panayensis Merr., Philipp.J.Sci.Bot. 9:528, 1915.
Philippines:Panay!
N.n.simplex .4.

218. panduriformis Elmer, Leafl.Philipp.Bot. 2:580, 1909.
Philippines!

* paniculata Wall. ex G.Don.Gen.Syst. 1:567 = napaulensis.

219. paniculigera Ridl., J.Fed.Mal.St.Mus. 8:19, 1917. Sumatra:
Gunong Kerintji!
Jacobs, Ann.Bog. 3:72, 1958 considers this may be con-
specific with S.vulcani Korth. N.n.rubens .3636.

220. pannosa Diels, Bot.Jahrb. 57:457, 1922. P.N.G.:Mt. Hellwig,
Morobe Dist., Highland Dists.!
Diels, Nova Guinea Bot. 14:84, 1924. N.n.mollissima .222.

221. papillulosa Merr., Philipp.J.Sci.Bot. 9:529, 1915.
Philippines:Luzon!
N.n.glabra .4.

* papuana Schum. ref?. Ridley, Trans.Linn.Soc.Bot. 9:15, 1916
considers this to be similar to S.uniflora Ridl.

222. parviflora Triana & Planch., Ann.Sc.Nat.ser.4, 18:268, 1862.
var.ghiesbreghtii Busc., Malphigia 27:302, 1916 = oreophila Hemsl., Hunter, Ann.Miss.Bot.Gard. 53:71, 1966. Mexico! Busc., Malphigia 25:14, 1912; loc.cit. 27:499, 1916.

223. pastasana Diels, Biblioth.Bot.,29,h. 116:107, 1937. Ecuador!
* pauciflora Rose, U.S.Dept.Agric.Contrib.Nat.Herb. 8:52, 1903 = oreophila Hemsl., Hunter, Ann.Miss.Bot.Gard. 53:71, 1966.
var.ghiesbreghtii Busc., Malphigia 25:11, 1912 = oreophila Hemsl., Hunter, Ann.Miss.Bot.Gard. 53:71, 1966. Mexico! Busc., Malphigia 26:112, 1913; loc.cit. 287-290; loc.cit. 27:492, 1916.
* pauciserrata Hemsl., Diagn.Pl.Nov.3 = kegeliana Schlecht., Hunter, Ann.Miss.Bot.Gard., 53:82, 1966.
var.kegeliana (Schlecht.) Busc., Malphigia 25:13, 1912 = kegeliana Schlecht., Hunter, Ann.Miss.Bot.Gard. 53:83, 1966.
f.crenata Busc., Malphigia 29:11, 1921 = kegeliana Schlecht., Hunter, Ann.Miss.Bot.Gard. 53:83, 1966.
f.veranii Busc., Malphigia 29:11, 1921 = kegeliana Schlecht., Hunter, Ann.Miss.Bot.Gard. 53:83, 1966. Mexico, Guatemala!

224. pedunculata Hook., Ic.Pl.4,t.341, 342, 1841 (ex icon.). Syn. Saurauia pedunculata
var.leucocarpa Busc., Malphigia 25:12, 1912; S.pedunculata f.veranii Busc., loc.cit. 28:236, 1917; S.pedunculata var.leucocarpa f.veranii Busc., loc.cit. 315, 1918.
var.fluviatilis Busc., loc.cit. 25:12, 1912 = serrata DC., Hunter, Ann.Miss.Bot.Gard. 53:79, 1966.
var.leucocarpa Busc. = S.pedunculata DC., Hunter, Ann.Miss. Bot.Gard. 53:78, 1966.
var.pringleana Busc., Malphigia 25:12, 1912 = leucocarpa Schlecht., Hunter, Ann.Miss.Bot.Gard. 53:82, 1966.
var.strigillosa Busc., Malphigia 25:12, 1912 = serrata DC., Hunter, Ann.Miss.Bot.Gard. 53:78, 1966.
var.reticulata Busc., Malphigia 25:12, 1912 = serrata DC., Hunter, Ann.Miss.Bot.Gard. 53:78, 1966. Mexico! Busc., Malphigia 25:409, 1912; loc.cit. 26:407, 1913.

225. peduncularis Triana & Planch., Ann.Sc.Nat.ser4, 18:267, 1862.
var.veraniana Busc., Malphigia 26:26, 1913. Mexico!
Busc., loc.cit. 25:420, 1912; loc.cit. 26:22-30, 1913; loc.cit. 26:99, 1913.

226. pendula Bl., Bijdr.:127, excl. specimens cult. Hort.Bog. which are nudiflora DC. Java!
Miq., Ann.Mus.Bot.Lugd.-bat. 4:110; Baker, J.Bot.Brit.For. 56:165, 1918; Koord., Fl.v.Tjibodas 7:183, 1923; Backer & Bakh.v.d.Brink, Fl.Java:326, 1963. N.n.heterosepala .333.

227. pentapetala (Jack) Hoogl., Gard.Bull.Sing. 30:112, 1977.
Syn. Ternstroemia pentapetala Jack, Mal.Misc. 1:40, 1821; Cleyera pentapetala (Jack) Spreng., Linn.Syst.Veg.ed.16, 2:596, 1825; Scapha pinangiana Choisy, Mem.Soc.Phys.Hist. Nat.Geneve 14:119, 1855. Saurauia nudiflora
var.angustifolia Craib, Fl.Siam.Enum. 1:128, 1925. Burma!
As tristyla DC. in Wall., Num.List no.1466, 1829; Wall. Pl.As.Rar. 2:40, 1831; Dyer ex Hook. Fl.Brit.Ind. 1:287, 1874; King, J.As.Soc.Beng. 59:197, 1890; Ridley, Fl.Mal. Pen. 1:207, 1922; Craib, Fl.Siam.Enum. 1:129, 1925; Burk. & Henders., Gard.Bull.Str.Settl. 3:349, 1925; Henders. loc.cit. 4:226, 1928; Burk.Dict.Econ.Prod.Mal.Pen:1967, 1935; loc.cit. ed2:2002, 1966; Keng., Fl.Thail. 2:110, 1972. Other lit. Merr., J.Arn.Arb. 33:247, 1952.
* perseifolia Standl. & Steyerm., Publ.Field Mus.Nat.Hist. Bot. 23:216, 1947 = aspera Turcz., Hunter, Ann.Miss.Bot. Gard. 53:73, 1966. Guatemala!

228. peruviana Busc., Malphigia 25:11, 1912. Peru!
Busc., loc.cit. 434; loc.cit. 27:319, 1916; loc.cit. 27: 323, 1916; loc.cit. 487; loc.cit. 495.

229. petelotii Merr., Pl.Elmer.Born.,Univ.Calif.Publ.Bot. 10: 426, 1924. Indo-China:Tonkin!
N.n.napaulensis .4167.

230. phaeosepala Diels, Bot.Jahrb. 57:454, 1922. P.N.G.:Sepik!
N.n.rudolfi .3193, rupestris .4118.

231. philippinensis Merr., Philipp.J.Sci. 2:282, 1907. Philippines:Mindanao, Mt. Halcon!
N.n.longipedicellata .333.

232. pilogyne Diels, Bot.Jahrb. 57:449, 1922. P.N.G.:Highlands Dists.!
N.n.desquamulata .3125.

233. pittieri Donn.Sm., Coult.Bot.Gaz. 23:237, 1897. Syn. Saurauia pseudopittieri Busc. f.veranii Busc., S.pittieri Donn.Sm.f.veranii Busc. Costa Rica!
Busc., Malphigia 25:7, 1912; loc.cit. 26:396, 1913; loc. cit. 27:147, 1915; loc.cit. 154; loc.cit. 30:98, 1927; loc.cit. 30:210, 1927.

234. planchonii Hook., Trans.Linn.Soc. 23:161, 1860. Sarawak!
Merrill, Philipp.J.Sci.Bot. 13:31, 1918; Merr., Enum.Born. Pl.,J.R.As.Soc.St.Br.Spec.Publ.:386, 1921.

235. platyphylla Merr., Philipp.J.Sci.Bot. 13:93, 1918. Sabah: Mt. Kinabalu!
Merr., Enum.Born.Pl.J.R.As.Soc.St.Br.Spec.Publ.:386, 1921.
N.n.cerea .4.

236. pleurotricha Diels, J.Arn.Arb. 10:80, 1929. P.N.G.:Vailala R., Fly R.!
White, J.Arn.Arb. 10:40, 1929; Smith, loc.cit. 22:521, 1941. N.n.stichophlebia .3043.

237. plurilocularis White & Francis, Proc.R.Soc.Qld. 38:244-245, 1927. P.N.G.:Central Div.!
White & Francis in Lane-Poole, Rep.For.Resources, Terr. Papua N.Guin.:116, 1925. White & Francis 1927 compare this species to S.pendula Blume, which it is not close to. Further collections of the species have been examined and found to possess large deciduous bracts like those of S.eburnea Smith which this species closely resembles and with which it appears to be gradational. In a flower from the specimen Hartley 11787, five not seven locules were

found. Further specimens referrable to this species include Hartley 11,787, Hartley 11797 (small leaved form like eburnea), Womersley & Hoogl. NGF 11807 (small leaved), Wheeler ANU 5944 (very like and apparently transitional with Brass 30761 referred to eburnea), Craven & Schodde 1309, Craven & Schodde 1141, Womersley NGF 11806, Womersley & Miller NGF 8330, Hoogland 9521. N.n.knemaefolia .3793.

238. poilanei Gagnep. ex Humbert, Suppl.Fl.Gen.Indo-Chine 1:25, 1938. Indo-China!

* polyantha D.Vr., Pl.Ind.Bat.Or.:36 = vulcani Korth., Index Kew. 7, 1921-1929.

* polyantha Gilg., Engl. & Prantl., Naturl.Pflanzenfam. 3:128, 1893 = rubiformis Vatke, Hunter, Ann.Miss.Bot.Gard. 53:60, 1966. Costa Rica!

239. polyodon Miq., Ann.Mus.Bot.Lugd.-bat. 4:107, 1869. Moluccas! N.n. amplifolia .4483.

240. polysperma (Blanco) Merr., Sp.Blancoanae:263, 1918. Syn. Gordonia polysperma Blanco. Philippines!

* polytricha Miq., Fl.Ind.Bat.suppl.:480 = setigera Korth., Miq., Ann.Mus.Bot.Lugd.-bat. 4:108.

241. poolei White & Francis ex Lane-Poole, Rep.For.Resources, Terr. Papua N.G.:116, 1925; White & Francis, Proc.R.Soc. Qld. 38:246-247, 1927. P.N.G.:Northern Div.! Smith, J.Arn.Arb. 22:518, 1941. N.n.versteegii .3, leytensis .3514.

242. prainiana Busc., Malphigia 25:7, 1912. Peru! var.humboldtiana Busc., loc.cit. 248. Busc., loc.cit. 389-398; pollen descr.Erdtman, Pollen Morph.Pl.Taxonomy:35, 1952.

243. portachuelensis Schultes, Caldasia 2:40, 1943. Colombia!

244. pringlei Rose, U.S.Dept.Agric.Contrib.Nat.Herb. 8:52. Syn. Saurauia pringlei

var.micrantha Busc., Malphigia 26:137, 1913; S.wildemanii Busc., loc.cit. 143; S.buscalioniana Blake, Contrib.Gray Herb. 52:74, 1916. Hunter, Ann.Miss.Bot.Gard. 53:70-71, 1966. Mexico!
Busc., Malphigia 26:130-135, 1913; floral biol. Dickison, J.Mitchell.Soc. 88:44, 1972.

245. pruinosa Schultes, Bot.Mus.Leafl.Harv.Univ. 16:81, 1953. Colombia!

* pseudocostaricensis Busc., Malphigia 25:10, 1912 = veraguasensis Seem., Hunter, Ann.Miss.Bot.Gard. 53:64, 1966. Panama!
Busc., Malphigia 27:25, 1914.

246. pseudoexcelsa Busc., Malphigia 25:8, 1912. Ecuador!
Busc., loc.cit. 433; loc.cit. 26:304, 1913; loc.cit. 323.

247. pseudoleucocarpa Busc., Malphigia 25:13, 1912. Colombia!
Busc., loc.cit. 26:328, 1913; loc.cit. 27:344, 1916.

248. pseudoparviflora Busc., Malphigia 25:15, 1912. Bolivia!
var.rusbyiana Busc., loc.cit. Bolivia!
Busc., loc.cit. 26:423, 1913; loc.cit. 27:350, 1916; loc. cit. 500; loc.cit. 30:158, 1927.

* pseudopedunculata Busc., Busc. & Muscat. Stud.Anat.Biol. Saurauia 37, 1918 = serrata DC., Hunter, Ann.Miss.Bot. Gard. 53:77, 1966. Busc., Malphigia 28:398, 1919. Mexico!

249. pseudopittieri Busc., Malphigia 25:14, 1912. Costa Rica!
f.veranii Busc., loc.cit. 30:98, 1927 = pittieri Donn.Sm., Hunter, Ann.Miss.Bot.Gard. 53:59, 1966. Busc., Malphigia 26:422, 1913; loc.cit. 27:348, 1916; loc.cit. 30:97, 1927.

* psuedopringlei Busc., Busc. & Muscat., Stud.Anat.Biol. Saurauia 37, 1918 = leucocarpa Schlecht., Hunter, Ann.Miss. Bot.Gard. 53:82, 1966.
var.fluviatilis Busc., Malphigia 28:380, 1919 = serrata DC., Hunter, Ann.Miss.Bot.Gard. 53:78, 1966. Mexico!
Busc., Malphigia 28:378, 1919.

* pseudorubiformis Busc., Malphigia 25:11, 1912 = rubiformis Vatke, Hunter, Ann.Miss.Bot.Gard. 53:60, 1966. Costa Rica!
var.guatemalensis Busc., Malphigia 27:155, 1915 = rubiformis Vatke, Hunter, Ann.Miss.Bot.Gard. 53:60, 1966. Guatemala!
Busc., Malphigia 27:149, 1915; loc.cit. 27:158, 1915; loc. cit. 293-294.

250. pseudoruitziana Busc., Malphigia 25:8, 1912. Peru!
Busc., loc.cit. 26:426, 1913; loc.cit. 30:244, 1927.

251. pseudoscabra Busc., Malphigia 25:11, 1912. Peru!
Busc., loc.cit. 28:1, 1917.

* pseudoscabrida Busc., Malphigia 25:10, 1912 = veraguasensis Seem., Hunter, Ann.Miss.Bot.Gard. 53:64, 1966. Costa Rica!

* pseudoveraguensis Busc., Malphigia 27:30, 1914 = veraguasensis Seem., Hunter, Ann.Miss.Bot.Gard. 53:64, 1966. Colombia!
Busc., Malphigia 27:127, 1915; loc.cit. 129; loc.cit. 137.

252. pseudostrigillosa Busc., Malphigia 25:7, 1912. Ecuador!
Busc., loc.cit. 125.

253. pulchra Sprague, Trans.Proc.Bot.Soc.Edinb. 22:426. Colombia!
Busc., Malphigia 25:15, 1912; Schultes, Caldasia 2:321, 1944.

254. punctata Stapf.MS in Herb.Kew. ex Baker, J.Bot.Brit.For. 56: 166, 1918. Sumatra:Mt.Singalan!
N.n.asperifolia .2382.

255. punduana (Wall.) Dyer, Hook., Fl.Brit.Ind. 1:287, 1874. Syn. Ternstroemia punduana Wall., Pl.As.Rar. 2:40. India:Sikkim, Bhutan. Burma, Indo-China:Laos. China:Yunnan!
Hemsl., J.Linn.Soc.Bot. 23:79, 1886-1888; Finet & Gagnep., Mem.Soc.Bot.Fr.4:15, 1905; Hundley, Trees, Shrubs, Herbs & Climbers from Borneo 1961; Mukerjee, Rec.Bot.Surv.Ind. 20: 43, 1973. N.n.lepidicalyx .333.

256. purgans Burtt., Hook.Ic.Pl.:34, t3316, 1936. Solomon Is.: Bougainville!
Foreman, Bot.Bull.Terr.P.N.G.:59, 1971. Burtt. in his paper discusses the use of leaf indument in defining the

sections of the genus. N.n.leytensis .2778.

257. purpurellifolia Kanehira & Hatusima, Bot.Mag.Tokyo 57:67, 1943. P.N.G.!

258. pustulata Hunter, Ann.Miss.Bot.Gard. 52:63, 1966. Mexico!

259. putumayonis Schultes & Garc.-Barrigae, Caldasia 2:42, 1943. Colombia!
Reproductive biol., Soejarto, J.Arn.Arb. 50:180-194, 1969.

260. pycnotricha Turcz., Bull.Soc.Nat.Mosc. 31:244, 1858. Venezuela!
Busc., Malphigia 25:240, 1912; loc.cit. 393; loc.cit. 413, loc.cit. 422; loc.cit. 432.

261. pyramidata Sleum., Notizbl.Bot.Gart.Berlin 12:145, 1934. Bolivia!

* radlkoferi Busc., Malphigia 25:10, 1912 = ?oreophila Hemsl., Hunter, Ann.Miss.Bot.Gard. 53:87, 1966. Mexico!
Busc., Malphigia 27:6, 1914; loc.cit. 9. Hunter is unsure of the identity of this sp.

262. raimondiana Sleum., Notizbl.Bot.Gart.Berlin 12:144, 1934. Peru!

263. ramiflora Koord. & Valet., Meded's Lands Plantent 16:278. Syn. Saurauia lanceolata DC.; Vanalphimia lanceolata Leschen.; Saurauia angustifolia (Becc.) Reinw.; S.spadicea Bl. Steud., Nom.Bot. 2:516, 1841. Java!
Boerlage,Cat.Bog.:90; Backer & Bakh.v.d.Brink, Fl.Java 1:326, 1963.

264. ramosii Quis., Philipp.J.Sci. 76:51, 1944. Philippines: Catanduanes!
N.n.confusa .2571.

* reinwardtiana Bl., Bijdr.:128, 1825 = bracteosa DC., Steud. Nom.Bot. 2:516, 1841. Syn. Saurauia hirsuta Hort.Bog.Cult. Java:Tjibodas!
Korth., Verh.Nat.Gesch.Bot.:154; Hassk.,Cat.Bog.:210; Miq.,

Fl.Ind.Bat. 1:480; Miq., Ann.Mus.Bot.Lugd.-bat. 4:110; Teysm. & Binn. Cat.Bog.:203; Koord. & Valet., Bijdr. Boschb.Fl.Java 3:259; Boerlage, Cat.Bog.:88; Baker, J.Bot. Brit.For. 56:162, 1918; Koord. Fl.v.Tjibodas 7:181, 1923; Ridley, J.R.As.Soc.Mal.Br. 1:54, 1923; Merr., Contrib. Arn. Arb. 8:105, 1934; Backer & Bakh.v.d.Brink, Fl.Java 1:325, 1963.

* reticulata Rose, U.S.Dept.Agric.Contrib.Nat.Herb. 8:52 = serrata DC., Hunter, Ann.Miss.Bot.Gard. 53:78, 1966. Mexico!

265. rhamnifolia Killip., J.Wash.Acad.Sci. 16:572, 1926. Ecuador!

266. rhodosma Sleum., Notizbl.Bot.Gart.Berlin 12:144, 1934. Peru!

267. ridleyi Merr., J.R.As.Soc.St.Br. 79:33, 1918. Sarawak!
Merr., Enum.Born.Pl.J.R.As.Soc.St.Br.Spec.Publ.:386, 1921. N.n.havilandii .3333.

268. rigidissima Schultes, Bot.Mus.Leafl.Harv.Univ. 13:283, 1949. Colombia!

269. rodatzii Schum. & Lautbch, Fl.Deutsch.Sudsee:446. P.N.G.: Highlands Dists.!
Diels, Bot.Jahrb. 57:446, 1922. N.n.desquamulata .2258.

270. roemeri Lautbch ex Lorentz, Nova Guinea Bot. 8:836, 1912. P.N.G.:Morobe Dist.!
Diels, Bot.Jahrb. 57:450, 1922; White & Francis, Proc. R.Soc.Qld. 39:61-70, 1928. N.n.vallium .375.

* rosea Jungh., Hoev. & DeVriese, Tijdchr. 8:384, 1841 = nudiflora Diels. Java!

* rosea Schum. & Lautbch., Fl.Deutsch.Sudsee:446 = schumanniana Diels, Bot.Jahrb. 57:448, 1922. P.N.G.!
N.n.schumanniana .1613.

271. roseata Ridl., J.R.As.Soc.Mal.Br. 1:54, 1923. Sumatra: Gunong Besagi!
Merr., Contrib.Arn.Arb. 8:105, 1934. N.n.borneensis .3571.

272. roseotincta Schultes, Bot.Mus.Leafl.Harv.Univ. 16:83, 1953. Colombia!

273. roxburghii Wall., Pl.As.Rar. 2:40. Syn. Saurauia micrantha Griff.; S.tristyla Pierre non DC.; Ternstroemia serrata Roxb., Jack, Hook.J.Bot. 1:376, 1834. As tristyla DC. in Bentham, Fl.Hong Kongensis:26, 1861; King, J.As.Soc.Beng. 59:197, 1890; Ridl., Trans.Linn.Soc.Lond.ser.2,Bot. 3:277, 1893; Finet & Gagnep., Mem.Soc.Bot.Fr.4:15, 1905; Ridl., Fl.Mal.Pen. 1:207, 1922; Craib, Fl.Siam.Enum. 1:128, 1925; Burk. & Henders., Gard.Bull.Str.Settlm. 3:349, 1925; Henders., loc.cit. 4:226, 1928; Burk., Dict.Econ.Prod.Mal. Pen.:1967, 1935; loc.cit.ed.2:2002, 1966; Keng.Fl.Thail.2: 110, 1972. Nepal, India:Bhutan. China, Cambodia, Thailand, Malaya, Tyukyu Is.!
Dyer in Hook.Fl.Brit.Ind. 1:287, 1875; Clark, J.Linn.Soc. Lond.Bot. 25:7, 1889-1890; Collett & Hemsl. loc.cit. 25: 25, 1891. Finet & Gagnep., Mem.Soc.Bot.Fr. 4:15, 1905; Hundley, Trees, Shrubs, Herbs & Climbers from Burma, 1961; Mukerjee, Rec.Bot.Surv.Ind. 20:43, 1973. N.n.fasciculata .3103, napaulensis .3793.

274. rubens Ridl., J.R.As.Soc.St.Br. 61:1, 1912. Malaya!
Burk. & Holttum, Gard.Bull.St.Settlm. 3:22, 1923; Ridl., Fl.Mal.Pen. 1:208, 1922-1925. N.n.paniculigera .3636.

275. rubicunda (A.Gray) Seem., Fl.Vit.:14. Syn. Draytonia rubicunda Gray, Bot.Wilkes:206,t.15. Fiji!
Smith, J.Arn.Arb. 31:313-314, 1950; floral biol. Dickison, J.Mitchell Soc. 88:44, 1972. N.n.heterosepala .3488.

276. rubiformis Vatke, Linnaea 40:221, 1876. Syn. Saurauia serapiquensis Carr; S.polyantha Gilg.; S.rubiformis f. veranii Busc., Malphigia 27:144, 1915; S.rubiformis f. aspera Busc., loc.cit. 145; S.pseudorubiformis Busc.; S.pseudorubiformis
var.guatemalensis Busc. Hunter, Ann.Miss.Bot.Gard. 53:60-61, 1966. Guatemala, Costa Rica, Panama!
Busc., Malphigia 25:394, 1912; loc.cit. 27:19, 1915; loc. cit. 138; loc.cit. 153; Hunter, Ann.Miss.Bot.Gard. 52:594-

595, 1965; floral biol. Dickison, J.Mitchell.Soc. 88:44, 1972.

277. rubiginosa (Jack) Merr., J.Arn.Arb. 33:248, 1952. Syn. Ternstroemia rubiginosa Jack, Mal.misc. 1:38, 1820; Cleyera rubiginosa Spreng.Syst.Veg. 2:596, 1825; Saurauia jackiana Korth. Sumatra!
Baker, J.Bot.Brit.For. 56:625, 1918. N.n.auricoma .444.

278. rubrisquamata Smith, J.Arb.Arb. 22:504, 1941. P.N.G.: Central Div.!
N.n.fimbriata .3333.

279. rudolfi Diels, Bot.Jahrb. 57:459, 1922. Bismarck Archip.: New Britain!
N.n.auricoma .2632.

280. rufa Burk., Kew.Bull.:97, 1899. P.N.G.:Morobe Dist., Central Div.!
Diels, Bot.Jahrb. 57:454, 1922; Diels, Nova Guinea Bot. 14:83, 1924. N.n.loheri .3793.

281. rufinervis Kanehira & Hatusima, Bot.Mag.Tokyo 57:70, 1943. N.G.!

* rugosa Turcz., Bull.Soc.Nat.Mosc. 31:245, 1858 = elegans F.Vill., Merr., J.Arn.Arb. 35:143-144, 1954. Philippines!

282. ruiziana Steud., Nom.Bot. 2:516, 1841. Syn. Apatelia lanceolata DC.; Palaua lanceolata R.P.; Saurauia lanceolata DC. Mem.t.4. Peru!
var.weberbaueri Busc., Malphigia 26:6, 1913. Peru!
Busc., loc.cit. 25:8, 1912; loc.cit. 26:9, 1913; loc.cit. 16; loc.cit. 21; loc.cit. 303; loc.cit. 395; loc.cit. 413; loc.cit. 423, loc.cit. 425, loc.cit. 432-435; Merrill, J.Arn.Arb. 35:144, 1954. Some confusion surrounds the original description of S.lanceolata. The fig. referred to as the illus. of the type does not match the description and is close to S.ruiziana Steud.

283. rupestris Diels, Bot.Jahrb. 57:454, 1922. P.N.G.:Madang

dist.!
N.n.egregia .2381.

284. rusbyi Britt., Bull.Torrey Bot.Club 16:64, 1889. Bolivia!
var.glabrata Busc., Malphigia 25:15, 1912.
var.spectabilis Busc., loc.cit.
f.macrophylla Busc., loc.cit.

285. sakoembangensis Korth., Verh.Nat.Gesch.Bot.:134, 1839-1842. Borneo!
Merr., Enum.Born.Pl., J.R.As.Soc.St.Br.Spec.Publ.:386, 1921.
* sakoembangensis Carr., Rev.Hortic. 49:60, 1877. This is cited in Index Kew.2 but is possibly an error. If not, the name is illeg. having been published after Korth.'s usage. Costa Rica!

286. samarensis Merr., Philipp.J.Sci.Bot. 9:530, 1915. Philippines:Samar!
N.n.bicolor .3846.

287. sampad Elmer, Leafl.Philipp.Bot. 7:2616, 1915. Philippines: Mindanao!

288. santosii Merr., Philipp.J.Sci. 14:422, 1919. Philippines: Luzon!
N.n.oblancifolia .4667, scaberrima .4667.

289. sapotoides Ridl., J.Fed.Mal.St.Mus. 8:19, 1917. Sumatra!
Baker, J.Bot.Brit.For. 56:164, 1918. N.n.petelotii .4737.
* sarapiquensis Carr., Rev.Hort. 49:60, 1877 = rubiformis Vatke, Hunter, Ann.Miss.Bot.Gard. 53:60, 1966.

290. scaberrima Lautbch ex Lorentz, Nova Guinea Bot. 8:837, 1912. P.N.G.:Morobe Dist.!
Smith, J.Arn.Arb. 22:523, 1941. N.n.caroli .4444.

291. scabra HBK. ex Busc., Malphigia 25:7, 1912. Peru!
Busc., loc.cit. 392; loc.cit. 26:25, 1913; loc.cit. 301; loc.cit. 394; loc.cit. 27:317, 1916.

scabra Poepp. ex Choisy, Mem.Soc.Phys.Geneve 14:118, 1855 = scabriuscula Macbride 1956. Syn. Palaua biserrata R. & Pav.; Apatelia glabrata DC, Prod 1:526, non Palaua glabrata Pav. Peru!

var.prainiana Busc., Malphigia 27:493, 1916.

var.boliviana Busc., loc.cit. 496.

Busc., loc.cit. 25:11, 1912; loc.cit. 27:488, 1916; loc. cit. 491-492; loc.cit. 495; loc.cit. 499-500.

292. scabrida Hemsl., Diagn.Pl.Nov.3, 1878. Syn. Saurauia nelsoni Rose; S.selerorum Busc.,

var.pseudonelsoni Busc.,; S.villosa DC.

var.micrantha Busc.; S.villosa DC.

var.scabrida Busc.; S.scabrida

var.hemsleyana Busc., Malphigia 26:403, 1913. Mexico, Guatemala, El.Salvador, Honduras!

Busc., 26:417, 1913; loc.cit. 27:19, 1915; loc.cit. 18; loc.cit. 487; Hunter, Ann.Miss.Bot.Gard. 53:69, 1966.

293. scabriuscula Macbride, Publ.Field Mus.Nat.Hist.Bot. 13(3A): 685, 1956. Syn. Saurauia scabra Poepp. ex Choisy. Peru!

294. schlimmi Sprague, Trans.Proc.Bot.Soc.Edinb. 22:427. Mexico; N.Granata!

Busc., Malphigia 25:7, 1912; loc.cit. 294.

295. schultesiana Soejarto, Bot.Mus.Leafl.Harv.Univ. 22:267, 1969. Colombia!

296. schultzeorum Sleum., Notizbl.Bot.Gart.Berlin 15:374, 1941. Ecuador!

297. schumanniana Diels, Bot.Jahrb. 57:448, 1922. Syn. Saurauia rosea Lautbch & Schum. Rectinger in Denkschr.Akad.Wiss. Wein 89:579, 1913, non S.rosea Jungh. Solomon Is.!

Smith, J. Arn.Arb. 22:509-510, 1941; Foreman, Bot.Bull.5, Terr.P.N.G.:59, 1971. N.n.rosea .1613.

298. schwazii Koord. ex Meded's Lands Plantent 19:644. Celebes!

299. seibertii Standl., Publ.Field Mus.Nat.Hist.Bot. 18:693, 1937. Costa Rica, Panama!
Hunter, Ann.Miss.Bot.Gard. 26:290, 1939; loc.cit. 52:596, 1965; loc.cit. 53:81, 1966.

300. selerorum Busc., Malphigia 25:8, 1912.
var.pseudonelsoni Busc., loc.cit. 26:107, 1913 = scabrida Hemsl., Hunter, Ann.Miss.Bot.Gard. 53:69, 1966.
Busc., Malphigia 26:20, 1913; loc.cit. 100; loc.cit. 104-105; loc.cit. 110-113; loc.cit. 117. Mexico, Guatemala, El Salvador, Honduras!

301. serrata DC., Mem.Soc.Phys.Geneve 1:420,t.3, 1822 (ex icon). Descr. Prod. 1:526, 1824 = in Peru, glabrata Steud., Nom. Bot. 2:516, 1841. Syn. Leucothea serrata Moc. & Sesse ex DC.Prod. 1:526; Davya serrata Moc. & Sesse ex DC. loc.cit; Obelanthera coneifolia Sesse & Moc., Pl.Nov.Hisp.:173, 1890; Saurauia reticulata Rose; S.pedunculata
var.fluviatilis Busc.; S.pedunculata
var.reticulata Busc.; S.pedunculata
var.striqillosa Busc.; S.pseudopringlei
var.fluviatilis Busc.; S.fluviatilis Rose ex Busc.; S.pseudopedunculata Busc. Hunter, Ann.Miss.Bot.Gard. 53: 78-79, 1966. Mexico!
Floral biol., Dickison, J.Mitchell.Soc. 88:47, 1972.

* setidens Miq., Fl.Ind.Bat.suppl.:481 = vulcani Korth.

302. setigera Korth., Verh.Nat.Gesch.Bot.:133. Syn. Saurauia polytricha Miq., Baker, J.Bot.Brit.For. 56:163, 1918. Sumatra!

* setosa Standl., Field Mus.Publ.Bot. 18:693, 1937 = veraguasensis Seem., Hunter, Ann.Miss.Bot.Gard. 53:64, 1966.

303. sibuyanensis Elmer, Leafl.Philipp.Bot.4:1492, 1912. Philippines:Sibuyan!

304. simplex Merr., Univ.Calif.Publ.Bot. 15:197, 1929. Sabah: Tawao!
N.n.panayensis .4.

305. singalangensis Korth., Verh.Nat.Gesch.Bot.:134.
var.longifolia Ridl., Kew.Bull.:60, 1926. Sumatra:
Mentawi Is.!
Miq., Fl.Ind.Bat. 1:483; Miq., Ann.Mus.Bot.Lugd.-bat.
4:107-118; Baker, J.Bot.Brit.For. 56:163, 1918; Ridley,
Kew Bull.:78, 1925. Frequently misspelled as singalensis.

306. siporensis Rid., Kew.Bull.:60,1926. Sumatra:Mentawi Is.!
In Ridley's description of this species the number of
styles is given as both four and seven. The former is
correct. N.n.agamae .69.

307. smithiana Busc., Malphigia 25:14, 1912. Colombia, Guatemala!
Busc., loc.cit. 421; loc.cit. 27:346, 1916.

308. solitaria Sleum., Notizbl.Bot.Gart.Berlin 12:144, 1934.
Peru!

309. sorsogonensis Merr., Philipp.J.Sc.Bot. 11:17, 1916.
Philippines:Luzon!
N.n.elmeri .333.

* spadicea Bl., Bijdr.:128 = lanceolata DC., Steud.Nom.Bot.
2:516, 1841. Cult.Hort.Bot.Buitenz!

310. sparsiflora Elmer, Leafl.Philipp.Bot. 1:322, 1908.
Philippines!

311. spectabilis Hook., Bot.Mag.t.3982. Sth.America!

* speluncicola Schultes, Bot.Mus.Leafl.Harv.Univ. 8:193,
1940 = villosa DC. Hunter, Ann.Miss.Bot.Gard. 53:58,
1966. Mexico!

312. spinuligera Schultes, Caldasia 2:44, 1943. Colombia!

313. spinuloso-setosa Merr., J.R.As.Soc.St.Br. 79:32, 1918.
Sarawak!
Merr., Enum.Born.Pl.J.R.As.Soc.St.Br.Spec.Publ.:386,
1921. N.n.agamae .3143.

314. spragueana Busc., Malphigia 25:8, 1912. Ecuador!
Busc., loc.cit. 10; loc.cit. 13-16.

315. sprucei Sprague, Trans.Proc.Bot.Soc.Edinb. 22:427. Ecuador!
Busc., Malphigia 25:7, 1912.

316. squamellicaula Miq., Ann.Mus.Bot.Lugd.-bat. 4:112.
Moluccas:Bachan!

317. squamulosa Koord. & Valet., Meded's Lands Plantent 16:268.
Java!
Backer & Bakh.v.d.Brink, Fl.Java 1:326, 1963.

318. squamifructa Hunter, Ann.Miss.Bot.Gard. 53:65, 1966.
Honduras!

* sterculifolia Griff., Itin.Notes:198 = napaulensis DC., Hook., Fl.Brit.Ind. 1:288.

319. stapfiana Busc., Malphigia 25:11, 1912. Colombia!
Busc., loc.cit. 314; loc.cit. 27:317-318, 1916.

320. sterrolepida Diels, Bot.Jahrb. 57:453, 1922. P.N.G.:
Highlands Dists. Irian Jaya; Bele River, Lake Habbema!
Smith, J.Arn.Arb. 22:515-516, 1941. N.n.lorentzii .4706.

321. stichophlebia Diels, Nova Guinea 14:83, 1924. Irian Jaya!
N.n.pleurotricha .3043, echioides .333.

322. strigillosa Triana & Planch., Ann.Sc.Nat.ser4, 18:266, 1862.
Ecuador!
var.microphylla Busc., Malphigia 25:15, 1912. Busc., loc. cit. 395; loc.cit. 27:158, 1915.

* subalpina Donn.Sm., Coult.Bot.Gaz. 42:292, 1906 = oreophila Hemsl., Hunter Ann.Miss.Bot.Gard. 53:71, 1966. Guatemala!
Busc., Malphigia 25:9, 1912; loc.cit. 26:105, 1913; loc. cit. 119-120; loc.cit. 123; loc.cit. 129.

323. subcordata Korth., Verh.Nat.Gesch.Bot.:124, 1839-1842.
Syn. Scapha subcordata Choisy, Mem.Soc.Phys.Hist.Nat. Geneve 14:119, 1855. Borneo!

Miq., Fl.In.Bat. 1:487; Miq., Ann.Mus.Bot.Lugd.-bat. 4: 106; Merr., Enum.Born.Pl.J.R.As.Soc.St.Br.Spec.Publ.: 386, 1921. N.n.actinidifolia .6364.

324. subglabra Merr., Philipp.Gov.Lab.Bur.Bull. 35:43. Philippines:Luzon!
Merr., Phil.J.Sci.1 suppl.:95, 1906.

325. submodesta Diels, Bot.Jahrb. 57:450, 1922. P.N.G.:Sepik Dists.!
var.procumbens Diels, loc.cit. N.n.caroli .2941.

326. subspinosa Anth., Notes Bot.Gard.Edinb., 15:244-245, 1927. Burma!
Floral biol., Brown, Trans.Proc.Bot.Soc.Edinb. 31:485-497, 1935; Dickison, J.Mitchell.Soc. 88:46-47,t,8, 1972.
N.n.tafana .5.

327. sumatrana Baker, J.Bot.Brit.For. 56:164, 1918. Sumatra!
N.n.pendula .35.

328. succulenta Elmer, Leafl.Philipp.Bot. 7:2617, 1915. Philippines:Mindanao!

329. sydowii Sleum., Notizbl.Bot.Gart.Berlin 15:374, 1941. Ecuador!

* synarrhena F.Muell., Fragm. 175, 1866-in obs.

330. tafana Smith, J.Arn.Arb. 22:517, 1941. P.N.G.:Central Div.!
N.n.belensis .3846, dielsiana .4, rubrisquamata .4.

331. tambensis Killip, J.Wash.Acad.Sc. 16:571, 1926. Ecuador!

332. tayabensis Quis., Philipp.J.Sci. 41:333, 1930. Philippines: Luzon!
N.n.longipedicellata .3939.

333. tewensis Korth., Verh.Nat.Gesch.Bot.:133. Borneo.
Miq., Fl.Ind.Bat. 1:487; Miq., Ann.Mus.Bot.Lugd.-bat. 4:110; Merr., Enum.Born.Pl.J.R.As.Soc.St.Br.Spec.Publ.:

387, 1921. Miquel in Ann.Mus. states that this species has numerous styles. Saurauia spp. have 3-5 (-7) styles, whereas Actinidia has 15-30.

* teysmanniana Miq., Fl.Ind.Bat.suppl. 481 = leucophloea f. longifolia Miq. = tristyla DC.

334. thorelii Finet & Gagnep., Bull.Soc.Bot.Fr. 54:84, 1907. Indo-China:Laos!
Craib, Fl.Siam.Enum. 1:128, 1925. N.n.napaulensis .4074.

335. tomentosa Spreng., Syst.4.Cur.Post.:211. Syn. Palaua tomentosa HKB., Steud., Nom.Bot. 2:516, 1841. Ecuador!
var.chillaneana Busc., Malphigia 27:4, 1914.
Busc., loc.cit. 25:10, 1912; loc.cit. 435; loc.cit. 26: 415, 1913; loc.cit. 420; loc.cit. 27:1, 1914; reproductive biol.Soejarto, J.Ar.Arb. 50:180-194, 1969.

336. trachylasia Diels, Nova Guinea 14:82, 1924. Irian Jaya: Geelvink Bay!
N.n.amplifolia .3571.

337. trichocalyx Koord. & Valet., Meded's Lands Plantent 16:268. Java!
Backer & Bakh.v.d.Brink, Fl.Java 1:325, 1963.

338. trichophora Quis., Philipp.J.Sci. 41:335, 1930. Philippines: Luzon!
N.n.hosei .4194.

339. trichopoda Baker, J.Bot.Brit.For. 56:167, 1918. Sumatra!
N.n.matthewsii .4.

340. tristyla DC., Mem.Soc.Phys.Geneve 1:423,t.7, 1822. Syn. Ternstroemia trilocularis, Burkill, J.R.As.Soc.St.Br. 72: 197, 1916; Saurauia leucophloea. It is unclear whether S.media Korth, S.camptodonta Miq. and S.inflexidens Miq. are syn. with tristyla as they are listed in Index Kew.7, 1921-1929 as so syn., and in Boerlage, Cat.Bog.:89 as syn. with S.nudiflora DC. S.oldhami must be excluded from tristyla. If it is syn. it is with S.roxburghii. All

records of tristyla DC. from Indo-China, Malaya and China are S.fragrans Hoogl., S.pentapetala (Jack) Hoogl. or S.roxburghii Wall. (Hoogl., Gard.Bull.Sing. 30:112, 1977).
Miq., Ann.Mus.Bot.Lugd.-bat. 4:106; Miq., Ann.J.Bot. Buitenz. 1:7, 1876; Baker, J.Bot.Brit.For. 56:165, 1918; Ridley, Kew Bull.:60, 1926; Merr., Contrib.Arn.Arb. 8:105-106, 1934. Non tristyla:- Hook., Fl.Brit.Ind. 1:287, 1875; Hemsl., J.Linn.Soc.Bot. 23:79, 1886-1888; Burkill, J.R.As.Soc.St.Br. 72:244, 1916; Henderson, loc.cit. Mal. Br. 5:243, 1927; Henders., Gard.Bull.St.Settlm. 4:226, 1928.
N.n.heterosepala .3182.

* tristyla Pierre, Fl.For.Cochinchine t.128 = roxburghii Wall., Finet & Gagnep., Mem.Soc.Bot.Fr. 4:15, 1905.

341. trolliana Sleum., Notizbl.Bot.Gart.Berlin 12:148, 1934. Bolivia!

342. trunciflora Merr., Philipp.J.Sci. 17:285, 1920. Philippines: Mindanao!
N.n.longistyla .3177.

343. umbellata Koord. & Valet, Meded's Lands Plantent 16:262. Java!
Backer & Bakh.v.d.Brink, Fl.Java 1:326, 1963.

344. uniflora Ridl., Trans.Linn.Soc.Bot. 9:15, 1916. Irian Jaya!
N.n.punctata .3636.

345. urdanatensis Elmer, Leafl.Philipp.Bot. 7:2619, 1915. Philippines:Mindanao!

346. ursina Triana & Planch., Ann.Sc.Nat.ser.4. 18:265, 1862. Ecuador!
var.strigosa Busc., Malphigia 25:393, 1912.
Busc., loc.cit. 408; loc.cit. 414-415; loc.cit. 26:14, 1913; loc.cit. 98; loc.cit. 104; loc.cit. 111; reproductive biol., Soejarto, J.Arn.Arb. 50:180-194, 1969.

347. vagans Diels, Bot.Jahrb. 57:453, 1922. P.N.G.:Highlands Dists!
N.n.drimytiflora .4194.

348. vallium White & Francis, Proc.R.Soc.Qld. 38:244, 1927.
P.N.G.:Central Div.!
N.n.drimytiflora .25, belensis .333.

* vanioti Leveille, Fl.Kouy-Tcheou:415, 1914-1915 = Celastrus vanioti (Levl.) Rehder, J.Arn.Arb. 14:249-250, 1933.

349. vanoverberghii Merr., Philipp.J.Sc.Bot. 7:91, 1912.
Philippines:Luzon!
N.n.loheri .2353.

* veneficorum Standl. & Steyerm., Publ.Field Mus.Nat.Hist. Bot. 23:217, 1947 = waldheimia Busc., Hunter, Ann.Miss. Bot.Gard. 53:67, 1966. Guatemala!

350. veraguasensis Seem., Bot.Voy.Herald:249, 1854. Syn. Saurauia montana Seem; S.costaricensis Donn.Sm.; S.ovalifolia Donn. Sm.; S.pseudoscabrida Busc.; S.costaricensis var.brachitricha Busc.; S.costaricensis var.dolicotricha Busc.; S.pseudocostaricensis Busc.; S.pseudoveraguensis Busc.; S.engleriana Busc.; S.setosa Standl. Hunter, Ann.Miss.Bot.Gard. 53:64, 1966. Honduras, Costa Rica, Panama!
Busc., Malphigia 27:129, 1914; Hunter, Ann.Miss.Bot.Gard. 52:593-594, 1965. Floral biol., Dickison, J.Mitchell Soc. 88:44, 1972.

351. versteegii Gilg. & Lautbch, Nova Guinea Bot. 8:306, 1910.
Irian Jaya!
Lautbch. loc.cit. 8:835, 1912; Diels, Bot.Jahrb. 57:412, 1922. N.n.poolei .3, macgregorii .3023.

352. villosa DC., Mem.Soc.Phys.Geneve 1:420, 1822 (ex icon). Syn. Leucothea villosa Moc. & Sesse ex DC. loc.cit; Leucothea excelsa Moc. & Sesse ex DC.loc.cit; Davya villosa Moc. & Sesse ex DC., Prodr. 1:525, 1824; Obelanthera melastomacea Turcz., Bull.Soc.Nat.Mosc. 20:148, 1847; Saurauia obelanthera Turcz., loc.cit. 30:245, 1858; S.pseudopeduncularis

Busc.; S.villosa

var.hahni Busc., Malphigia 26:305, 1913; S.speluncicola Schultes; S.macrophylla Lindl. Mexico!

var.tuberculata Busc., Malphigia 25:9, 1912 = scabrida Hemsl., Hunter, Ann.Miss.Bot.Gard. 53:69, 1966. Guatemala!

var.scabrida Busc., Malphigia 25:9, 1912 = scabrida Hemsl., Hunter, Ann.Miss.Bot.Gard. 53:69, 1966. Mexico!

var.hahni Busc., Malphigia 26:305, 1913 = villosa DC., Hunter, Ann.Miss.Bot.Gard. 53:58, 1966.

var.straussiana Busc., Malphigia 30:348, 1927, var.dub. Busc., loc.cit. 26:299-311, 1913; loc.cit. 389-398; loc. cit. 409; loc.cit. 414-417; loc.cit. 27:293, 1915; wood anatomy; Record, Tropical Woods, 8:11-13, 1962.

353. vulcani Korth., Verh.Nat.Gesch.Bot. 128. Syn. Saurauia grandis Ridl., Hoogl., Gard.Bull.Sing. 30:122, 1977; S.setidens Miq., Java, Sumatra, Malaya!

N.n.napaulensis .4074.

* vulcanica Elmer ex Merr., Enum.Philipp.Fl.Pl. 3:63, 1923 = confusa Merr.

354. waldheimia Busc., Malphigia 25:12, 1912. Syn. Saurauia veneficorum Standl. & Steyerm., Hunter, Ann.Miss.Bot. Gard. 53:67, 1966. Guatemala, El Salvador, Nicaragua! Busc., Malphigia 28:488, 1918; Busc. & Muscat., Stud. Anat.Biol. Saurauia:38, 1918.

* warburgii Koord., Meded's Lands Plantent 19:644 = costata Reinw., Merr., J.Arn.Arb. 35:144, 1954. Celebes!

355. warenensis Kanehira & Hatusima, Bot.Mag.Tokyo 57:72, 1943. N.G.!

356. waworoentii Koord., Meded's Lands Plantent, 19:644. Celebes!

357. weberbaueri Busc., Malphigia 25:15, 1912. Brazil! Busc., loc.cit. 26:423, 1913; loc.cit. 27:349, 1916; loc. cit. 30:148, 1927.

358. wenzelii Merr., Philipp.J.Sci.Bot. 9:376, 1914. Philippines: Leyte!

N.n.xylantha .4737.

359. whitfordi Merr., Philipp.Gov.Lab.Bur.Bull. 35:42.
Philippines!

360. wigmanni Koord., Meded's Lands Plantent.19:644. Celebes!

* wildemanii Busc., Malphigia 25:9, 1912 = pringlei Rose., Hunter, Ann.Miss.Bot.Gard. 53:70, 1966. Mexico!
Busc., Malphigia 26:143, 1913; loc.cit. 284-285.

361. winkleri Merr., Philipp.J.Sci.Bot. 13:93, 1918. Borneo!
Merr., Enum.Born.Pl.,J.R.As.Soc.St.Br.Spec.Publ.:387, 1921. N.n.amplifolia .4286.

362. xanthotricha Turcz., Bull.Soc.Nat.Mosc. 31:243, 1858.
Venezuela!
Busc., Malphigia 25:414, 1912.

363. xiphophylla Diels, Bot.Jahrb. 57:451, 1922. P.N.G.:April R!
N.n.ceramica .4.

364. xylantha Stapf. ex Baker, J.Bot.Brit.For. 56:162, 1918.
Sumatra:Padang!
N.n.wenzelii .4737.

* yasicae Leosen.,Bot.Jahrb. 23:125, 1896 = laevigata Triana & Planch., Hunter, Ann.Miss.Bot.Gard. 53:84, 1966.
Nicaragua, Guatemala!
Busc., Malphigia 25:14, 1912.

365. zahlbruckneri Busc., Malphigia 25:14, 1912. Mexico, Guatemala!
Busc., loc.cit. 26:421, 1913; loc.cit. 27:346, 1916; Hunter, Ann.Miss.Bot.Gard. 53:72-73, 1966.

366. zamboangensis Merr., Philipp.J.Sci. 26:471, 1925. Philippines:Mindanao!
N.n.agamae .3125.

367. zetekiana Standl., J.Arn.Arb. 11:124, 1930. Panama:Barro Colorado Is.!

APPENDIX 11.

PAPERS PUBLISHED AND IN PRESS.

This appendix contains three papers prepared during the course of the project and either published or submitted for publication.

A COLOUR FAST STAIN FOR POLYESTER EMBEDDED LIGNEOUS TISSUES.

by

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ABSTRACT

Cleared leaves mounted in polyester resin and stained with Safranin have been found not to be colour fast. Reduction of potassium permanganate to manganese dioxide within leaf tissue produces a lignin specific, stable stain. The high optical density of stained vasculature relative to leaf mesophyll makes this stain well suited to the requirements of photomicrography.

A clearing and mounting technique described by Christophel and Blackburn (1975) has proven useful in the preparation of a permanent cleared leaf collection. A problem associated with the long term storage of the leaves has become evident however. It has been found that the Safranin O used for staining the preparations fades with time. Fading is accelerated by exposure to light, and appears to be related to the presence of traces of catalyst in the mountant. The mounting medium used is a low wax polyester resin. Its polymerisation is catalysed by methyl ethyl ketone peroxide (MEKP). Catalysis is effected by the generation of free radicals from the MEKP. Presence of these groups even in hardened resin accelerates light induced decomposition of the organic stain molecules. To overcome this problem an inorganic stain has been tested and found to be superior in all respects to Safranin.

Johansen (1940), described a test for lignin, which used potassium permanganate as an intermediate reagent (Maule test). Cleared leaves stained only in .1M neutral aqueous potassium permanganate gave excellent results for selective staining of venation only, resulting in a high degree of contrast between veins and mesophyll (Figure 1). The pigment itself is manganese dioxide, deposited from the reduction of the permanganate in the presence of lignin. This compound is chemically stable and there is no reason to believe that it will fade with time. The stain is fine grained and not discernible by optical microscopy at 1000 times magnification.

The procedure of Christophel and Blackburn is modified in the following manner. After the rinse in chloral hydrate, stain the leaves until desired contrast is achieved. Should destaining be necessary this can be done in 1% w/v aqueous oxalic acid. Destaining will continue unless the leaves are neutralised for five minutes in 5% aqueous ammonia. Following this, wash the leaves for fifteen minutes in gently running water and transfer to an alcohol dehydration series. Omit the alcohol/toluol steps and transfer dehydrated leaves to acetone. From acetone, leaves should be placed in a styrene monomer bath for five minutes. This is done to prevent the possibility of drying and damage occurring when transferring leaves from acetone to the viscous resin. From this point follow the described procedure.

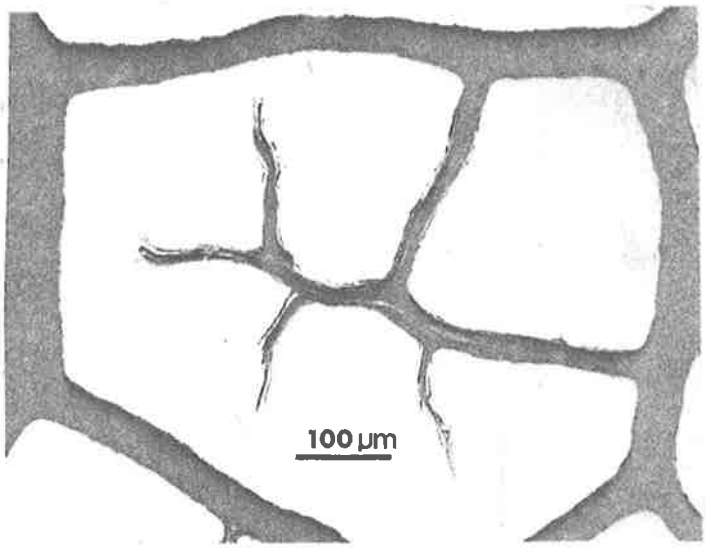
REFERENCES

Christophel, D.C., and Blackburn, D.T. 1975. - A new procedure for mounting cleared leaves using polyester resin. Trans. R. Soc. S. Aust. 99: 55-58.

Johansen, D.A. 1940. -"Plant Microtechnique". First edition. McGraw-Hill. New York.

FIGURE LEGEND.

Figure 1. Veinlets on a leaf of Harpullia pendula (Sapindaceae). Leaf stained with potassium permanganate and mounted in polyester resin. Terminal cells of the vasculature are clearly visible.



Christophel, D.C. and Blackburn, D.T. (1975). A new procedure for mounting cleared leaves using polyester resin. *Transactions of The Royal Society of South Australia, 99, 55-58*.

Blackburn, D.T. and Christophel, D.C. (1976). A Method of Permanently Mounting Biological Tissue Cleared in Herr's Four-And-A-Half Clearing Fluid. *Stain Technology*, *51*(2), 125-130.