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Bayesian island biogeography in a continental setting: the Rand Flora case

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We here explore the use of a Bayesian approach to island biogeography for disentangling the evolutionary origins of a continental-scale floristic pattern, the enigmatic ‘Rand Flora’. The existence of disjunct distributions across many plant lineages between Macaronesia–northwest Africa, Horn of Africa–southern Arabia and east–south Africa has long intrigued botanists, but only now can we start analysing it within a statistical framework.

Phylogenetic and distributional data from 13 plant lineages exhibiting this disjunct distribution were analysed to estimate area carrying capacities and historical rates of biotic exchange between areas. The results indicate that there has been little exchange between southern Africa and the northern African region, and that this exchange occurred via east Africa. Northwest Africa–Macaronesia shows the smallest carrying capacity but highest dispersal rate with other regions, suggesting that its flora was built up by immigration of lineages, probably from the Mediterranean region and western Asia. In contrast, southern Africa shows the highest carrying capacity and lowest dispersal rate, suggesting a flora formed by *in situ* diversification.

We discuss further improvements of the method for addressing more complex hypotheses, such as asymmetric dispersal between regions or repeated cyclical events.

Keywords: Rand Flora; disjunct pattern; Bayesian analysis; Africa; island biogeography

1. INTRODUCTION

One of the best known examples of continental floristic disjunctions is the so-called ‘Rand Flora’ pattern: an *Afro-Mediterranean phytogeographic pattern* that evolutionarily relates floras of disjunct regions such as Macaronesia (the Azores, Madeira, Canary and Cape Verde archipelagos), northwest Africa, southern Arabia and western Asia, with the floras of east and south Africa (Le Brun 1971; Bramwell 1985). The most-cited example of this enigmatic floristic pattern

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is the Canary Islands ‘dragon tree’ (*Dracaena draco*) that presumably has its closest relatives in northeast Africa, the Socotra islands and southern Arabia, but many other plant groups have also been suggested as having a similar distribution pattern (Bramwell 1985; Andrus *et al.* 2004).

Two main hypotheses about the evolutionary origin for the Rand Flora pattern have been suggested: (i) the ‘vicariance hypothesis’: extant species are the remnants of an ancient widespread African flora that went partly extinct as a result of increasing aridification from the Miocene onwards, leaving relict biotas in climatic refuges at the east and west continental margins of Africa (Axelrod & Raven 1978; Bramwell 1985; Quezel 1979; Andrus *et al.* 2004; Thiv *et al.* 2010), or (ii) the ‘dispersal hypothesis’: the species’ present disjunct distributions are the result of more recent long-distance dispersal events between geographically isolated areas, followed by *in situ* diversification (figure 1). For the dispersal hypothesis, two main directional routes have been proposed: (i) southwards, either from the Mediterranean region or from west–Asia via the Arabian Plate (e.g. Levyns 1964), or (ii) northwards from the southern African region via eastern Africa (e.g. Galley *et al.* 2007).

So far, biogeographic studies on the Rand Flora have been mainly descriptive, focusing on reconstructing biogeographic patterns in one or several groups (Bramwell 1985; Andrus *et al.* 2004). However, in the last years many new phylogenetic studies of plant taxa exhibiting this disjunction have been published, allowing us for the first time to conduct a meta-analysis to test general hypotheses within a statistical framework. At the same time, the development in the last years of new model-based methods of biogeographic inference (Ree & Sanmartín 2009) has made it possible to reconstruct the spatio-temporal evolution of individual lineages and regional biotas with increasing detail. One such method is the Bayesian approach to island biogeography (BIB) proposed by Sanmartín *et al.* (2008). It uses a Bayesian statistical approach that integrates phylogenetic and biogeographic uncertainty to estimate carrying capacities (equilibrium frequencies of species diversity) and rates of dispersal/biotic migration between geographically isolated areas (i.e. ‘islands’), using DNA sequence data and species distributions. An advantage of the method is that estimates of biogeographic parameters are integrated over the phylogeny of each group (phylogenetic relationships and divergence times), so the method can be used across multiple taxonomic groups differing in their age, evolutionary rate and/or dispersal capabilities. So far, it has only been used in an island context (i.e. areas separated by oceanic barriers), but Sanmartín *et al.* (2008) argued that the method could also be useful for scenarios in which areas are isolated by ecological barriers, such as high-mountain biotas separated by lowlands.

Here, we explore the usefulness of the BIB method for disentangling the origin of a complex continental floristic pattern such as the Rand Flora, where subtropical floras in the margins of Africa are now separated by tropical lowlands (west–east Africa) or by arid and semi-arid terrains such as the Saharan desert. We combine phylogenetic molecular data of multiple

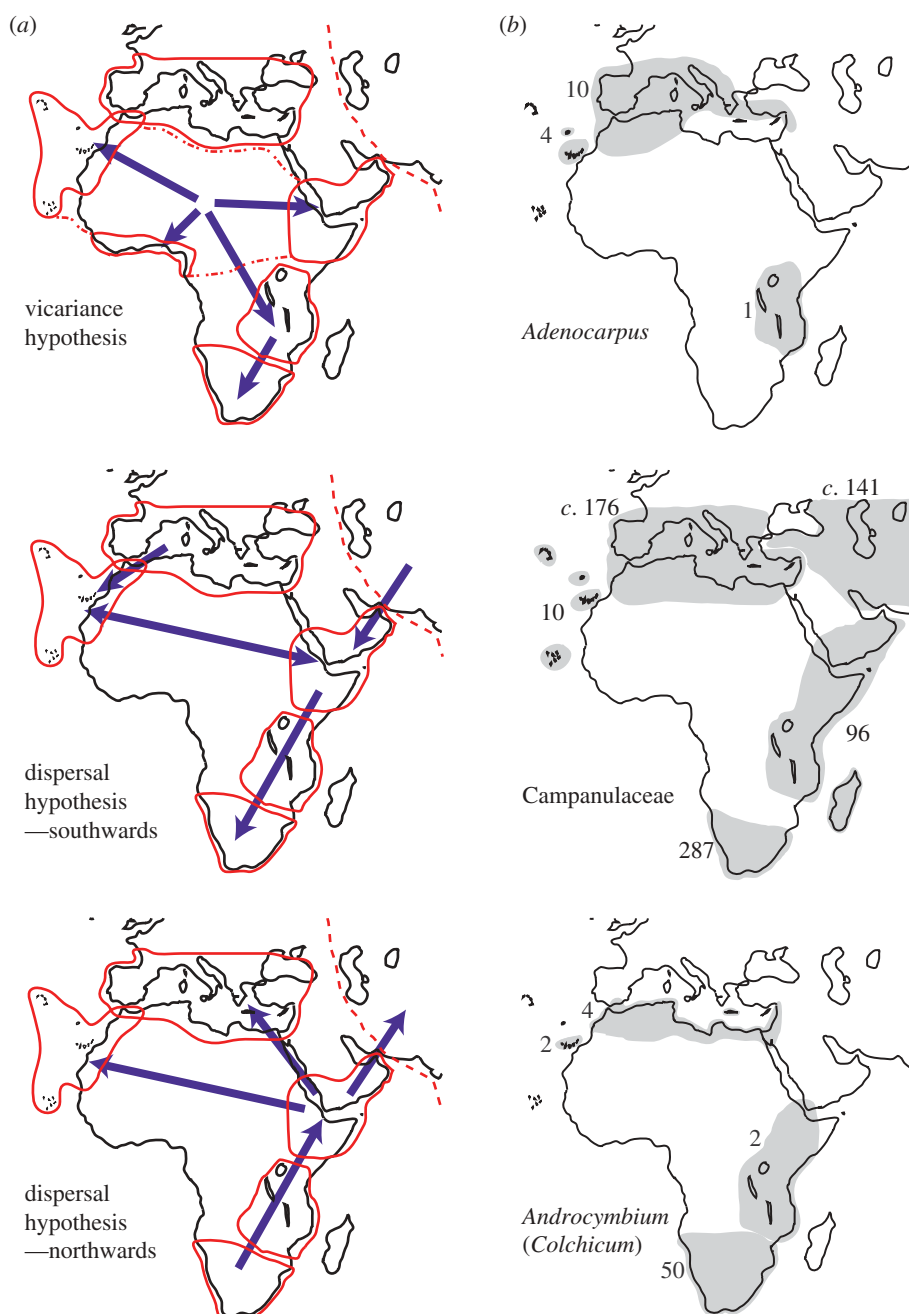


Figure 1. (a) The main hypotheses to explain the origin of the 'Rand Flora' pattern and (b) plant groups that have been argued to exemplify these hypotheses. (1) Vicariance—climatic changes lead to vicariance of a once continuous Paleogene flora. (2a) Dispersal southwards—the pattern is a consequence of immigrants from the Mediterranean region and west spreading to south Africa via eastern Africa. (2b) Dispersal northwards—the elements of the flora dispersed from south Africa to Horn of Africa region, and from there to the west and north.

taxonomic groups exhibiting this disjunction into a large meta-analysis for inferring the rate of dispersal/historical migration between these now-isolated floras.

2. MATERIAL AND METHODS

DNA sequence data from well-sampled molecular phylogenies including a broad representation of species within each lineage and area of distribution (either previously published or from our own ongoing research) were gathered for 13 groups exhibiting the disjunct Rand Flora distribution: *Aeonium* (Crassulaceae), *Adenocarpus* (Fabaceae), *Androcymbium (Colchicum)* (Colchicaceae), *Convolvulus* (Convolvulaceae), *Monsonia* (Geraniaceae), *Moraea* (Iridaceae), *Sideroxylon* (Sapotaceae), Ceropegiae (Apocynaceae), *Geranium* (subg. *Robertium*) (Geraniaceae) (subg. *Leptostemonum* p.p.) (Solanaaceae), two subgroups of the large genera *Euphorbia* (subg.

Rhizanthium and subg. *Esula* p.p.) (Euphorbiaceae), as well as the family Campanulaceae. See the electronic supplementary material for details on distributions, phylogenetic studies and references.

Carrying capacities of the study areas and dispersal/migration rates between areas were estimated using the Bayesian island biogeography method of Sanmartín *et al.* (2008) implemented in MrBayes 4.0 (Ronquist *et al.* 2008, beta version, <http://mrbayes.cvs.sourceforge.net/>). As input for the analysis, we used a matrix of aligned sequences for each separate plant group, together with distributions for all included species (see the electronic supplementary material). Five distributional areas were defined: (i) Macaronesia—northwest Africa, (ii) eastern Africa and southern Arabia, (iii) southern Africa, and the 'outside' areas, (iv) Mediterranean region and (v) western Asia (see figure 1 and the electronic supplementary material for area definitions). We set up an individual general time reversible (GTR) molecular model for each group and a common GTR biogeographic model for the entire dataset, so that phylogeny and molecular parameters were estimated (independently) per group

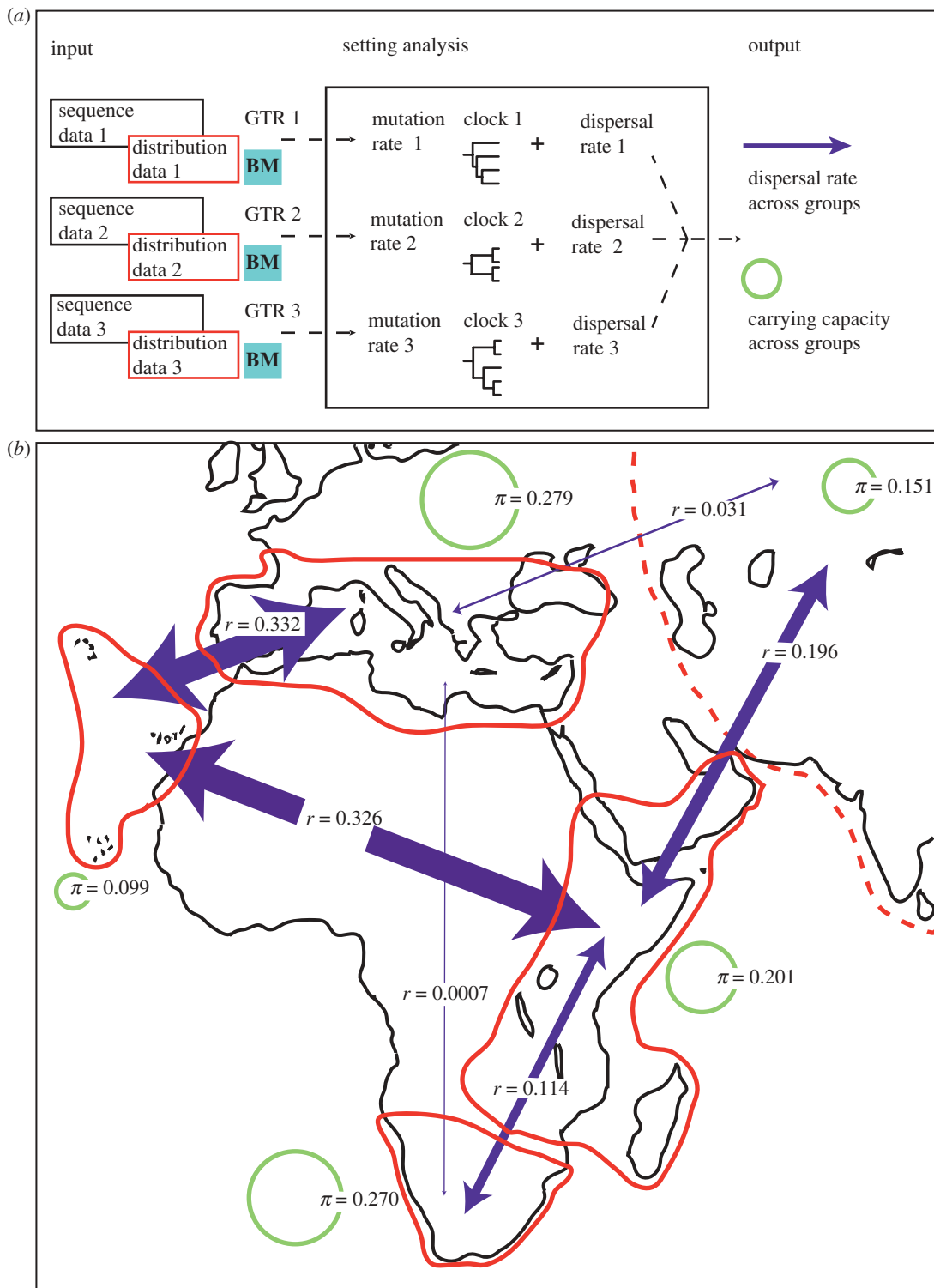


Figure 2. (a) Scheme of the Bayesian island biogeography method used in this study. For details, see text and the electronic supplementary material. (b) Relative dispersal rates between areas (purple arrows) and area carrying capacities (green circles) obtained from an analysis of 13 plant groups. Dispersal rates lower than $1.0E^{-6}$ are not shown. See the electronic supplementary material for details.

while biogeographic parameters were estimated across all groups. Differences in age, molecular evolutionary rate and dispersal rate among groups were accounted for by using group-specific molecular and dispersal rate scalars. For further details and specific settings, see the electronic supplementary material.

3. RESULTS

Posterior probabilities of parameters were surprisingly narrow (table 1, figure S3 in the electronic

supplementary material), indicating good behaviour of the model despite the low number of potential dispersal events. Among regions, the lowest carrying capacity was estimated for the northwest Africa–Macaronesian region, whereas southern Africa showed the highest carrying capacity. The opposite pattern was found for dispersal rates, which were lowest for south Africa and highest for the northwest Africa–Macaronesian region, both with east Africa–

Table 1. Bayesian estimates (mean, standard deviation and 95% credibility interval of the posterior probability distribution) of the parameters of the biogeographic model described in figure 2. Abbreviations: π , island carrying capacity; r , relative dispersal rate; NW, Macaronesia–northwest Africa; SAF, southern Africa; EAF, eastern Africa; MED, Mediterranean region; WAS, western Asia; PSRF, potential scale reduction factor: a value close to one indicates a good sampling from the posterior probability of the parameter.

biogeographic parameter	mean	s.d.	lower	upper	median	PSRF
π_{NW}	0.099	0.030	0.053	0.168	0.096	1.010
π_{SAF}	0.270	0.083	0.130	0.452	0.263	1.002
π_{EAF}	0.201	0.043	0.126	0.293	0.198	1.020
π_{MED}	0.279	0.083	0.137	0.462	0.272	1.002
π_{WAS}	0.151	0.057	0.066	0.288	0.141	1.006
$r_{NW \rightleftharpoons EAF}$	0.326	0.093	0.154	0.517	0.322	1.000
$r_{NW \rightleftharpoons MED}$	0.331	0.121	0.122	0.591	0.322	1.008
$r_{SAF \rightleftharpoons EAF}$	0.114	0.052	0.041	0.238	0.105	1.007
$r_{SAF \rightleftharpoons MED}$	0.001	0.005	<1.0E–6	0.007	<1.0E–6	1.023
$r_{EAF \rightleftharpoons WAS}$	0.196	0.089	0.061	0.408	0.184	1.004
$r_{MED \rightleftharpoons WAS}$	0.031	0.051	<1.0E–6	0.168	<1.0E–6	1.021

southern Arabia and the Mediterranean (table 1 and figure 2). The results showed very little or no exchange between southern Africa and northwest Africa–Macaronesia. If any, this biotic exchange took place via the eastern African region, the only region that exhibits significant exchange with southern Africa (table 1 and figure 2).

4. DISCUSSION

The high dispersal rate observed between northwest Africa–Macaronesia and the eastern Africa–southern Arabia (table 1 and figure 2) gives some support to the vicariance hypothesis (figure 1*a*), which postulates the fragmentation of a continuous, subtropical flora in northern Africa that was divided by climatic events into eastern and western refuges (Axelrod & Raven 1978). However, rather than one vicariant event across multiple groups, this rate is likely to reflect repeated events of dispersal and vicariance between east and west Africa following the alternation of cycles of arid and humid periods in the Saharan Desert since the Late Miocene/Pliocene (Thiv *et al.* 2010).

The high dispersal rate between northern Africa and the eastern region stands in contrast with the low dispersal rate between this region and southern Africa (table 1 and figure 2). This can be interpreted as either a historical low rate of biotic exchange between southern and northern Africa, or, alternatively, that this exchange is too old to leave a signal in our phylogenetic data, that is, the south–north African disjunctions may be older than the northwest–eastern African disjunctions and therefore more likely to have been obscured or wiped-out by later extinction events. Indeed, there is some support for this hypothesis. The fossil record suggests that forests covering the whole of tropical/central Africa appeared in the Oligocene–Miocene, and geological data give the same time frame for mountain formation and the establishment of drier areas in northern Africa. In contrast, direct contact between the African continent and Eurasia was not established until the Miocene, when the Arabian Plate collided with the Eurasian Plate 16 Ma ago. If southern Africa was a

part of a continuous Rand Flora, the region is likely to have been separated by climatological barriers from the northern areas earlier than the start of major biotic exchange between northern Africa and Eurasia.

Interestingly, northwest Africa plus Macaronesia show the smallest carrying capacity but present the highest dispersal rate (table 1), suggesting that the flora of this region was built up by immigration of new lineages. Migration from the Mediterranean region was probably the dominant route (figure 2), but dispersal from west Asia via the Arabian Plate and across the Saharan desert is another possible route supported by our data.

Conversely, the high carrying capacity of southern Africa (table 1) gives some support to the hypothesis that the highly diverse South African Cape flora has diverged *in situ*, facilitated by the relative climatological stability of the area from the Miocene onwards (Linder 2005). Similarly, the low dispersal rate with all other regions but eastern Africa agrees well with the idea that, following the formation of the eastern African mountains in the Pliocene, some south African lineages migrated to the north (via the Grand Rift and the Drakensberg mountains) and gave rise to the highly endemic eastern African mountain flora (Linder 2005; Galley *et al.* 2007).

The results from this analysis should be considered preliminary for several reasons: the dataset only represents a sample of groups showing this disjunction (Andrus *et al.* 2004); all phylogenies are not complete and some of the relevant disjunct taxa are missing (e.g. *Monsonia*, see the electronic supplementary material); finally, there is a potential underestimation of groups with southern African distributions (e.g. *Euphorbia*). Despite these drawbacks, our results suggest that the Bayesian island model may be useful in a continental setting, where the number of inferred dispersal/migration events between areas is low.

Although originally designed to study dispersal patterns in islands, the BIB method may also be used to detect possible vicariance events, by incorporating estimates of absolute divergence times. Vicariance predicts biogeographical and temporal congruence in disjunct distribution patterns across different plant groups,

and that the disjunct distribution is at least as old as the geological barrier that caused it. By plotting the rate of dispersal over time, the appearance of a vicariance event can be detected: a decrease in dispersal frequency between two areas would suggest the formation of a new geographical barrier between them. BIB can even be used to estimate the timing of the paleogeographic barrier from the dated phylogenies, by comparing a one-rate model, in which the rate of biotic exchange is constant before and after the barrier, with a two-rate model in which there are two parameters, the rate of exchange before and after the barrier.

Future work should focus on testing asymmetric dispersal patterns, e.g. northward versus southward migration between southern Africa and northern–eastern Africa, as well as on incorporating absolute times to the inference, either directly as molecular divergence time estimates or indirectly through the use of fossil and paleogeographical information (Ree & Sanmartín 2009).

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Electronic Supplementary Material for:

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1. PLANT GROUPS INCLUDED IN THIS STUDY

To reconstruct the biogeographic origins and temporal evolution of the Rand Flora pattern, we need well-sampled phylogenies that include a broad representation of species within each lineage and each relevant area of distribution. First, we compiled information on groups exhibiting this disjunct distribution for which there is a phylogenetic hypothesis based on molecular data. The most recent published review is Andrus *et al.* (2004), but for some groups there are more recent phylogenies that are not listed there (e.g., *Campanula*, Roquet *et al.* 2008). From this compilation, we selected the study groups according to the following criteria: a) they present the relevant geographic disjunction, that is, they are distributed in northwestern Africa and/or Macaronesia and show a geographic disjunction between western and eastern African taxa. Groups that are only disjunct between the eastern and western Mediterranean coastal areas were excluded. b) They exhibit some degree of adaptation to subtropical, afrotemperate, or dry (xeric) environments. Groups that are exclusively from the tropical African forest, even though they present a disjunct east-west African distribution (e.g., Annonaceae, Couvreur *et al.* 2008) were excluded. These disjunctions are situated at lower latitudes and generally regarded as older (i.e., Mid Tertiary, Axelrod & Raven, 1978).

Table S1 lists the selected study groups and their reference studies. The distribution of each group is given in figure S1. Below follows some brief information on the phylogeny and distribution of each group:

1. *Adenocarpus* (Fabaceae)

Adenocarpus contains approximately 20 species, and most of these inhabit northwestern Africa and the Iberian peninsula. However, one well supported monophyletic group (Percy & Cronk, 2002) show a disjunct pattern, where the 3 Macaronesian species and the Mediterranean widespread *A. complicatus* together form a sistergroup to the only subtropical-tropical African species, *A. mannii*. According to Percy & Cronk (2002) the distribution of *A. mannii* can be explained by either an west-eastern dispersal route of Mediterranean-Macaronesian species via the Saharan mountains or an eastern route of dispersal of Mediterranean species via the Red Sea Hills.

2. *Aeonium* (Crassulaceae)

Most of the approximately 42 species of *Aeonium* are endemic to the Canary Islands. The remaining species have their distribution in Madeira (2 sp.), Cape Verde (1 sp.), Morocco (1 sp.) and eastern Africa (2 sp.). The genus was shown by Mort *et al.* (2002) to be nested within a clade consisting of other Macaronesian endemic taxa (*Aichryson* and *Monanthes*), and they therefore concluded that the east African species are the result of a relatively recent long distance dispersal event.

3. *Androcymbium* [*Colchicum*] (Colchicaceae)

The former genus *Androcymbium* is paraphyletic in relation to *Colchicum* (Vinnersten & Reeves, 2003; Manning *et al.* 2007) and has therefore been transferred to *Colchicum* (Manning *et al.* 2007). While *Colchicum s. str.* is a genus that is centered in the Mediterranean basin and eastwards, the ca. 60 species formerly belonging to *Androcymbium* are distributed in southern, eastern and northern Africa and the Mediterranean area. Del Hoyo & Pedrola (2008) refuted the transfer of *Androcymbium* to *Colchicum*, and in their study they focused on the African former *Androcymbium* species, including a larger sampling of these than Vinnersten & Reeves (2003). *Androcymbium* has a high concentration of species in southern Africa (some 50 species), especially in the South African winter-rainfall region. The disjunct distribution between South and North Africa is according to Caujapé-Castells *et al.* (2001) best explained by an origin in southern Africa, followed by dispersal northwards via "the arid track", prior to the desiccation of Africa in the Miocene. Del Hoyo *et al.* (2009) extended this hypothesis, concluding that three northward dispersal events have occurred: one dispersal event during the Late Miocene that gave rise to *Colchicum s. str.*, and two separate dispersal events from southern Africa to the Horn of Africa and the Mediterranean region during the Mid Pliocene.

4. Campanulaceae

The Campanulaceae have a nearly cosmopolitan distribution, comprising three tribes: Wahlebergieae (ca. 98 species, centred in southern Africa), Platycodoneae (ca. 98 species, distributed across eastern Asia) and Campanuleae, with ca. 617 species, distributed across western Asia and the Mediterranean basin (Roquet *et al.* 2008; 2009). They present two geographic east-west disjunctions: 1. within the tribe Platycodoneae, between *Canarina canariensis* (Canary Islands) and *C. eminii* and *C. abyssinica* from Ethiopia, Somalia, Kenya and Tanzania (Olesen *et al.* in review), and 2. within the tribe Campanuleae sect. *Rupestres* (species-group of *C. mollis*): between *C. jacobaea* (Cape Verde) and *C. balfouri* (Socotra) (Olesen *et al.* in review).

5. *Convolvulus* (Convolvulaceae)

The genus *Convolvulus* comprises about 250 species and has a cosmopolitan distribution. The 11 Macaronesian species of *Convolvulus* have been shown to represent two separate dispersal events (Carine *et al.* 2004; Carine, 2005). "Clade I" has its closest relatives predominantly in the northern Africa/western Mediterranean area, while "Clade II" has its closest relatives predominantly in the central/eastern Mediterranean area.

6. *Euphorbia* subgenus *Esula* (sensu Bruyns *et al.* 2006) (Euphorbiaceae)

With more than 2000 species and a nearly worldwide distribution, *Euphorbia* is the largest genus of Euphorbiaceae (Govaerts *et al.* 2000). Molecular evidence (Steinmann

& Porter, 2002; Bruyns *et al.* 2006) has shown that the majority of currently recognized subgenera and sections are para- or polyphyletic. Using nuclear and plastid molecular markers, Bruyns *et al.* (2006) defined four subgenera: *Chamaescy*, *Euphorbia*, *Esula*, and *Rhizanthium*. Subgenus *Esula* comprises more than 500 species and has a mainly northern temperate distribution. Nested within *Esula* is a group of dendroid spurges of *ca.* 23 species (the "Macaronesian-Mediterranean group" sensu Molero *et al.* 2002), which includes a subclade of Eastern African and South African succulent species (e.g., *E. schimperi*) nested within a well supported clade of succulent species from the Canary Islands and Morocco (e.g., *E. aphyllis*; Molero *et al.* 2002; Bruyns *et al.* 2006). According to Molero *et al.* (2002), the Mediterranean *Euphorbia dendroides* is the sister-group of the Canarian species, indicating a western Mediterranean origin for this clade.

7. *Euphorbia* subgenus *Rhizanthium* (sensu Bruyns *et al.* 2006) (Euphorbiaceae)

Subgenus *Rhizanthium* occurs from South Africa to Arabia, with one species in Madagascar (*E. antso*), but it is especially diverse in southern Africa (Ritz *et al.* 2003; Bruyns *et al.* 2006). The clade includes the widespread taxon *Euphorbia balsamifera* (informal group "*E. balsamifera* s.l.", Molero *et al.* 2002), a species of fleshy xerophilous, dendroid shrub that has diversified into three geographically disjunct subspecies: subsp. *balsamifera* in the Canary Islands and western Morocco, subsp. *sepium* in western Africa from Niger to Senegal, and subsp. *adenensis* in Southern Arabia and Somalia. According to Steinmann & Porter (2002), *E. balsamifera* would be sister to *E. meuleniana* from Yemen, while Bruyns *et al.* (2006) place *E. balsamifera* at the base of a clade of mainly southern African species, with the eastern African species *E. platycephala* and *E. longituberculosa*, and the Madagascar endemic *E. antso* diverging basally to them. Molero *et al.* (2002) explains the disjunct distribution of *E. balsamifera* by geographical vicariance from a widespread ancestor that diversified during the Late Tertiary and later became fragmented by Quaternary climatic changes.

8. *Geranium* subgenus *Robertium* (Geraniaceae)

The genus *Geranium* is divided into two subgenera (Fiz *et al.* 2008): *Geranium* (>380 species) and *Robertium* (24 species). Within the subgenus *Robertium*, the species endemic to Macaronesia, Morocco and the Iberian Peninsula constitute the sister group to a clade formed by species from eastern Africa. Together these two clades form the sister-group of a clade of Asian species. Fiz *et al.* (2008) suggested that the Afro-Macaronesian clade originated from Asian lineages that migrated across the Arabian Plate, after its collision with Eurasia in the Miocene.

9. *Monsonia* (Geraniaceae)

Monsonia include 39 species, of which 21 are endemic to southern Africa. There are two endemic species in eastern Africa, and three other species distributed across northern Africa, from Morocco to the Arabian peninsula (Touloumenidou *et al.* 2007; Fiz *et al.* 2008). Most of the remaining species are found in southern Africa. Fiz *et al.* (2008) suggested that *Monsonia* originated in southern Africa, and migrated northwards and diversified in the Mediterranean area and southwestern Asia during the Miocene.

10. *Moraea* (Iridaceae)

Moraea include about 200 species, and of these approximately 150 occur in the southern African winter-rainfall region (Goldblatt *et al.* 2002). About 35 species are distributed in eastern Africa - southern Arabia, and one is widespread in the Mediterranean basin. According to Galley *et al.* (2008), *Moraea* is an example of plants having evolved in southern Africa and later spread northwards using the Drakenberg mountains as a 'stepping-stone' to the tropical Afrotropical region. Galley *et al.* (2008) dated the migration of *Moraea* to Miocene-Pliocene, which coincides with the uplift of the highlands of tropical Africa.

11. *Sideroxylon s. l.* (Sapotaceae)

Sideroxyleae is a tribe of about 80 species of trees and shrubs in the Sapotaceae family. It comprises three genera, *Nesoluma*, *Argania*, and *Sideroxylon* with an amphi-tropical distribution, spanning mainland Africa, Madagascar, the Indo-Pacific region, and the Americas (Pennington, 1991). Recent molecular phylogenetic analyses (Smedmark & Anderberg, 2007; Smedmark *et al.* 2006) have shown that the two smallest genera, *Nesoluma* and *Argania*, are nested within *Sideroxylon* (Smedmark & Anderberg, 2007). They have also revealed several interesting east-west African disjunctions: the northwestern African endemic species *Argania spinosa* is the sister-group to *Sideroxylon mascatense*, which occurs in northeastern Africa and southwest Asia (from Ethiopia to Pakistan), whereas the two Macaronesian species *S. marmulano* (Canary Islands) and *S. marginatum* (Cape Verde Islands) form a monophyletic clade together with several species from Madagascar and the Mascarene Islands (Smedmark *et al.* 2006; Smedmark & Anderberg, 2007). Smedmark & Anderberg (2007) suggested an African origin for the tribe (and genus *Sideroxylon s. str.*) during the Paleogene and later dispersal to South America via the boreotropical migration route (Tiffney, 1985).

12. *Solanum* subgenus *Leptostemonum* (Solanaceae)

Solanum subgenus *Leptostemonum* (the "spiny Solanums") are a large group (*ca.* 350-450 species) within *Solanum*, comprising almost one third of the genus (Olmstead & Palmer, 1997; Levin *et al.* 2006). It has a worldwide distribution, concentrated in Africa, Australia, and Central-South America. Levin *et al.* (2006) used DNA sequence data to reconstruct phylogenetic relationships within this group. They recognized a monophyletic group, the "Old World clade" with *ca.* 74 species distributed in Macaronesia, Africa, Madagascar, Asia and Australia. This group includes a monophyletic group of Canary Island species (*S. vespertilio* + *S. lidii*), nested within a clade of mainly eastern and southern African species (Levin *et al.* 2006; Anderson *et al.* 2006; Weese & Bohs, 2007). A few species of this clade are also widespread in west-central Africa (e.g., *S. macrocarpon*). According to Olmstead & Palmer (1997), *Leptostemonum* originated in South America and dispersed to Africa, where the "Old World clade" diversified. Members of this clade later migrated to the east (Australia) and the west (Canary Islands).

13. Ceropegieae (Apocynaceae)

The stapeliad tribe Ceropegieae (Apocynaceae-Asclepiadoideae) comprises about 350 species distributed in *ca.* 40 genera (Meve & Liede, 2002). *Ceropegia* (subtribe Stapeliinae) is the largest genus with 180 species distributed in the Old World, from the Canary Islands to Australia. The two main centers of diversity are East Africa-southeastern Africa (115 species) and India (40 sp.), with other centers in Madagascar (20 sp.) and China (17 sp.) (Meve & Liede-Schumann, 2007). Recent molecular work by Meve & Liede (2002), Meve & Liede-Schumann (2007) and Surweswaran *et al.*

(2009) has showed that *Ceropegia* is twice paraphyletic, with genus *Brachystelma* (120 sp.) and a monophyletic clade including the rest of 34 stapeliad genera (*Apteranthes*, *Orbea*, etc) nested within it. Meve & Liede (2007) propose an origin of *Ceropegia* in northeast Africa (Arabia + eastern Africa) with subsequent dispersal and diversification in eastern-southern Africa. The endemic Madagascar stapeliads seem to have originated from a long-distance dispersal event from east Africa (Meve & Liede-Schumann, 2007).

2. GEOGRAPHIC AREAS

One critical point in any biogeographic analysis is the circumscription of the areas of study. This is even more important for parametric methods because the number of parameters to be estimated from the data (i.e., dispersal rates and carrying capacities) increases exponentially with the number of areas (Ree & Sanmartin, 2009). Preliminary analyses with a varying number of areas showed that five areas represent the extreme limit of the resolving power of our data (see below). Therefore, we decided to combine the Eastern Africa and the Horn of Africa-Southern Arabia regions into one area, and also to omit the western African region (figure 1a) from the analysis. This region has been sometimes considered as part of the Rand Flora (Axelrod & Raven, 1978), but only a few groups in our analysis occur in this area (e.g., *Solanum macrocarpon*), and often as part of a wider distribution including central-eastern Africa. In all, five distributional areas were defined:

- 1) Southern Africa, including the Cape Flora region, southern Angola and Namibia delimited in the northeast by the Drakensberg Mountains. Galley *et al.* (2007) considered the Drakensberg range as a separate area, a sort of 'stepping-stone' for plants between the Cape and the tropical Afrotropical region. The close floristic affinity between the Cape and the Drakensberg range is well known (Carbutt & Edwards, 2002). Most species endemic to the Drakensberg have their sister species in the Cape and only a few show closer relationships with species from the north (Galley *et al.* 2007). We chose here to include the Drakensberg Mountains as part of the southern African region. Most groups included in our analysis have the natural limit to their southern distribution in the Limpopo River and surrounding plains, which form a natural barrier between the Greater Cape region and Drakensberg range and the eastern-central African region.
- 2) Eastern Africa and Southern Arabia, including southeast Egypt, eastern Sudan, Somalia, Ethiopia, Kenya, Tanzania, Malawi, Uganda, Mozambique, and Zambia, delimited in the southeast by the Inyanga Mountains, plus all the semi-arid regions of southern Arabia (e.g. south of Saudi Arabia, Oman, Yemen and Socotra). We also included Madagascar within this area because several groups comprise species that are widespread in eastern Africa and Madagascar or are endemic to Madagascar (*Euphorbia antso*).
- 3) Northwest Africa-Macaronesia, including the Azores, Canarias, Selvagens Islands, Cape Verde, and Madeira, as well as the areas of western Morocco, delimited by the coastal hills up to the Anti-Atlas Mountains.
- 4) Mediterranean region, including northern coastal Africa from Morocco to northern Egypt and the Levante region.
- 5) West Asia, including the Mesopotamia region, the Iranian plateau, the Pamir region, and western continental India.

3. PHYLOGENETIC AND GEOGRAPHICAL DATA

Published sequences were downloaded from GenBank and aligned by hand or with the help of multiple alignment software such as Clustal X. When a choice of markers was available (e.g., *Sideroxylon*), we chose the most species-rich dataset to minimize taxon sampling effects in the analysis. Table S2 lists the molecular markers used for each group. For some groups (e.g., *Euphorbia*), new sequences from GenBank were added to the published phylogenies listed in table S1. To check that alignments were consistent with these studies, we estimated the phylogeny for each study group using MrBayes 3.2 cvs (Ronquist *et al.* 2009) and compared it with the published phylogeny from the reference study. No major differences were found, especially with regard to the position of the disjunct taxa. Distribution data for the taxa included in the analysis was compiled from the original reference studies (table S1) and complemented with the help of online plant taxonomic databases such as NPGS-GRIN (<http://www.ars-grin.gov/cgi-bin/npgs/html>), Aluka (<http://www.aluka.org>), Flora Zambesiaca (<http://apps.kew.org/efloras/fz/intro/html>), PBI *Solanum* (<http://www.nhm.ac.uk/research-curation/research/projects/solanaceaesource/project>), Flora of Mozambique (<http://www.mozambiqueflora.com/speciesdata>), the New York Botanical Garden virtual herbarium (http://sweetgum.nybg.org/vh/specimen_list.php), and the African flowering plants database (<http://www.ville-ge.ch/musinfo/bd/cjb/africa/details.php>).

The final dataset consisted of 13 groups and 822 sequences/individuals, belonging to 753 species and 8 subspecies or varieties (see table S2).

For accurate estimation of carrying capacities and dispersal rates, unbiased sampling across lineages is required. If a large number of species were unsampled for one area, the carrying capacity and number of dispersal events would be underestimated for that area. The choice of dataset used in this study was therefore based on how well a molecular marker covered each group's geographic distribution and number of species. Several phylogenies in this study are incomplete, but they constitute the best available data sets for the groups studied here. In some cases, one or a few areas were less well sampled. For example, for *Euphorbia* subgenus *Rhizantium* it is possible that further south African species could belong to this clade and hence the carrying capacity for this area could have been underestimated. For *Euphorbia* subgenus *Esula* we are missing several European and Asian species, so the number of dispersal events with these areas could be larger. However, since the phylogenies of the different groups are not undersampled for the same areas, taken together no area should be specifically biased. Further studies with more complete phylogenies would be needed to confirm these preliminary results.

4. METHOD: BAYESIAN BIOGEOGRAPHIC ANALYSIS

Parametric or model-based biogeographic methods model range evolution (i.e., the change in geographic range from ancestor to descendant) as a stochastic process with discrete states (geographic ranges), that evolves along the branches of the phylogeny according to a probabilistic Markov model. Transitions between states are assumed to occur stochastically according to an instantaneous rate matrix (Q) whose

parameters describe biogeographical processes (e.g., extinction, range expansion, dispersal) and determine the probability of range evolution from ancestor to descendants as a function of time (Ree & Sanmartín, 2009; Sanmartín, in press; see figure S2). Relative to previous approaches (i.e., cladistic biogeography, event-based methods such as dispersal-vicariance analysis, Ronquist, 1997), model-based methods allow incorporation of estimates of evolutionary divergence between lineages (represented by the length of branches in the phylogeny) into biogeographic reconstructions (figure S2). Thus, they are less sensitive to the phenomenon of "biogeographical pseudocongruence", when two groups show similar distribution patterns but of different temporal origin, and therefore unlikely to have been generated by the same biogeographic event (Donoghue & Moore, 2003).

Here we use the parametric Bayesian island biogeography model (BIB) proposed by Sanmartín *et al.* (2008), which allows estimation of area carrying capacities and rates of dispersal/biotic migration between geographically (or ecologically) isolated areas from DNA sequence data and species distributions. It uses a Bayesian statistical approach that integrates over phylogenetic and biogeographic uncertainty, so estimates of biogeographic parameters such as dispersal rates are not made dependent on a particular phylogeny and the method can be used across multiple taxonomic groups differing in their ecological preferences and dispersal capabilities (Sanmartín, in press).

There are two components in the model: 1) Carrying capacities are the stationary frequencies of the biogeographic Markov process. They have a biological interpretation as the relative species richness - or the proportion of the total number of lineages on all areas - that we expect to find in a given area at equilibrium conditions. It is analogous to the stationary state frequencies in a DNA substitution model. 2) The relative dispersal rate (r_{AB}) is the rate of biotic exchange between areas A and B, corrected for relative carrying capacities. They are analogous to the relative substitution rates in a GTR substitution model.

The BIB model has been implemented in the program MrBayes 4.0, beta version (source code and compiled versions for Macintosh OSX and Linux can be obtained from I. S. on request).

5. SETTING THE ANALYSIS

Figure 2a shows the setting of the analysis. For each group, we included a molecular partition (i.e., DNA sequence alignment) and a biogeographic partition comprising only one character ("area") coded as a "standard" morphological character (0, 1, 2, ... 5). The molecular partition for each group was allowed to evolve under its own DNA model (GTR₁, GTR₂, etc, figure 2a), while the biogeographical model of island evolution was shared across groups. This means that molecular rates and nucleotide stationary frequencies were estimated independently for each group ("parameters unlinked"), whereas biogeographic parameters were estimated based on all groups analyzed. For this analysis, we used the unconstrained GTR model (Sanmartín *et al.* 2008), which allows dispersal rates and carrying capacities to differ among groups.

Branch-lengths inferred from nucleotide substitution data and measured as expected number of substitutions per site are difficult to interpret in terms of dispersal rates. Because rates of molecular evolution usually differ among groups, and often among lineages within each group, branch lengths need not be comparable across groups. Moreover, branch lengths – measured as evolutionary rate or time – cannot be

compared in terms of expected number of dispersal events because some groups may be older than others or may have a higher dispersal capability (e.g., they may present a wider geographic distribution). To address these problems, we introduced two tree height scalers: 1) a molecular tree height parameter, equivalent to enforcing a molecular clock for each group, that scales branch lengths as expected number of nucleotide substitutions per unit of time (relative time since no fossil calibration was used) and 2) a dispersal rate scaler that scales branch lengths as expected number of dispersal events per number of substitution events per unit of time (figure 2a). These tree height scalers were group-specific (i.e., they were estimated independently for each group, see figure 2a) and incorporated as free parameters in the model to be simultaneously estimated with other model parameters describing rate of exchange and carrying capacities. The tree height parameter associated to the molecular clock (total expected substitution rate per site measured from the root to the tip of the tree) accounted for differences in evolutionary rate across groups and across lineages within each group, whereas the biogeographic tree height parameter (total expected number of dispersal events from the root to the tip of the tree) accounted for differences in age and dispersal capabilities (dispersal rate) across groups. These parameters can be converted into absolute dispersal and substitution rates by dividing the tree height parameters by the time from the root to the tip but this would require an estimate of the age of the different groups.

Prior settings for the biogeographic parameters were similar to their molecular counterparts: for carrying capacities (= equilibrium frequencies) and relative dispersal rates (= substitution rates), we used a dirichlet distribution, while for the biogeographic tree height scaler (= molecular tree height parameter), we used a gamma prior distribution.

Once the analysis was set up, a composite phylogenetic-biogeographical Markov chain Monte Carlo run was constructed to sample stochastically the tree topology, branch lengths and the parameters of the biogeographical and molecular models, yielding estimates of the posterior distribution of the biogeographical parameters while integrating over the distributions of all other parameters.

First we ran two independent analyses of 50 million generations each (no Metropolis coupling, one chain each), sampling every 1000th generation, and discarded 24% of sampled chains as burnin (12 million generations). Convergence and mixing was assessed using MrBayes 3.2cvs (Ronquist *et al.* 2009) and Tracer 1.5 (Rambaut & Drummond, 2007). Convergence diagnostics showed poor mixing and low effective sample sizes (< 200) for these preliminary runs. Accordingly, we run a second, longer analysis with two independent runs of 60 million generations each. Results were very similar to the previous analysis but Tracer and MrBayes plots showed better mixing and large effective sample sizes (> 400 for the pooled runs) for all biogeographical and molecular parameters. The Potential Scale Reduction Factor (PSRF) was < 1.02 for nearly all parameters, indicating good convergence among the runs. Table 1 and figure S3a,b show values and plots for the biogeographical parameters of interest. No significant correlations were found between the highest dispersal rates and the estimated carrying capacities (figure S3c), suggesting that we can disentangle these two parameters from the model.

The lowest value of the dispersal rate scaler was estimated for genus *Aeonium* (thI = 0.1517), which is distributed in only two areas (Macaronesia-Morocco and eastern Africa) and has but one example of disjunct sister-taxa: the eastern African endemic *A. leucoblepharum* is nested within a mainly Macaronesian clade comprising the rest of species. In contrast, the highest value corresponded to genus *Moraea* (thI=3.616),

whose phylogeny shows several clades with disjunct taxa between south Africa and eastern Africa-Arabia, indicating several independent northward dispersal events. The second highest value corresponds to *Euphorbia* subgenus *Esula* (thI = 3.085), a large, cosmopolitan subgenus, represented in all the study areas; the preliminary phylogeny suggests multiple cases of clades containing disjunct taxa. Thus, the dispersal rate scaler shows a correlation with the size of the geographic range of the taxon and the potential number of disjunct clades.

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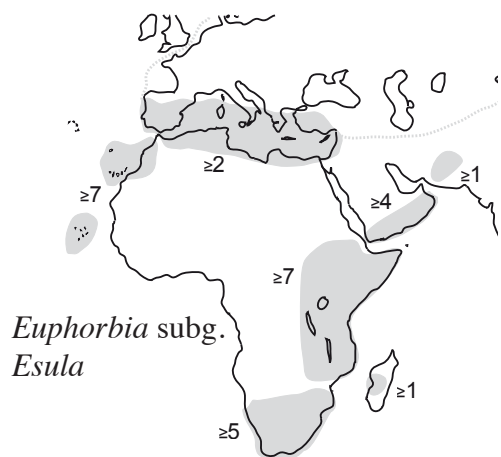
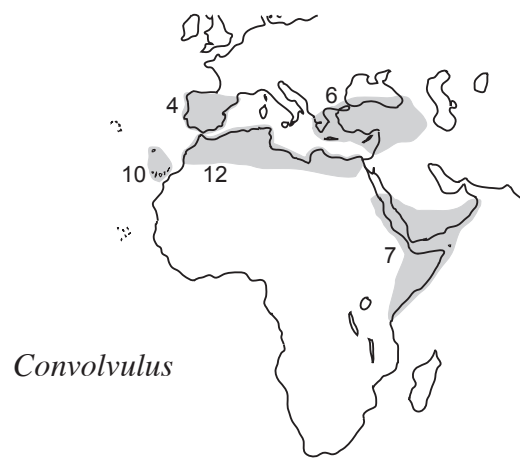
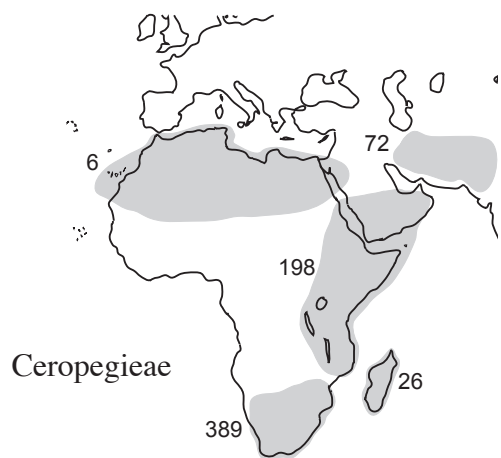
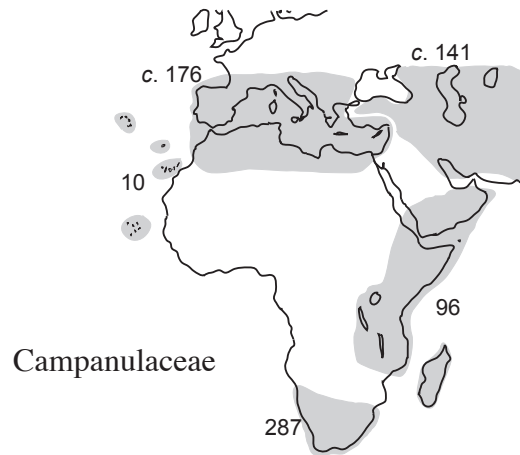
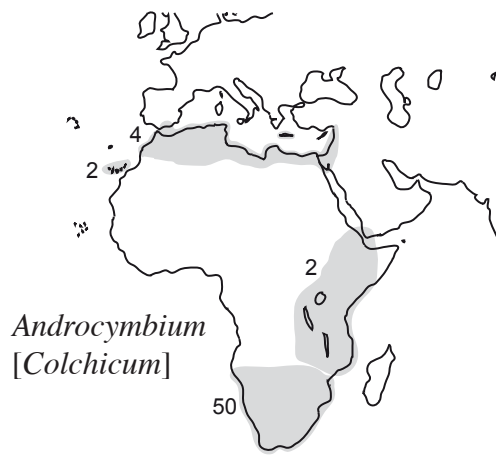
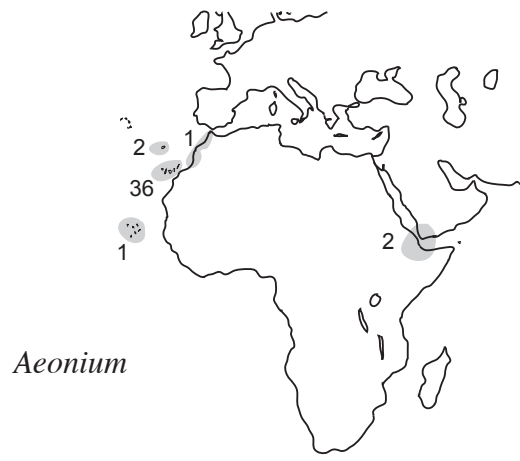
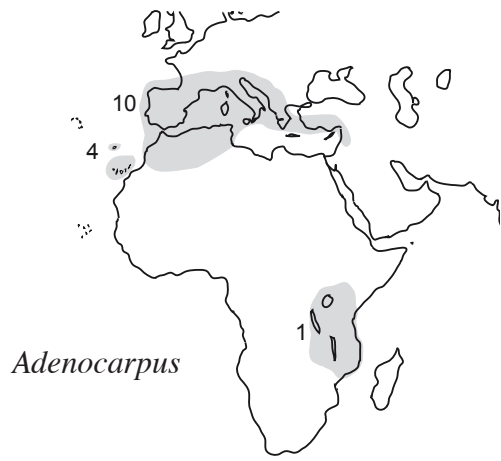


Figure S1.

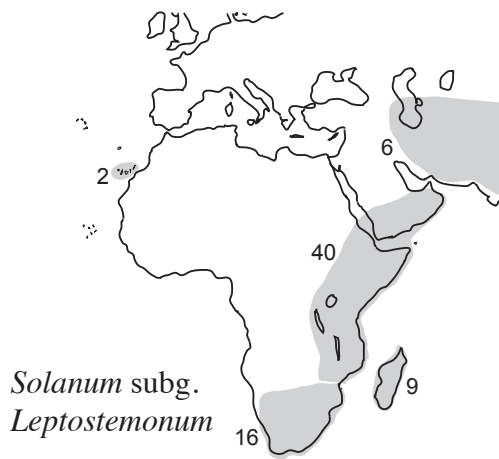
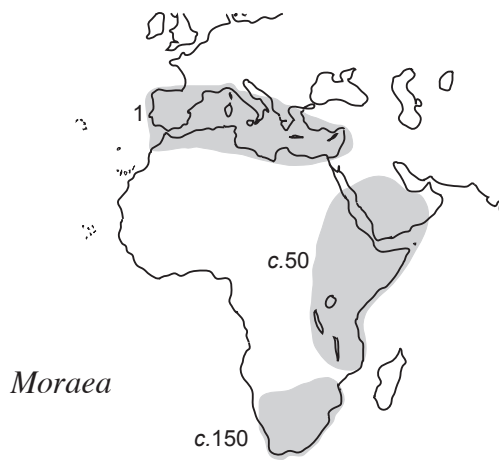
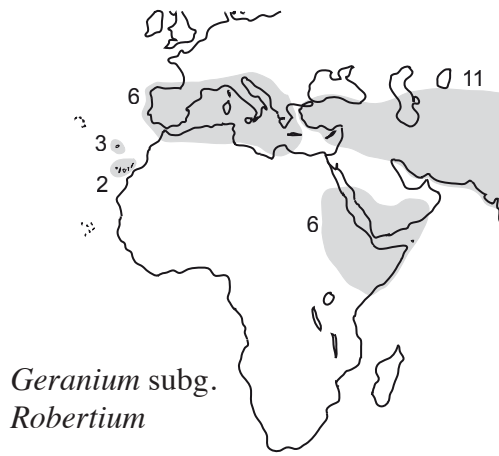
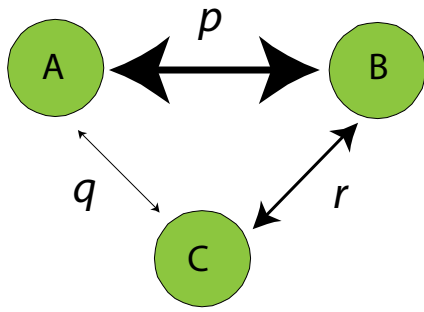


Figure S1.
Maps showing the distribution of the study-groups.

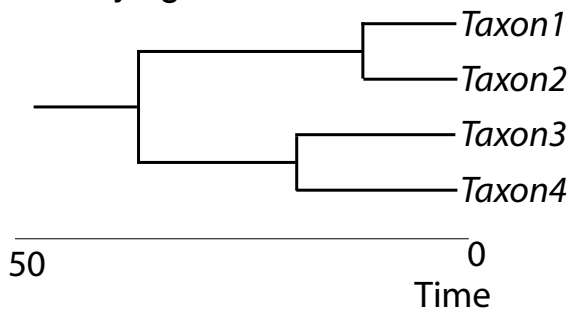
Markov chain



Transition probability matrix

$$Q = \begin{array}{c|ccc} & A & B & C \\ \hline A & - & p & q \\ B & p & - & r \\ C & q & r & - \end{array}$$

Phylogenetic tree

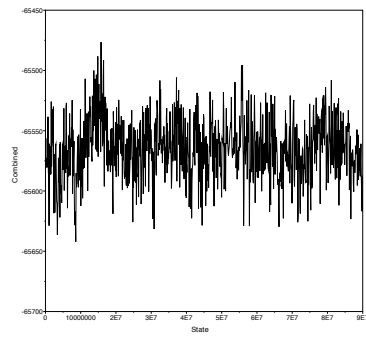
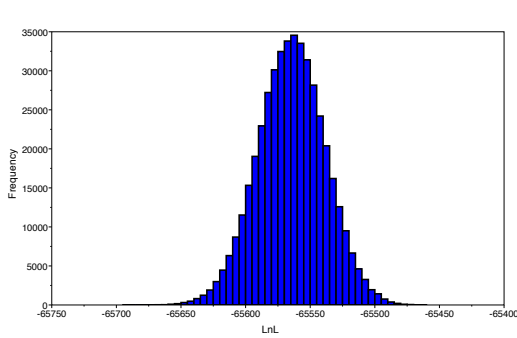


$$\mathbf{P} = e^{Q\mathbf{t}}$$

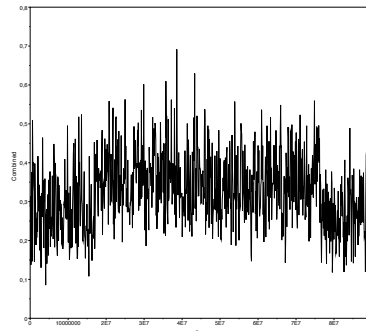
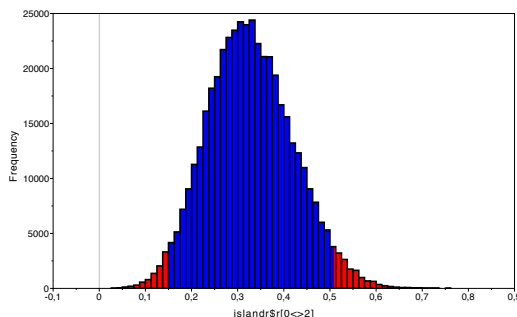
Figure S2.

Scheme showing the main components of the parametric biogeographic model.

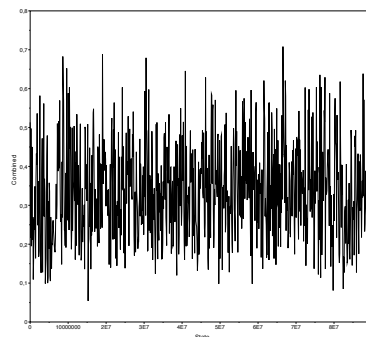
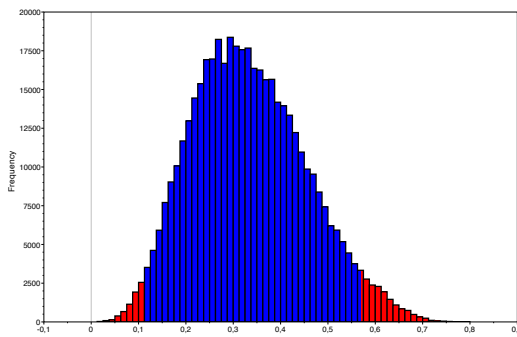
Figure S3a. Tracer plots showing traces of sampled values against MCMC generations, estimates of posterior probability distributions (frequency of plot samples), and effective sample sizes (EES) for biogeographic parameters in the GTR model. Results pooled from two runs of 60 million generations each.



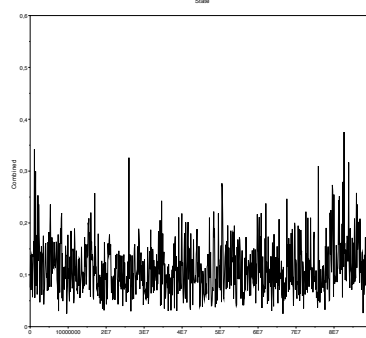
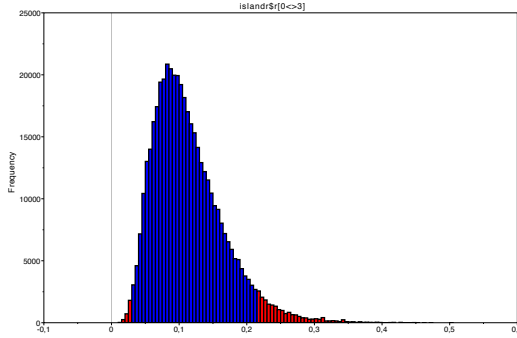
LnL
ESS = 437.8887



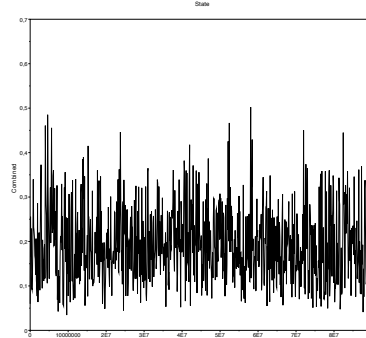
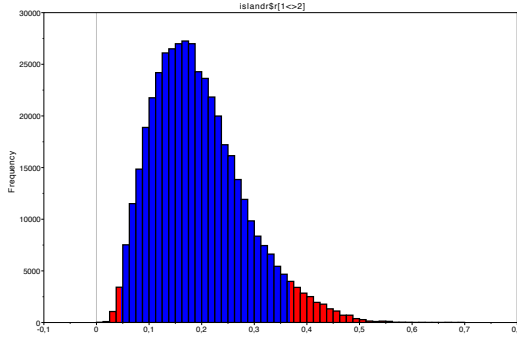
rate
NW Afr - EAfr
ESS = 476.8426



rate
NW Afr - Med
ESS = 722.564



rate
SAfr - EAfr
ESS = 816.2273



rate
EAfr - WAfr
ESS = 848.8923

Figure S3b. Tracer plots showing traces of sampled values against MCMC generations, estimates of posterior probability distributions (frequency of plot samples), and effective sample sizes (EES) for biogeographic parameters in the GTR model. Results pooled from two runs of 60 million generations each.

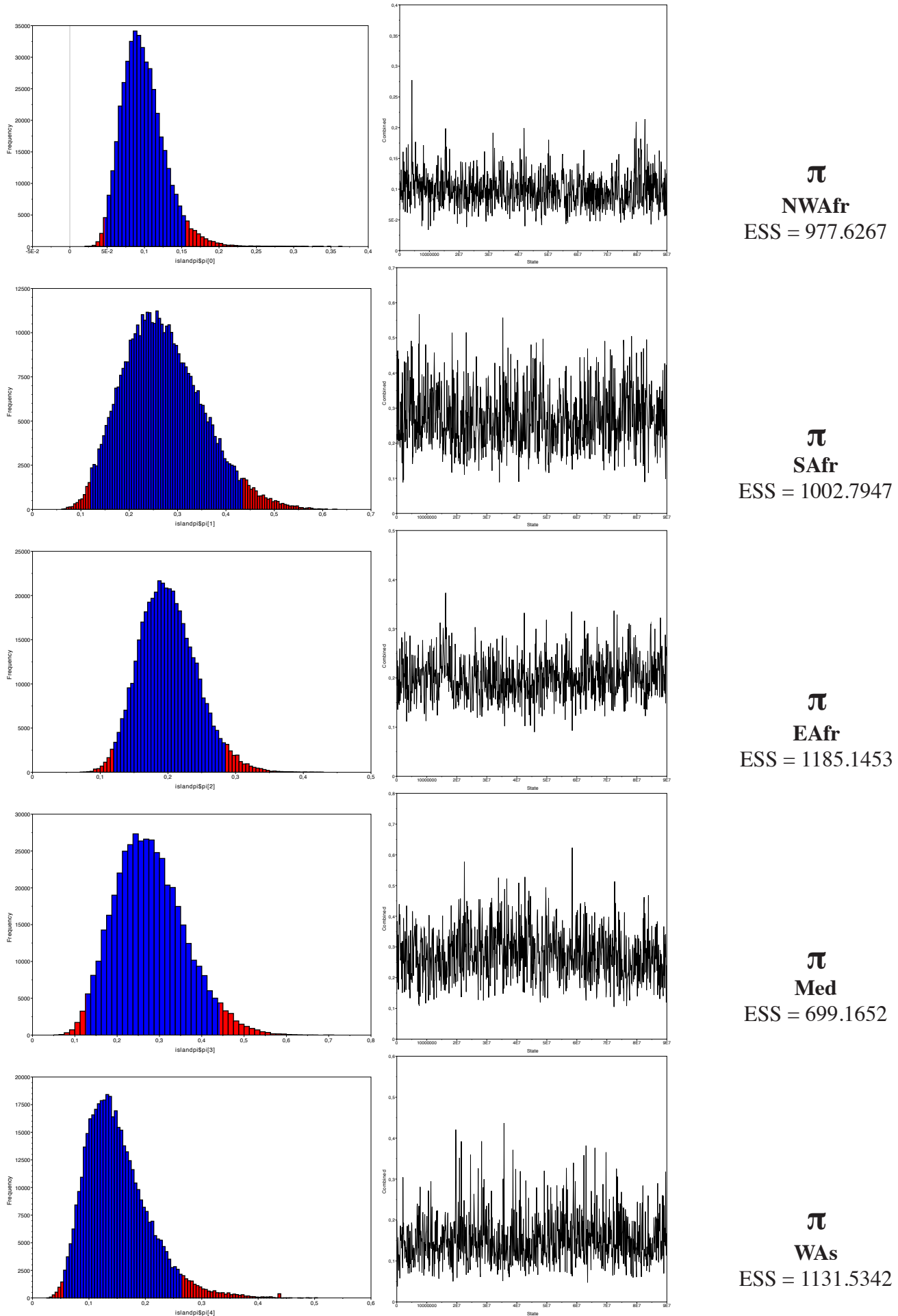
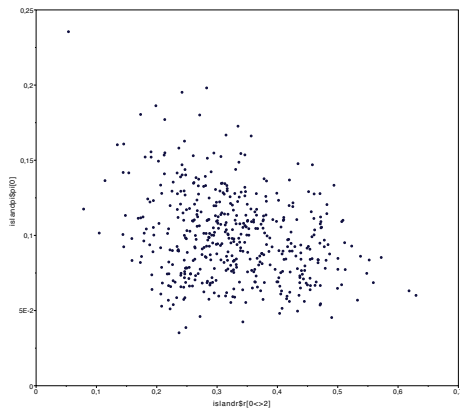
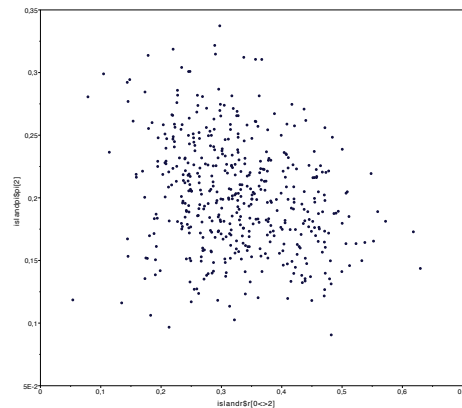


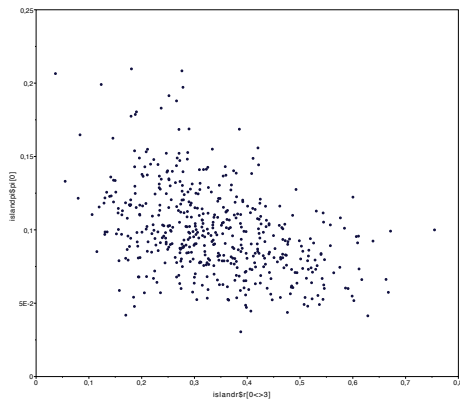
Figure S3c. Tracer plots showing putative correlations between carrying capacities and dispersal rate estimates in the GTR model. Results pooled from two runs of 60 million generations each.



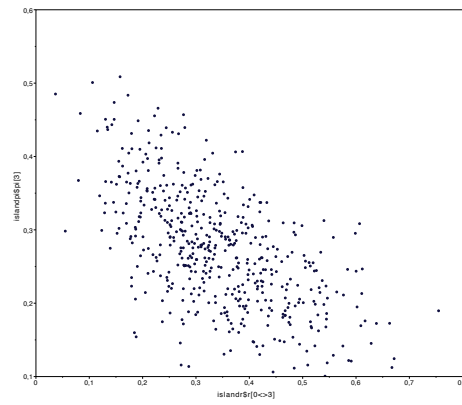
rate [NWAfr - EAfr] / π NWAfr



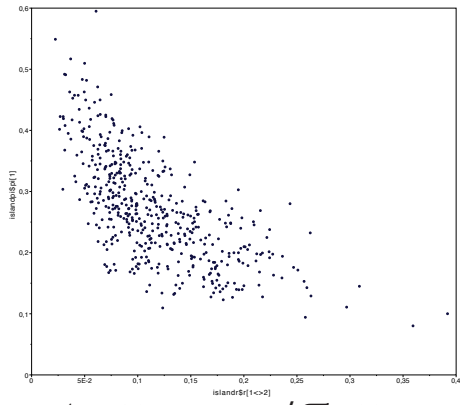
rate [NWAfr - EAfr] / π EAfr



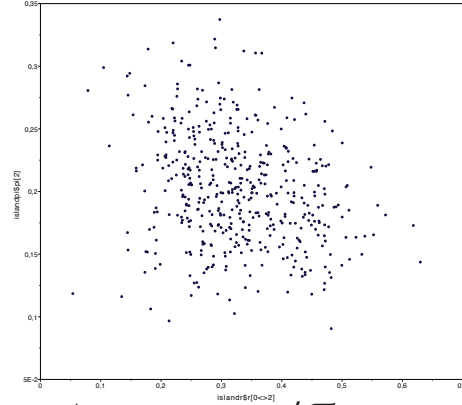
rate [NWAfr - Med] / π NWAfr



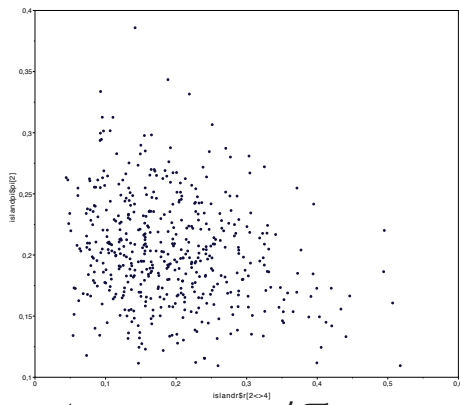
rate [NWAfr - Med] / π Med



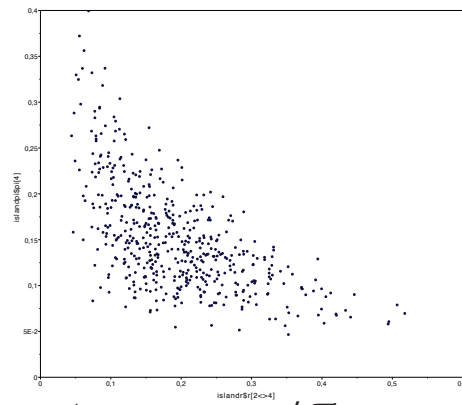
rate [SAfr - EAfr] / π SAfr



rate [SAfr - EAfr] / π EAfr



rate [EAfr - WAs] / π EAfr



rate [EAfr - WAs] / π WAs

Table S1. List of plant groups included in the analysis, and selected (main) references for the phylogeny and distribution.

Taxon	Reference
<i>Adenocarpus</i> (Fabaceae)	Percy & Cronk, 2002
<i>Aeonium</i> (Crassulaceae)	Mort <i>et al.</i> , 2002
<i>Androcymbium</i> (Colchicaceae)	Del Hoyo & Pedrola 2008; Del Hoyo <i>et al.</i> , 2009
Campanulaceae	Roquet <i>et al.</i> , 2008, 2009; Olesen <i>et al.</i> , submitted
<i>Convolvulus</i> (Convolvulaceae)	Carine <i>et al.</i> , 2004; Carine, 2005
<i>Euphorbia</i> subgenus <i>Esula</i>	Steinmann & Porter, 2002; Bruyns <i>et al.</i> , 2006
<i>Euphorbia</i> subgenus <i>Rhizantium</i>	Steinmann & Porter, 2002; Bruyns <i>et al.</i> , 2006; Ritz <i>et al.</i> , 2003
<i>Geranium</i> subgenus <i>Robertium</i> (Geraniaceae)	Fiz <i>et al.</i> , 2008
<i>Monsonia</i> (Geraniaceae)	Touloumenidou <i>et al.</i> , 2007; Fiz <i>et al.</i> , 2008
<i>Moraea</i> (Iridaceae)	Goldblatt <i>et al.</i> , 2002
<i>Sideroxylon s. l.</i> (Sapotaceae)	Smedmark <i>et al.</i> , 2006; Smedmark & Anderberg, 2007
<i>Solanum</i> subgenus <i>Leptostemum</i>	Levin <i>et al.</i> , 2006
Ceropegieae (Asclepiadaceae)	Meve & Liede 2002, 2007; Surweswaran <i>et al.</i> 2009

Table ESM-2. List of species included in this study, showing geographic distribution, the molecular marker used in the analysis, the GenBank accession number and the reference study for the selected sequences. Complete references for those studies not mentioned in the ESM are given below. In some cases, the reference study was an unpublished work.

<i>Study group</i>	<i>Species</i> <i>*outgroup</i>	Marker	Reference	Accession	Distribution	
<i>Adenocarpus</i>	<i>Anagyris foetida*</i>	ITS	Percy & Cronk, 2002	AF330637	Iberian Peninsula	
	<i>Genista florida</i>	ITS	Percy & Cronk, 2002	AF330659	Iberian Peninsula, Morocco	
	<i>Genista florida</i> ssp. <i>maroccana</i>	ITS	Percy & Cronk, 2002	AF330660	Morocco	
	<i>Adenocarpus argyrophyllus</i>	ITS	Cubas et al., 2002.	AF443627	Iberian Peninsula, Morocco	
	<i>Adenocarpus hispanicus</i>	ITS	Cubas et al., 2002.	AF351086	Iberian Peninsula, Morocco	
	<i>Adenocarpus ombriosus</i>	ITS	Percy & Cronk, 2002	AF330652	Canary Is.	
	<i>Adenocarpus nainii</i>	ITS	Percy & Cronk, 2002	AF330651	Morocco	
	<i>Adenocarpus nainii</i>	ITS	Percy & Cronk, 2002	AF330650	Morocco	
	<i>Adenocarpus mannii</i>	ITS	Percy & Cronk, 2002	AF330649	Ethiopia, Kenya, Uganda, Tanzania, Rwanda, Malawi, Nigeria, Zambia, , Zimbabwe, Angola Tanzania, Ethiopia, Rwanda, Malawi, Nigeria, Uganda, Zambia, Angola, Zimbabwe, Ethiopia, Kenya,	
	<i>Adenocarpus mannii</i>	ITS	Percy & Cronk, 2002	AF330648		
	<i>Adenocarpus decorticans</i>	ITS	Percy & Cronk, 2002	AF330646	Morocco, Algeria, Iberian Peninsula	
	<i>Adenocarpus decorticans</i>	ITS	Percy & Cronk, 2002	AF330645	Morocco, Algeria, Iberian Peninsula	
	<i>Adenocarpus boudyi</i>	ITS	Percy & Cronk, 2002	AF330641	Morocco	
	<i>Adenocarpus bacquei</i>	ITS	Percy & Cronk, 2002	AF330640	Morocco	
	<i>Adenocarpus anagyriifolius</i>	ITS	Percy & Cronk, 2002	AF330639	Morocco	
	<i>Adenocarpus viscosus</i>	ITS	Percy & Cronk, 2002	AF330655	Canary Is.	
	<i>Adenocarpus telonensis</i>	ITS	Percy & Cronk, 2002	AF330654	Iberian Peninsula, Morocco, France	
	<i>Adenocarpus telonensis</i>	ITS	Percy & Cronk, 2002	AF330653	Iberian Peninsula, Morocco, France	
	<i>Adenocarpus foliolosus</i>	ITS	Percy & Cronk, 2002	AF330647	Canary Is.	
	<i>Adenocarpus complicatus</i>	ITS	Cubas et al., 2002	AF351085	Madeira Is., Mediterranean, Turkey	
	<i>Adenocarpus complicatus</i>	ITS	Cubas et al., 2002	AF443628	Madeira Is., Mediterranean, Turkey	
	<i>Adenocarpus complicatus</i>	ITS	Percy & Cronk, 2002	AF330644	Madeira Is., Mediterranean, Turkey	
	<i>Adenocarpus complicatus</i>	ITS	Percy & Cronk, 2002	AF330643	Madeira Is., Mediterranean, Turkey	
	<i>Adenocarpus complicatus</i>	ITS	Percy & Cronk, 2002	AF330642	Madeira Is., Mediterranean, Turkey	
	<i>Argyrocystis battandieri</i>	ITS	Percy & Cronk, 2002	AF330638	Morocco	
	<i>Aeonium</i>	<i>Aichryson parlatorei*</i>	ITS	Fairfield et al 2004	AY568354	Canary Is.
		<i>Monanthes subcrassicaulis</i>	ITS	Mort et al. 2002	AY082117	Canary Is.
<i>Monanthes minima</i>		ITS	Mort et al. 2002	AY082119	Canary Is.	
<i>Aeonium leucoblepharum</i>		ITS	Mort et al. 2002	AY082140	Ethiopia, Somalia, Yemen	
<i>Aeonium gorgoneum</i>		ITS	Mort et al. 2002	AY082135	Cape Verde	
<i>Aeonium korneliuslemsii</i>		ITS	Mort et al. 2002	AY082139	SW Morocco	
<i>Aeonium holochrysum</i>		ITS	Mort et al. 2002	AY082138	Canary Is.	
<i>Aeonium vestitum</i>		ITS	Mort et al. 2002	AY082155	Canary Is.	
<i>Aeonium rubrolineatum</i>		ITS	Mort et al. 2002	AY082147	Canary Is.	
<i>Aeonium simsii</i>		ITS	Mort et al. 2002	AY082150	Canary Is.	
<i>Aeonium percarneum</i>		ITS	Mort et al. 2002	AY082146	Canary Is.	
<i>Aeonium undulatum</i>		ITS	Mort et al. 2002	AY082151	Canary Is.	
<i>Aeonium lancerottense</i>		ITS	Mort et al. 2002	AY082143	Canary Is.	
<i>Aeonium mascaense</i>		ITS	Mort et al. 2002	AY082142	Canary Is.	
<i>Aeonium volkeri</i>		ITS	Mort et al. 2002	AY082121	Canary Is.	
<i>Aeonium balsamiferum</i>	ITS	Mort et al. 2002	AY082120	Canary Is.		

	<i>Aeonium viscatum</i>	ITS	Mort et al. 2002	AY082154	Canary Is.
	<i>Aeonium saundersii</i>	ITS	Mort et al. 2002	AY082148	Canary Is.
	<i>Aeonium castellopaivae</i>	ITS	Mort et al. 2002	AY082127	Canary Is.
	<i>Aeonium decorum</i>	ITS	Mort et al. 2002	AY082130	Canary Is.
	<i>Aeonium haworthii</i>	ITS	Mort et al. 2002	AY082136	Canary Is.
	<i>Aeonium gomerense</i>	ITS	Mort et al. 2002	AY082133	Canary Is.
	<i>Aeonium hierrense</i>	ITS	Mort et al. 2002	AY082137	Canary Is.
	<i>Aeonium pseudourbicum</i>	ITS	Mort et al. 2002	AY082153	Canary Is.
	<i>Aeonium urbicum</i>	ITS	Mort et al. 2002	AY082152	Canary Is.
	<i>Aeonium nobile</i>	ITS	Mort et al. 2002	AY082144	Canary Is.
	<i>Aeonium spathulatum</i>	ITS	Mort et al. 2002	AY082149	Canary Is.
	<i>Aeonium ciliatum</i>	ITS	Mort et al. 2002	AY082128	Canary Is.
	<i>Aeonium davidbramwellii</i>	ITS	Mort et al. 2002	AY082129	Canary Is.
	<i>Aeonium glandulosum</i>	ITS	Mort et al. 2002	AY082131	Madeira Is.
	<i>Aeonium glutinosum</i>	ITS	Mort et al. 2002	AY082132	Madeira Is.
	<i>Aeonium tabuliforme</i>	ITS	Mort et al. 2002	AY082126	Canary Is.
	<i>Aeonium virgineum</i>	ITS	Mort et al. 2002	AY082123	Canary Is.
	<i>Aeonium canariense</i>	ITS	Mort et al. 2002	AY082122	Canary Is.
	<i>Aeonium palmense</i>	ITS	Mort et al. 2002	AY082125	Canary Is.
	<i>Aeonium subplanum</i>	ITS	Mort et al. 2002	AY082124	Canary Is.
	<i>Aeonium goochiae</i>	ITS	Mort et al. 2002	AY082134	Canary Is.
	<i>Aeonium lindleyi</i>	ITS	Mort et al. 2002	AY082141	Canary Is.
Colchicaceae	<i>Androcymbium dregei*</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622748	South Africa
	<i>Androcymbium hierrense</i>	trnLF	Del Hoyo & Pedrola 2008.	AY608523	Canary Is.
	<i>Androcymbium psammophilum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY608524	Canary Is.
	<i>Androcymbium wyssianum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY608526	NW Africa
	<i>Androcymbium wyssianum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY608522	NW Africa
	<i>Androcymbium gramineum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY608520	NW Africa
	<i>Androcymbium gramineum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY608521	NW Africa
	<i>Androcymbium palaestinum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY608527	Israel, Egypt, Jordan
	<i>Androcymbium rechingeri</i>	trnLF	Del Hoyo & Pedrola 2008.	AY608525	Kriti, Libya
	<i>Androcymbium roseum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622692	Namibia,
	<i>Androcymbium asteroides</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622693	Namibia
	<i>Androcymbium melanthioides</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622694	Namibia
	<i>Androcymbium decipiens</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622697	South Africa
	<i>Androcymbium albanense</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622695	South Africa
	<i>Androcymbium longipes</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622699	South Africa
	<i>Androcymbium longipes</i>	trnLF	Vinnersten and Reeves, 2003	AJ551331	South Africa
	<i>Androcymbium leistneri</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622698	South Africa
	<i>Androcymbium austrocapense</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622696	South Africa
	<i>Androcymbium irroratum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622714	South Africa
	<i>Androcymbium irroratum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622715	South Africa
	<i>Androcymbium irroratum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622716	South Africa
	<i>Androcymbium cedarbergense</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622708	South Africa
	<i>Androcymbium hantamense</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622711	South Africa
	<i>Androcymbium burchellii</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622701	South Africa
	<i>Androcymbium burchellii ssp pulchrum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622702	South Africa
	<i>Androcymbium capense</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622703	South Africa
	<i>Androcymbium ciliolatum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622704	South Africa
	<i>Androcymbium circinatum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622705	South Africa
	<i>Androcymbium circinatum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622706	South Africa
	<i>Androcymbium circinatum ssp vestitum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622719	South Africa
	<i>Androcymbium circinatum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622706	South Africa
	<i>Androcymbium eghimocymbium</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622710	South Africa
	<i>Androcymbium henssenianum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622712	South Africa

	<i>Androcymbium poeltianum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622717	South Africa
	<i>Androcymbium poeltianum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622718	South Africa
	<i>Androcymbium walteri</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622720	Namibia
	<i>Androcymbium bellum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622700	South Africa
	<i>Androcymbium bellum</i>	trnLF	Del Hoyo & Pedrola 2008.	AJ551334	South Africa
	<i>Androcymbium huntleyi</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622713	South Africa
	<i>Androcymbium cuspidatum</i>	trnLF	Del Hoyo & Pedrola 2008.	AY622707	South Africa
	<i>Androcymbium cuspidatum</i>	trnLF	Vinnersten and Reeves, 2003	AJ551337	South Africa
	<i>Androcymbium exiguum</i>	trnLF	Del Hoyo et al. 2007.	EU237038	South Africa
	<i>Androcymbium volutare</i>	trnLF	Del Hoyo et al. 2007.	EU237038	South Africa
	<i>Androcymbium vogelii</i>	trnLF	Vinnersten and Reeves, 2003	AJ551345	South Africa
	<i>Androcymbium striatum</i>	trnLF	Vinnersten and Reeves, 2003	AJ551344	South Africa
	<i>Androcymbium scabromarginatum</i>	trnLF	Vinnersten and Reeves, 2003	AJ551344	South Africa
	<i>Androcymbium latifolium</i>	trnLF	Vinnersten and Reeves, 2003	AJ551341	South Africa
	<i>Androcymbium cruciatum</i>	trnLF	Vinnersten and Reeves, 2003	AJ551336	South Africa
	<i>Androcymbium orienticapense</i>	trnLF	Vinnersten and Reeves, 2003	AJ551342	South Africa
	<i>Androcymbium europaeum</i>	trnLF	Vinnersten and Reeves, 2003	AJ551340	Iberian Peninsula
	<i>Androcymbium eucomoides</i>	trnLF	Vinnersten and Reeves, 2003	AJ551339	South Africa
Campanulaceae	<i>Burmestiera sodiroana*</i>	trnLF	unpublished	unpublished	South America
	<i>Solenopsis laurentia</i>	trnLF	Roquet et al 2008	EF088790	Mediterranean
	<i>Lobelia tupa</i>	trnLF	Antonelli, 2008	DQ356211	South America
	<i>Platycodon grandiflorum</i>	trnLF	Roquet et al 2009	EF088788	Western Asia
	<i>Codonopsis lanceolata</i>	trnLF	unpublished	unpublished	Western Asia
	<i>Canarina canariensis</i>	trnLF	Antonelli, 2008	DQ356167	Canary Is.
	<i>Canarina eminii</i>	trnLF	unpublished	unpublished	Ethiopia, Kenya, Uganda, Tanzania
	<i>Canarina abyssinica</i>	trnLF	unpublished	unpublished	Ethiopia, Kenya, Uganda, Tanzania
	<i>Wahlenbergia lobelioides</i>	trnLF	Roquet et al 2008	EF088793	Canary Is., Madeira Is., Ethiopia
	<i>Nesocodon mauritianus</i>	trnLF	unpublished	unpublished	Mauritius Is.
	<i>Heterochaenia borbonica</i>	trnLF	unpublished	unpublished	Reunion Is.
	<i>Heterochaenia ensifolia</i>	trnLF	unpublished	unpublished	Reunion Is.
	<i>Heterochaenia rivalsii</i>	trnLF	unpublished	unpublished	Reunion Is.
	<i>Roella ciliata</i>	trnLF	Roquet et al. 2008	EF088789	South Africa
	<i>Campanula peregrina</i>	trnLF	Roquet et al. 2008	EF088742	Turkey, Lebanon, Syria
	<i>Campanula primulifolia</i>	trnLF	Roquet et al. 2008	EF088699	Iberian Peninsula
	<i>Musschia aurea</i>	trnLF	Roquet et al. 2008	EF088785	Madeira Is.
	<i>Musschia wollastonii</i>	trnLF	unpublished	unpublished	Madeira Is.
	<i>Jasione montana</i>	trnLF	Antonelli 2008.	DQ356174	Mediterranean
	<i>Feeria angustifolia</i>	trnLF	Roquet et al. 2008	EF088780	Morocco
	<i>Wahlenbergia hederacea</i>	trnLF	Roquet et al. 2008	EF088792	Iberian Peninsula, Fra Turkey, Aegean Is., Greece, Bosnia, Bulgaria, Italy
	<i>Asyneuma limonifolium</i>	trnLF	Roquet et al. 2008	EF088694	
	<i>Asyneuma lobelioides</i>	trnLF	Roquet et al. 2008	EF088695	Anatolia
	<i>Phyteuma spicatum</i>	trnLF	Roquet et al. 2008	EF088787	C and E Europe
	<i>Legousia hybrida</i>	trnLF	Roquet et al. 2008	EF088783	Madeira Is., N Mediterranean, W Asia
	<i>Campanulastrum americana</i>	trnLF	Roquet et al. 2008	EF088776	North America
	<i>Campanula lusitanica</i>	trnLF	Roquet et al. 2008	EF088733	Iberian Peninsula
	<i>Campanula abietina</i>	trnLF	Roquet et al. 2008	EF088697	Asia
	<i>Campanula rapunculus</i>	trnLF	Roquet et al. 2008	EF088758	Eurasia
	<i>Campanula decumbens</i>	trnLF	Roquet et al. 2008	EF088716	Iberian Peninsula
	<i>Campanula persicifolia</i>	trnLF	Roquet et al. 2008	EF088743	Europe, Russia
	<i>Campanula rotundifolia</i>	trnLF	Stefanovic et al. 2008	EF213153	Europe, W and C Asia, North America
	<i>Campanula scheuchzeri</i>	trnLF	Roquet et al. 2008	EF088762	Europe
	<i>Campanula poscharskyana</i>	trnLF	Frajman & Schneeweiss 2009	FJ426588	Balkans
	<i>Campanula cymbalaria</i>	trnLF	Roquet et al. 2008	EF088715	Turkey
	<i>Campanula rapunculoides</i>	trnLF	Roquet et al. 2008	EF088757	Europe, W and C Asia
	<i>Campanula creutzburgii</i>	trnLF	Roquet et al. 2008	EF088714	Crete

	<i>Campanula erinus</i>	trnLF	Roquet et al. 2008	EF088720	Europe, W Asia, N Africa
	<i>Campanula fastigiata</i>	trnLF	Roquet et al. 2008	EF088721	Iberian Peninsula, W Asia, N Africa
	<i>Campanula macrostyla</i>	trnLF	Roquet et al. 2008	EF088737	Turkey
	<i>Campanula semisecta</i>	trnLF	Roquet et al. 2008	EF088766	Iberian Peninsula
	<i>Campanula balfourii</i>	trnLF	Roquet et al. 2008	EF088705	Socotra Is.
	<i>Campanula jacobaea</i>	trnLF	unpublished	unpublished	Cape Verde Is.
	<i>Campanula mollis</i>	trnLF	Roquet et al. 2008	EF088739	Morocco, Iberian Peninsula
	<i>Azorina vidalii</i>	trnLF	Roquet et al. 2008	EF088696	Azores Is.
	<i>Michauxia tchichatewii</i>	trnLF	Roquet et al. 2008	EF088784	Turkey
	<i>Diosphaera rumeliana</i>	trnLF	Roquet et al. 2008	EF088778	Turkey
	<i>Campanula pubicalyx</i>	trnLF	Roquet et al. 2008	EF088752	Turkey
	<i>Trachelium caeruleum</i>	trnLF	Roquet et al. 2008	EF088791	Iberian Peninsula, Italy, Morocco
	<i>Campanula punctata</i>	trnLF	Roquet et al. 2008	EF088753	Japan, Korea, Manchuria
	<i>Campanula argaea</i>	trnLF	Roquet et al. 2008	EF088703	Turkey
	<i>Campanula affinis</i>	trnLF	Roquet et al. 2008	EF088698	Iberian Peninsula
	<i>Campanula lyrata</i>	trnLF	Roquet et al. 2008	EF088734	Turkey
	<i>Campanula filicaulis</i>	trnLF	Roquet et al. 2008	EF088722	Morocco
	<i>Campanula trachelium</i>	trnLF	Roquet et al. 2008	EF088774	Europe, Russia
<i>Convolvulus</i>	<i>Ipomoea arborescens*</i>	ITS	Miller et al. 2000	AF110924	North America
	<i>Calystegia sepium</i>	ITS	Carine, M. A. 2005.	AY560267	Widespread
	<i>Calystegia soldanella</i>	ITS	Carine, M. A. 2005.	AY560268	Widespread
	<i>Calystegia silvatica</i>	ITS	Carine, M. A. 2005.	AY560269	Widespread
	<i>Convolvulus acanthocladus</i>	ITS	Carine, M. A. 2005.	AY560270	Oman, Yemen
	<i>Convolvulus althaeoides</i>	ITS	Carine, M. A. 2005.	AY560271	Mediterranean and Ethiopia
	<i>Convolvulus argyrothamnos</i>	ITS	Carine, M. A. 2005.	AY560273	Crete
	<i>Convolvulus arvensis</i>	ITS	Carine, M. A. 2005.	AY560274	Mediterranean
	<i>Convolvulus boissieri</i>	ITS	Carine, M. A. 2005.	AY560275	Iberian Peninsula
	<i>Convolvulus canariensis</i>	ITS	Carine, M. A. 2005.	AY560276	Canary Is.
	<i>Convolvulus cantabrica</i>	ITS	Carine, M. A. 2005.	AY560278	Morocco
	<i>Convolvulus cneorum</i>	ITS	Carine, M. A. 2005.	AY560282	Mediterranean
	<i>Convolvulus cephalopodus</i>	ITS	Carine, M. A. 2005.	AY560281	Oman, Yemen
	<i>Convolvulus caputmedusae</i>	ITS	Carine, M. A. 2005.	AY560280	Canary Is.
	<i>Convolvulus compactus</i>	ITS	Carine, M. A. 2005.	AY560283	Turkey
	<i>Convolvulus fernandesii</i>	ITS	Carine, M. A. 2005.	AY560286	Iberian Peninsula
	<i>Convolvulus dorycnium</i>	ITS	Carine, M. A. 2005.	AY560285	Libya
	<i>Convolvulus glandulosus</i>	ITS	Carine, M. A. 2005.	AY560290	Canary Is.
	<i>Convolvulus gharbensis</i>	ITS	Carine, M. A. 2005.	AY560289	Morocco
	<i>Convolvulus fruticosus</i>	ITS	Carine, M. A. 2005.	AY560288	Canary Is.
	<i>Convolvulus floridus</i>	ITS	Carine, M. A. 2005.	AY560287	Canary Is.
	<i>Convolvulus leiocalycinus</i>	ITS	Carine, M. A. 2005.	AY560296	Iran
	<i>Convolvulus lanuginosus</i>	ITS	Carine, M. A. 2005.	AY560295	Iberian Peninsula
	<i>Convolvulus humilis</i>	ITS	Carine et al. 2004.	AY560294	Morocco
	<i>Convolvulus holosericeus</i>	ITS	Carine, M. A. 2005.	AY560293	Turkey
	<i>Convolvulus leucochnous</i>	ITS	Carine, M. A. 2005.	AY560297	Morocco
	<i>Convolvulus lineatus</i>	ITS	Carine, M. A. 2005.	AY560299	Turkey
	<i>Convolvulus massonii</i>	ITS	Carine, M. A. 2005.	AY560302	Madagascar
	<i>Convolvulus lopezocastii</i>	ITS	Carine, M. A. 2005.	AY560301	Canary Is.
	<i>Convolvulus mazicum</i>	ITS	Carine, M. A. 2005.	AY560304	Morocco
	<i>Convolvulus oleifolius</i>	ITS	Carine, M. A. 2005.	AY560306	Crete
	<i>Convolvulus oxyphyllus</i>	ITS	Carine, M. A. 2005.	AY560308	Arabia, Yemen
	<i>Convolvulus trabutianus</i>	ITS	Carine, M. A. 2005.	AY560314	Morocco
	<i>Convolvulus supinus</i>	ITS	Carine, M. A. 2005.	AY560313	Morocco
	<i>Convolvulus siculus</i>	ITS	Carine, M. A. 2005.	AY560312	Kenya, Tanzania, Ethiopia
	<i>Convolvulus scoparius</i>	ITS	Carine, M. A. 2005.	AY560311	Canary Is.
	<i>Convolvulus sabatius</i>	ITS	Carine, M. A. 2005.	AY560310	Mediterranean
	<i>Convolvulus prostratus</i>	ITS	Carine, M. A. 2005.	AY560309	Yemen

	<i>Convolvulus volubilis</i>	ITS	Carine, M. A. 2005.	AY560318	Canary Is.
	<i>Convolvulus ulcinus</i>	ITS	Carine, M. A. 2005.	AY560317	Oman, Yemen
	<i>Convolvulus tricolor</i>	ITS	Carine, M. A. 2005.	AY560316	Morocco
<i>Euphorbia</i> subg. <i>Rhizanthium</i>	<i>Euphorbia crotonoides*</i>	ITS	Steinmann & Porter. 2002.	AF537578	Tanzania, South Africa, Zimbabwe, Ethiopia, Kenya,
	<i>Euphorbia antso*</i>	ITS	Steinmann & Porter. 2002.	AF537579	Madagascar
	<i>Euphorbia meuleniana</i>	ITS	Steinmann & Porter. 2002.	AF537572	Yemen
	<i>Euphorbia balsamifera ssp. balsamifera</i>	ITS1		AF334249	
	<i>Euphorbia balsamifera ssp. adenensis</i>	ITS2	Molero, et al. 2002	AF334264	Canary Is.
		ITS	Steinmann & Porter. 2002.	AF537571	Yemen, Somalia
		ITS1		AJ535517	
	<i>Euphorbia meloformis</i>	ITS2	Ritz et al. 2003	AJ535542	South Africa
		ITS1		AJ535535	
	<i>Euphorbia globosa</i>	ITS2	Ritz et al. 2003	AJ535557	South Africa
		ITS1		AJ535524	
	<i>Euphorbia jansenvillensis</i>	ITS2	Ritz et al. 2003	AJ535546	South Africa
		ITS1		AJ535526	
	<i>Euphorbia heptagona</i>	ITS2	Ritz et al. 2003	AJ535548	South Africa
		ITS1		AJ535527	
	<i>Euphorbia pseudoglobosa</i>	ITS2	Ritz et al. 2003	AJ535550	South Africa
		ITS1		AJ535531	
	<i>Euphorbia susannae</i>	ITS2	Ritz et al. 2003	AJ535553	South Africa
		ITS1		AJ535533	
	<i>Euphorbia caput-medusae</i>	ITS2	Ritz et al. 2003	AJ535555	South Africa
		ITS1		AJ535534	
	<i>Euphorbia hypogaea</i>	ITS2	Ritz et al. 2003	AJ535556	South Africa
		ITS1		AJ536017	
	<i>Euphorbia bupleurifolia</i>	ITS2	Ritz et al. 2003	AJ536018	South Africa
		ITS1		AJ535525	
	<i>Euphorbia horrida</i>	ITS2	Ritz et al. 2003	AJ535547	South Africa
	<i>Euphorbia esculenta</i>	ITS	Steinmann & Porter. 2002.	AF537575	South Africa
	<i>Euphorbia tubiglans</i>	ITS	Steinmann & Porter. 2002.	AF537567	South Africa
	<i>Euphorbia multifolia</i>	ITS	Bruyns et al. 2006.	AM040782	South Africa
	<i>Euphorbia clava</i>	ITS	Steinmann & Porter. 2002.	AF537569	South Africa
	<i>Euphorbia gariepina</i>	ITS	Bruyns et al. 2006.	AM040769	South Africa, Namibia, Angola
	<i>Euphorbia tuberosa</i>	ITS	Steinmann & Porter. 2002.	AF537570	South Africa
	<i>Euphorbia filiflora</i>	ITS	Bruyns et al. 2006.	AM040768	South Africa, Namibia
	<i>Euphorbia hallii</i>	ITS	Steinmann & Porter. 2002.	AF537573	South Africa
	<i>Euphorbia oxystegia</i>	ITS	Bruyns et al. 2006.	AM040785	South Africa
	<i>Euphorbia monteiri</i>	ITS	Steinmann & Porter. 2002.	AF537563	South Africa, Namibia, Zimbabwe, Angola
	<i>Euphorbia longituberculosa</i>	ITS	Steinmann & Porter. 2002.	AF537577	Somalia
	<i>Euphorbia schoenlandii</i>	ITS	Bruyns et al. 2006.	AM040788	South Africa
	<i>Euphorbia trichadenia</i>	ITS	Steinmann & Porter. 2002.	AF537564	South Africa, Angola, Zimbabwe Malawi
	<i>Euphorbia hamata</i>	ITS	Bruyns et al. 2006.	AM040774	Namibia South Africa
	<i>Euphorbia namuskluftensis</i>	ITS	Steinmann & Porter. 2002.	AF537562	Namibia
	<i>Euphorbia quadrata</i>	ITS	Bruyns et al. 2006.	AM040786	South Africa
	<i>Euphorbia obesa</i>	ITS	Steinmann & Porter. 2002.	AF537566	South Africa
	<i>Euphorbia platycephala</i>	ITS	Steinmann & Porter. 2002.	AF537561	Malawi , Tanzania , Zambia , Zimbabwe
	<i>Euphorbia bruynsii</i>	ITS	Bruyns et al. 2006.	AM040759	South Africa
<i>Euphorbia</i> subg. <i>Esula</i>	<i>Euphorbia helioscopia*</i>	ITS	Kim and Kim. 2008.	EU659747	Widespread
	<i>Euphorbia aphylla</i>	ITS	Steinmann & Porter. 2002.	AF537540	Canary Is.
	<i>Euphorbia schimperi</i>	ITS	Steinmann & Porter. 2002.	AF537537	Arabia, Yemen
	<i>Euphorbia dendroides</i>	ITS	Steinmann & Porter. 2002.	AF537539	N Mediterranean, Turkey
	<i>Euphorbia stolonifera</i>	ITS	Bruyns et al. 2006.	AM040792	South Africa
	<i>Euphorbia mauritanica</i>	ITS	Steinmann & Porter. 2002.	AF537531	South Africa
	<i>Euphorbia atropurpurea</i>	ITS	Steinmann & Porter. 2002.	AF537542	Canary Is.
	<i>Euphorbia regisjubae</i>	ITS	Steinmann & Porter. 2002.	AF537541	Canary Is.
	<i>Euphorbia kraussiana</i>	ITS	Steinmann & Porter. 2002.	AF537548	South Africa
		ITS1		AF334240	
	<i>Euphorbia tuckeyana</i>	ITS2	Molero et al. 2002	AF334255	Cape Verde
		ITS1		AF334244	
	<i>Euphorbia lamarckii</i>	ITS2	Molero et al. 2002	AF334259	Morocco
	<i>Euphorbia usambarica</i>	ITS	Steinmann & Porter. 2002.	AF537538	Tanzania

	<i>Euphorbia bravoana</i>	ITS	Molero et al. 2002	AF334239	Canary Is.
	<i>Euphorbia piscatoria</i>	ITS	Molero et al. 2002	AF334245	Madeira Is.
	<i>Euphorbia esula</i>	ITS	Kim and Kim. 2008.	EU659749	Europe, Asia
	<i>Euphorbia discolor</i>	ITS	Steinmann & Porter. 2002.	AF537547	Asia
	<i>Euphorbia calyptrata</i>	ITS	Steinmann & Porter. 2002.	AF537549	Morocco
	<i>Euphorbia medicaginea</i>	ITS	Steinmann & Porter. 2002.	AF537535	Morocco
	<i>Euphorbia myrsinites</i>	ITS	Steinmann & Porter. 2002.	AF537551	Europe, Asia
	<i>Euphorbia lamprocarpa</i>	ITS	Steinmann & Porter. 2002.	AF537545	asia
	<i>Euphorbia megalatlantica</i>	ITS	Steinmann & Porter. 2002.	AF537536	Morocco
	<i>Euphorbia turczaninowii</i>	ITS	Steinmann & Porter. 2002.	AF537543	China
	<i>Euphorbia amygdaloides</i>	ITS	Steinmann & Porter. 2002.	AF537544	Europe
	<i>Euphorbia lathyris</i>	ITS	Steinmann & Porter. 2002.	AF537550	Europe, Asia
	<i>Euphorbia stricta</i>	ITS	Steinmann & Porter. 2002.	AF537559	Europe, Asia
	<i>Euphorbia spathulata</i>	ITS	Steinmann & Porter. 2002.	AF537552	North America
	<i>Euphorbia genistoides</i>	ITS	Bruyns et al. 2006.	AM040770	Madagascar
	<i>Euphorbia dregeana</i>	ITS	Zimmermann & Hellwig, 2007	AJ534724	South Africa, Namibia
	<i>Euphorbia peplus</i>	ITS	Steinmann & Porter. 2002.	AF537532	Europe, Asia
	<i>Euphorbia robusta</i>	ITS	Steinmann & Porter. 2002.	AF537533	North America
<i>Geranium</i> subg					
<i>Robertium</i>	<i>Pelargonium australe*</i>	ITS	Bakker et al., 1997	Z95256	South Africa, Australia
	<i>Pelargonium exstipulatum*</i>	ITS	Bakker et al., 1997	Z95263	South Africa
	<i>California macrophylla</i>	ITS	Fiz et al 2008	EF185338	North America
	<i>Geranium brasiliense</i>	ITS	Fiz et al 2008	DQ525060	Brasil Tanzania, South Africa, Zimbabwe, Ethiopia, Kenya,
	<i>Geranium aculeolatum</i>	ITS	Fiz et al 2008	DQ525075	Kenya,
	<i>Geranium phaeum</i>	ITS	Fiz et al 2008	DQ525078	Europe
	<i>Geranium macrorrhizum</i>	ITS	Fiz et al 2008	DQ525073	Europe
	<i>Geranium maderense</i>	ITS	Fiz et al 2008	DQ525074	Madeira Is.
	<i>Geranium ocellatum</i>	ITS	unpublished	unpublished	Ethiopia, Yemen
	<i>Geranium glaberrimum</i>	ITS	unpublished	unpublished	Turkey
	<i>Geranium purpureum</i>	ITS	unpublished	unpublished	Europe, Asia
	<i>Geranium mascatense</i>	ITS	unpublished	unpublished	Ethiopia, Yemen, Somalia, Arabia
	<i>Geranium biuncinatum</i>	ITS	Fiz et al 2008	DQ525077	Ethiopia, Yemen, Somalia, Arabia
	<i>Geranium yeoi</i>	ITS	Fiz et al 2008	DQ525076	Madeira Is.
	<i>Geranium robertianum</i>	ITS	Fiz et al 2008	DQ525071	Europe, Asia
	<i>Geranium strictipes</i>	ITS	unpublished	unpublished	China
	<i>Geranium cataractarum</i>	ITS	Fiz et al 2008	DQ525068	Morocco Iberian Peninsula
	<i>Geranium dalmaticum</i>	ITS	Fiz et al 2008	DQ525072	Albania, Croatia, Bosnia
<i>Monsonia</i>	<i>Pelargonium australe*</i>	ITS trnLF	Fiz et al 2008	Z95256 Z95280	South Africa, Australia
	<i>Pelargonium exstipulatum*</i>	ITS trnLF	Fiz et al 2008	Z95263 Z95284	South Africa
	<i>Monsonia angustifolia</i>	ITS trnLF	Touloumenidou et al. 2007.	AF505632 AY036160	Namibia, Ethiopia, Senegal, S Africa, Zambia, Tanzania, Kenya
	<i>Monsonia praemorsa</i>	ITS trnLF	Fiz et al 2008	-- DQ452892	South Africa
	<i>Monsonia emarginata</i>	ITS trnLF	Touloumenidou et al. 2007.	AF505628 AY036157	South Africa
	<i>Monsonia senegalensis</i>	ITS trnLF	Touloumenidou et al. 2007.	AF505633 AY036179	Namibia, Ethiopia, Senegal, S Africa, Zambia, Tanzania, Kenya
	<i>Monsonia deserticola</i>	ITS trnLF	Touloumenidou et al. 2007.	AF505652 AY036178	South Africa
	<i>Monsonia attenuata</i>	ITS trnLF	Touloumenidou et al. 2007.	AF505630 AY036161	South Africa
	<i>Monsonia brevirostrata</i>	ITS trnLF	Touloumenidou et al. 2007.	AY036159 AF505631	South Africa
	<i>Monsonia grandifolia</i>	ITS trnLF	Touloumenidou et al. 2007.	AF505629 AY036158	South Africa
	<i>Monsonia natalensis</i>	ITS trnLF	Touloumenidou et al. 2007.	AF505626 AY036156	South Africa
	<i>Monsonia speciosa</i>	ITS trnLF	Touloumenidou et al. 2007.	AF505648 AY036174	South Africa
	<i>Monsonia luederitziana</i>	ITS trnLF	Touloumenidou et al. 2007.	AF505646 AY036173	South Africa
	<i>Monsonia umbellata</i>	ITS	Touloumenidou et al. 2007.	AF505645	South Africa

		trnLF		AY036172	
		ITS		AF505644	
	<i>Monsonia parvifolia</i>	trnLF	Touloumenidou et al. 2007.	AY036171	South Africa
		ITS	Touloumenidou et al. 2007	AF505647	
	<i>Monsonia ignorata</i>	trnLF	al 2008	DQ072010	South Africa
		ITS		AF505650	
	<i>Monsonia nivea</i>	trnLF	Touloumenidou et al. 2007.	AY036176	Morocco, Algeria, Tunisia, Egypt, Sudan
		ITS		AF505651	Morocco, Algeria, Tunisia, Egypt, Arabia,
	<i>Monsonia heliotropioides</i>	trnLF	Touloumenidou et al. 2007.	AY036177	Pakistan, Sudan,
		ITS		AF505635	
	<i>Monsonia multifida</i>	trnLF	Touloumenidou et al. 2007.	AY036163	South Africa
		ITS		AF505639	
	<i>Monsonia salmoniflora</i>	trnLF	Touloumenidou et al. 2007.	AY036167	South Africa
		ITS		AF505638	
	<i>Monsonia ciliata</i>	trnLF	Touloumenidou et al. 2007.	AY036166	South Africa
		ITS		AF505637	
	<i>Monsonia crassicaule</i>	trnLF	Touloumenidou et al. 2007.	AY036165	South Africa
		ITS		AF505636	
	<i>Monsonia flavescens</i>	trnLF	Touloumenidou et al. 2007.	AY036164	South Africa
		ITS		AF505634	
	<i>Monsonia inermis</i>	trnLF	Touloumenidou et al. 2007.	AY036162	South Africa
		ITS		AF505639	
	<i>Monsonia mossamedense</i>	trnLF	Touloumenidou et al. 2007.	AY036169	South Africa
		ITS		AF505640	
	<i>Monsonia patersonii</i>	trnLF	Touloumenidou et al. 2007.	AY036168	South Africa
		ITS		AF505642	
	<i>Monsonia marlothii</i>	trnLF	Touloumenidou et al. 2007.	AY036170	South Africa
		ITS		--	
	<i>Monsonia camdeboense</i>	trnLF	Fiz et al 2008	DQ452900	South Africa
		ITS		--	
	<i>Monsonia vandierietiae</i>	trnLF	Bakker et al. 2000.	AF167150	South Africa
<i>Moraea</i>	<i>Moraea lugubris*</i>	trnLF	Goldblatt et al 2002	AJ307273	South Africa
	<i>Moraea spathulata</i>	trnLF	Goldblatt et al 2002	AJ307300	South Africa, Zimbabwe
	<i>Moraea vegeta</i>	trnLF	Goldblatt et al 2002	AJ307308	South Africa
	<i>Moraea albicuspa</i>	trnLF	Goldblatt et al 2002	AJ307241	South Africa
	<i>Moraea alpina</i>	trnLF	Goldblatt et al 2002	AJ307242	South Africa
	<i>Moraea alticola</i>	trnLF	Goldblatt et al 2002	AJ307243	South Africa
	<i>Moraea angusta</i>	trnLF	Goldblatt et al 2002	AJ307244	South Africa
	<i>Moraea autumnalis</i>	trnLF	Goldblatt et al 2002	AJ307245	South Africa
	<i>Moraea barnardiella</i>	trnLF	Goldblatt et al 2002	AJ307246	South Africa
	<i>Moraea bella</i>	trnLF	Goldblatt et al 2002	AJ307247	South Africa
	<i>Moraea bifida</i>	trnLF	Goldblatt et al 2002	AJ307248	South Africa
	<i>Moraea bituminosa</i>	trnLF	Goldblatt et al 2002	AJ307249	South Africa
	<i>Moraea brevistyla</i>	trnLF	Goldblatt et al 2002	AJ307250	South Africa
	<i>Moraea brittenieae</i>	trnLF	Goldblatt et al 2002	AJ307251	South Africa
	<i>Moraea carsonii</i>	trnLF	Goldblatt et al 2002	AJ307252	Tanzania, Zimbabwe, Zambia, Malawi
	<i>Moraea cedarmonicola</i>	trnLF	Goldblatt et al 2002	AJ307253	South Africa
	<i>Moraea ciliata</i>	trnLF	Goldblatt et al 2002	AJ307254	South Africa
	<i>Moraea collina</i>	trnLF	Goldblatt et al 2002	AJ307255	South Africa
	<i>Moraea cookii</i>	trnLF	Goldblatt et al 2002	AJ307256	South Africa
	<i>Moraea dracomontana</i>	trnLF	Goldblatt et al 2002	AJ307257	South Africa
	<i>Moraea elliotii</i>	trnLF	Goldblatt et al 2002	AJ307258	South Africa, Malawi
	<i>Moraea falcifolia</i>	trnLF	Goldblatt et al 2002	AJ307259	South Africa
	<i>Moraea flaccida</i>	trnLF	Goldblatt et al 2002	AJ307260	South Africa
	<i>Moraea fugax</i>	trnLF	Goldblatt et al 2002	AJ307261	South Africa
	<i>Moraea galpinii</i>	trnLF	Goldblatt et al 2002	AJ307262	South Africa
	<i>Moraea garipensis</i>	trnLF	Goldblatt et al 2002	AJ307263	South Africa
	<i>Moraea gawleri</i>	trnLF	Goldblatt et al 2002	AJ307264	South Africa
	<i>Moraea graniticola</i>	trnLF	Goldblatt et al 2002	AJ307265	South Africa
	<i>Moraea herrei</i>	trnLF	Goldblatt et al 2002	AJ307266	South Africa
	<i>Moraea hesperantha</i>	trnLF	Goldblatt et al 2002	AJ307267	South Africa
	<i>Moraea huttonii</i>	trnLF	Goldblatt et al 2002	AJ307268	South Africa
	<i>Moraea inclinata</i>	trnLF	Goldblatt et al 2002	AJ307269	South Africa
	<i>Moraea inconspicua</i>	trnLF	Goldblatt et al 2002	AJ307270	South Africa
	<i>Moraea incurva</i>	trnLF	Goldblatt et al 2002	AJ307271	South Africa

<i>Moraea lewisiae</i>	trnLF	Goldblatt et al 2002	AJ307272	South Africa
<i>Moraea lurida</i>	trnLF	Goldblatt et al 2002	AJ307274	South Africa
<i>Moraea luteoalba</i>	trnLF	Goldblatt et al 2002	AJ307275	South Africa
<i>Moraea macgregorii</i>	trnLF	Goldblatt et al 2002	AJ307276	South Africa
<i>Moraea melanops</i>	trnLF	Goldblatt et al 2002	AJ307277	South Africa
<i>Moraea miniata</i>	trnLF	Goldblatt et al 2002	AJ307278	South Africa
<i>Moraea minor</i>	trnLF	Goldblatt et al 2002	AJ307279	South Africa
<i>Moraea muddii</i>	trnLF	Goldblatt et al 2002	AJ307280	Zimbabwe, Mozambique
<i>Moraea namaquamontana</i>	trnLF	Goldblatt et al 2002	AJ409613	South Africa
<i>Moraea namaquamontana</i>	trnLF	Goldblatt et al 2002	AJ307281	South Africa
<i>Moraea natalensis</i>	trnLF	Goldblatt et al 2002	AJ307282	South Africa, Zaire, Zimbabwe, Mozambique, Zambia, Malawi
<i>Moraea neglecta</i>	trnLF	Goldblatt et al 2002	AJ307283	South Africa
<i>Moraea ochroleuca</i>	trnLF	Goldblatt et al 2002	AJ307284	South Africa
<i>Moraea papilionacea</i>	trnLF	Goldblatt et al 2002	AJ307285	South Africa
<i>Moraea patens</i>	trnLF	Goldblatt et al 2002	AJ307286	South Africa
<i>Moraea pilifolia</i>	trnLF	Goldblatt et al 2002	AJ307287	South Africa
<i>Moraea polyanthos</i>	trnLF	Goldblatt et al 2002	AJ307288	South Africa
<i>Moraea polystachya</i>	trnLF	Goldblatt et al 2002	AJ307289	South Africa
<i>Moraea pritzeliana</i>	trnLF	Goldblatt et al 2002	AJ307290	South Africa
<i>Moraea pubiflora</i>	trnLF	Goldblatt et al 2002	AJ307291	South Africa
<i>Moraea radians</i>	trnLF	Goldblatt et al 2002	AJ307292	South Africa
<i>Moraea ramosissima</i>	trnLF	Goldblatt et al 2002	AJ307293	South Africa
<i>Moraea regalis</i>	trnLF	Goldblatt et al 2002	AJ307294	South Africa
<i>Moraea rigidifolia</i>	trnLF	Goldblatt et al 2002	AJ307295	South Africa
<i>Moraea rivulicola</i>	trnLF	Goldblatt et al 2002	AJ307296	South Africa
<i>Moraea schimperi</i>	trnLF	Goldblatt et al 2002	AJ307297	Zaire, Nigeria, Angola, Ethiopia, Zimbabwe, Mozambique, Tanzania, Zambia, Malawi, Uganda, South Africa
<i>Moraea serpentina</i>	trnLF	Goldblatt et al 2002	AJ307298	South Africa
<i>Moraea sisyrinchium</i>	trnLF	Goldblatt et al 2002	AJ307299	Mediterranean, W and C Asia
<i>Moraea thomasiae</i>	trnLF	Goldblatt et al 2002	AJ307301	South Africa
<i>Moraea tricuspida</i>	trnLF	Goldblatt et al 2002	AJ307302	South Africa
<i>Moraea trifida</i>	trnLF	Goldblatt et al 2002	AJ307303	South Africa
<i>Moraea tripetala</i>	trnLF	Goldblatt et al 2002	AJ307304	South Africa
<i>Moraea tulbaghensis</i>	trnLF	Goldblatt et al 2002	AJ307305	South Africa
<i>Moraea umbellata</i>	trnLF	Goldblatt et al 2002	AJ307306	South Africa
<i>Moraea unguiculata</i>	trnLF	Goldblatt et al 2002	AJ307307	South Africa
<i>Moraea ventricosa</i>	trnLF	Goldblatt et al 2002	AJ307309	Zambia, Zaire, Tanzania
<i>Moraea verdickii</i>	trnLF	Goldblatt et al 2002	AJ307310	South Africa
<i>Moraea verecunda</i>	trnLF	Goldblatt et al 2002	AJ307311	South Africa
<i>Moraea vigilans</i>	trnLF	Goldblatt et al 2002	AJ307312	South Africa
<i>Moraea villosa</i>	trnLF	Goldblatt et al 2002	AJ307313	South Africa

<i>Sideroxylon</i>	<i>Capurodendron androyense*</i>	ITS	Smedmark & Anderberg. 2007	AM408107	Madagascar
	<i>Argania spinosa</i>	ITS	Smedmark & Anderberg. 2007	AM408056	SW Morocco
	<i>Nesoluma polynesiicum</i>	ITS	Smedmark & Anderberg. 2007	AM408059	Hawai
	<i>Sideroxylon mascatense</i>	ITS	Smedmark & Anderberg. 2007	AM408085	Yemen
	<i>Sideroxylon wightianum</i>	ITS	Smedmark & Anderberg. 2007	AM408106	China
	<i>Sideroxylon marmulano</i>	ITS	Smedmark & Anderberg. 2007	AM408084	Canary Is.
	<i>Sideroxylon marginatum</i>	ITS	Smedmark & Anderberg. 2007	AM408083	Cape Verde
	<i>Sideroxylon betsimisarakum</i>	ITS	Smedmark & Anderberg. 2007	AM408063	Madagascar
	<i>Sideroxylon saxorum</i>	ITS	Smedmark & Anderberg. 2007	AM408099	Madagascar
	<i>Sideroxylon inerme</i>	ITS	Smedmark & Anderberg. 2007	AM408078	America
	<i>Sideroxylon majus</i>	ITS	Smedmark & Anderberg. 2007	AM408082	Reunion Is.
	<i>Sideroxylon tenax</i>	ITS	Smedmark & Anderberg. 2007	AM408104	America
	<i>Sideroxylon reclinatum</i>	ITS	Smedmark & Anderberg. 2007	AM408095	America
	<i>Sideroxylon lanuginosum</i>	ITS	Smedmark & Anderberg. 2007	AM408079	America
	<i>Sideroxylon lycioides</i>	ITS	Smedmark & Anderberg. 2007	AM408081	America

	<i>Sideroxylon obtusifolium</i>	ITS	Smedmark & Anderberg. 2007	AM408087	America
	<i>Sideroxylon occidentale</i>	ITS	Smedmark & Anderberg. 2007	AM408088	America
	<i>Sideroxylon americanum</i>	ITS	Smedmark & Anderberg. 2007	AM408060	America
	<i>Sideroxylon horridum</i>	ITS	Smedmark & Anderberg. 2007	AM408076	America
	<i>Sideroxylon foetidissimum</i>	ITS	Smedmark & Anderberg. 2007	AM408072	America
	<i>Sideroxylon salicifolium</i>	ITS	Smedmark & Anderberg. 2007	AM408098	America
	<i>Sideroxylon cubense</i>	ITS	Smedmark & Anderberg. 2007	AM408070	America
	<i>Sideroxylon repens</i>	ITS	Smedmark & Anderberg. 2007	AM408096	America
<i>Solanum subg</i>					
<i>Leptostemonum</i>	<i>Solanum elaeagnifolium*</i>	trnLF	Weese et al, 2006	DQ180399	America, invasive
	<i>Solanum tridynamum</i>	trnLF	Weese et al, 2006	DQ180412	America
	<i>Solanum linnaeanum</i>	trnLF	Weese & Bohs, 2007	EU915549	Widespread Somalia, Ethiopia, Kenya, Tanzania, Mozambique
	<i>Solanum aethiopicum</i>	trnLF	Weese et al, 2006	DQ180394	Mozambique
	<i>Solanum violaceum</i>	trnLF	Weese & Bohs, 2007	EU176159	India
	<i>Solanum tomentosum</i>	trnLF	Weese & Bohs, 2006	DQ392961	South Africa Somalia, Ethiopia, Kenya, Tanzania, Mozambique
	<i>Solanum cyaneopurpureum</i>	trnLF	Weese & Bohs, 2006	DQ392959	Mozambique
	<i>Solanum anguivi</i>	trnLF	Weese & Bohs, 2007	DQ812103	Somalia, Ethiopia, Somalia, Ethiopia, Kenya, Tanzania, Mozambique
	<i>Solanum hastifolium</i>	trnLF	Weese & Bohs, 2007	DQ812106	Mozambique
	<i>Solanum capense</i>	trnLF	Weese & Bohs, 2007	DQ392958	South Africa
	<i>Solanum supinum</i>	trnLF	Weese & Bohs, 2007	EU176158	South Africa Namibia
	<i>Solanum rigescens</i>	trnLF	Weese & Bohs, 2007	EU176157	South Africa
	<i>Solanum vespertilio</i>	trnLF	Weese et al, 2006	DQ180413	Canary Is.
	<i>Solanum incanum</i>	trnLF	Weese & Bohs, 2007	EU176145	Africa
	<i>Solanum melongena</i>	trnLF	Weese et al, 2006	DQ180406	unknown origin Medit, Macar, Africa, WAsia Somalia, Ethiopia, Kenya, Tanzania, Mozambique, Zai, etc
	<i>Solanum dasyphyllum</i>	trnLF	Weese & Bohs, 2007	EU176139	Mozambique, Zai, etc
	<i>Solanum macrocarpon</i>	trnLF	Weese et al, 2006	DQ180404	unknown origin CW Africa Kenya, Tanzania Malawi Mozambique Zam Madagascar
	<i>Solanum richardii</i>	trnLF	Weese & Bohs, 2007	EU176156	Madagascar
	<i>Solanum lidii</i>	trnLF	Weese et al, 2006	DQ180403	Canary Is.
	<i>Solanum campylacanthum</i>	trnLF	Weese & Bohs, 2007	EU176141	Somalia, Kenya Tanzania Uga Malawi
	<i>Solanum campylacanthum</i>	trnLF	Weese & Bohs, 2007	EU176142	Somalia, Kenya Tanzania Uga Malawi South Africa Kenya Tanzania Malawi Zamb
	<i>Solanum panduriforme</i>	trnLF	Weese & Bohs, 2007	EU176143	Zimbabwe
	<i>Solanum panduriforme</i>	trnLF	Weese & Bohs, 2008	EU427552	South Africa, Kenya, Tanzania, Malawi Zambia Zimbabwe
	<i>Solanum schimperianum</i>	trnLF	Weese et al, 2006	DQ180410	Ethiopia Kenya
	<i>Solanum sessilistellatum</i>	trnLF	Weese & Bohs, 2008	EU427553	Ethiopia Kenya
	<i>Solanum virginianum</i>	trnLF	Weese & Bohs, 2007	EU176160	South Africa
	<i>Solanum aculeastrum</i>	trnLF	Weese & Bohs, 2007	DQ812102	South Africa Kenya Tanzania
	<i>Solanum marginatum</i>	trnLF	Weese & Bohs, 2007	EU176148	Ethiopia Kenya
	<i>Solanum toliaraea</i>	trnLF	Weese et al, 2006	DQ180411	Ethiopia Kenya
	<i>Solanum mahoriense</i>	trnLF	Weese et al, 2006	DQ180405	Ethiopia Kenya
	<i>Solanum pyracanthos</i>	trnLF	Weese et al, 2006	DQ180408	Ethiopia Kenya
	<i>Solanum myoxotrichum</i>	trnLF	Weese et al, 2006	DQ392960	Madagascar
<i>Stapelioidaeae</i>	<i>Riocreuxia burchelli *</i>	ITS	Meve & Liede S. 2007	AJ488771	South Africa
	<i>Riocreuxia torulosa</i>	ITS	Meve & Liede-Schumann 2007	AM493295	South Africa
	<i>Sisyranthus compactus</i>	ITS	Meve & Liede-Schumann 2007	AJ310795	South Africa
	<i>Sisyranthus trichostomus</i>	ITS	Meve & Liede-Schumann 2007	AM493296	South Africa
	<i>Sisyranthus virgatus</i>	ITS	Meve & Liede-Schumann 2007	AM493297	South Africa
	<i>Anisotoma cordifolia</i>	ITS	Meve & Liede 2001	AJ310780	South Africa
	<i>Leptadenia hastata</i>	ITS	Meve & Liede 2002	AJ310787	Gambia, Senegal, Ghana, Ethiopia
	<i>Leptadenia arborea</i>	ITS	Meve & Liede-Schumann 2007	AM493305	Egypt, Sudan, Ethiopia
	<i>Anomalluma meccoyi</i>	ITS	Meve & Liede 2002	AJ488772	Somalia, Oman, Yemen
	<i>Apteranthes burchardii</i>	ITS	Surveswaran & al., 2009	EU267907	Canary Is.
	<i>Apteranthes europaea</i>	ITS	Meve & Liede 2002	AJ488773	Iberian Peninsula, N Africa, Jordan
	<i>Apteranthes munbyana</i>	ITS	Meve & Liede 2002	AJ488774	Iberian Peninsula, Morocco, Algeria
	<i>Apteranthes tuberculata</i>	ITS	Meve & Liede 2002	AJ488775	Arabia, India, Pakistan

<i>Australluma peschii</i>	ITS	Meve & Liede 2002	AJ488776	Namibia
<i>Boucerosia frerei</i>	ITS	Meve & Liede 2002	AJ488777	India
<i>Boucerosia indica</i>	ITS	Surveswaran & al., 2009	EU267903	India
<i>Boucerosia umbellata</i>	ITS	Meve & Liede 2002	AJ488778	India
<i>Boucerosia lasiantha</i>	ITS	Surveswaran & al., 2009	EU267902	India
<i>Boucerosia pauciflora</i>	ITS	Surveswaran & al., 2009	EU267905	India
<i>Brachystelma ellipticum</i>	ITS	Meve & Liede 2001	AJ310781	India
<i>Brachystelma edulis</i>	ITS	Surveswaran & al., 2009	EU106702	India
<i>Brachystelma malwanense</i>	ITS	Surveswaran & al., 2009	EU106703	India
<i>Brachystelma naorojii</i>	ITS	Surveswaran & al., 2009	EU106705	India
<i>Brachystelma sp3SS2007</i>	ITS	Surveswaran & al., 2009	EU106704	India
<i>Brachystelma macropetalum</i>	ITS	Meve & Liede 2001	AJ310782	South Africa
<i>Brachystelma nanum</i>	ITS	Meve & Liede 2001	AJ310783	South Africa
<i>Brachystelma pygmaeum</i>	ITS	Meve & Liede 2001	AJ310784	South Africa
<i>Brachystelma burchellii</i>	ITS	Meve & Liede 2001	AJ310789	South Africa
<i>Brachystelma christianeae</i>	ITS	Meve & Liede 2001	AJ310796	South Africa
<i>Brachystelma filifolium</i>	ITS	Meve & Liede 2001	AJ310797	South Africa
<i>Brachystelma rubellum</i>	ITS	Meve & Liede 2001	AJ310798	South Africa
<i>Caralluma adscendens v fimbriata</i>	ITS	Surveswaran et al 2009	EU267900	India
<i>Caralluma adscendens v attenuata</i>	ITS	Surveswaran et al 2009	EU267897	India
<i>Caralluma adscendens</i>	ITS	Surveswaran et al 2009	EU267898	India
<i>Caralluma adscendens v carinata</i>	ITS	Surveswaran et al 2009	EU267896	India
<i>Caralluma adscendens v gracilis</i>	ITS	Surveswaran et al 2009	EU267899	India
<i>Caralluma sarkariae</i>	ITS	Surveswaran et al 2009	EU267904	India
<i>Caralluma stalagmifera</i>	ITS	Surveswaran et al 2009	EU267894	India
<i>Caralluma bhupinderana</i>	ITS	Surveswaran et al 2009	EU267895	India
<i>Caralluma subulata</i>	ITS	Surveswaran et al 2009	AJ488781	Sudan, Arabia
<i>Caralluma arachnoidea</i>	ITS	Surveswaran et al 2009	AJ310785	Kenya
<i>Caralluma umbellata</i>	ITS	Surveswaran et al 2009	EU267901	India
<i>Caralluma adscendens</i>	ITS	Meve & Liede 2002	AJ488779	India
<i>Caralluma priogonium</i>	ITS	Meve & Liede 2002	AJ488780	Somalia
<i>Caudanthera edulis</i>	ITS	Meve & Liede 2002	AJ402162	Oman, Somalia, Sudan, Pakistan
<i>Caudanthera sinaica</i>	ITS	Meve & Liede 2002	AJ488782	Israel, Jordan, Lebanon
<i>Ceropegia nilotica</i>	ITS	Meve & Liede 2000	AJ402161	Egypt Uganda Zimbabwe Tanzania
<i>Ceropegia saxatilis</i>	ITS	Meve & Liede 2001	AJ310786	Madagascar
<i>Ceropegia striata</i>	ITS	Meve & Liede 2001	AJ310788	Madagascar
<i>Ceropegia racemosa</i>	ITS	Meve & Liede 2002	AM493279	Tanzania Zimbabwe
<i>Ceropegia distincta</i>	ITS	Meve & Liede 2002	AJ488784	Tanzania
<i>Ceropegia robynsiana</i>	ITS	Meve & Liede-Schumann 2007	AM493278	Kenya
<i>Ceropegia rupicola</i>	ITS	Meve & Liede-Schumann 2007	AM493277	Yemen
<i>Ceropegia sankuruensis</i>	ITS	Meve & Liede-Schumann 2007	AM493276	Cameroon, Zimbabwe, Congo
<i>Ceropegia simoneae</i>	ITS	Meve & Liede-Schumann 2007	AM493275	Madagascar
<i>Ceropegia variegata</i>	ITS	Meve & Liede-Schumann 2007	AM493274	Kenya
<i>Ceropegia yemenensis</i>	ITS	Meve & Liede-Schumann 2007	AM493293	Yemen
<i>Ceropegia abyssinica</i>	ITS	Meve & Liede-Schumann 2007	AM493298	Ethiopia, Kenya, Congo
<i>Ceropegia albisepta</i>	ITS	Meve & Liede-Schumann 2007	AM493299	Madagascar
<i>Ceropegia mbovombensis</i>	ITS	Meve & Liede-Schumann 2007	AM493300	Madagascar
<i>Ceropegia arabica</i>	ITS	Meve & Liede-Schumann 2007	AM493301	Yemen
<i>Ceropegia cufodontii</i>	ITS	Meve & Liede-Schumann 2007	AM493304	Ethiopia
<i>Ceropegia denticulata</i>	ITS	Meve & Liede-Schumann 2007	AM493291	Kenya
<i>Ceropegia foliosa</i>	ITS	Meve & Liede-Schumann 2007	AM493288	Yemen
<i>Ceropegia gilgiana</i>	ITS	Meve & Liede-Schumann 2007	AM493287	South Africa
<i>Ceropegia humbertii</i>	ITS	Meve & Liede-Schumann 2007	AM493286	Madagascar
<i>Ceropegia meyerijohannis</i>	ITS	Meve & Liede-Schumann 2007	AM493281	Kenya
<i>Ceropegia dichotoma</i>	ITS	Meve & Liede-Schumann 2007	AM493290	Canary Is.

<i>Ceropegia dichotoma</i>	ITS	Meve & Liede-Schumann 2007	AM493290	Canary Is.
<i>Ceropegia dichotoma</i>	ITS	Surveswaran et al 2009	EU267906	Canary Is.
<i>Ceropegia dichotoma</i>	ITS	Surveswaran & al., 2009	EU312082	Canary Is.
<i>Ceropegia crassifolia</i>	ITS	Meve & Liede-Schumann 2007	AM493303	Yemen
<i>Ceropegia filiformis</i>	ITS	Meve & Liede-Schumann 2007	AM493289	South Africa
<i>Ceropegia juncea</i>	ITS	Meve & Liede 2002	AJ488785	India
<i>Ceropegia juncea</i>	ITS	Surveswaran & al., 2009	EU106691	India
<i>Ceropegia woodii</i>	ITS	Meve & Liede-Schumann 2007	AM493292	South Africa, Zimbabwe
<i>Ceropegia bulbosa</i>	ITS	Meve & Liede-Schumann 2007	AJ488783	India
<i>Ceropegia monticola</i>	ITS	Meve & Liede-Schumann 2007	AM493306	China
<i>Ceropegia pubescens</i>	ITS	Meve & Liede-Schumann 2007	AM493280	Nepal, India
<i>Ceropegia cumingiana</i>	ITS	Meve & Liede-Schumann 2007	AM493294	Philippines
<i>Ceropegia intermedia</i>	ITS	Surveswaran & al., 2009	EU106678	India
<i>Ceropegia intermedia</i>	ITS	Meve & Liede-Schumann 2007	AM493285	India
<i>Ceropegia konasita</i>	ITS	Meve & Liede-Schumann 2007	AM493284	Kenya
<i>Ceropegia longifolia</i>	ITS	Meve & Liede-Schumann 2007	AM493283	Bhutan
<i>Ceropegia maccannii</i>	ITS	Surveswaran & al., 2009	EU106685	India
<i>Ceropegia meleagrifolia</i>	ITS	Meve & Liede-Schumann 2007	AM493282	Nepal
<i>Ceropegia aristolochioides</i> ssp <i>deflersiana</i>	ITS	Meve & Liede-Schumann 2007	AM493302	Yemen, Eritrea
<i>Ceropegia nantii</i>	ITS	Surveswaran & al., 2009	EU106699	India
<i>Ceropegia njanerica</i>	ITS	Surveswaran & al., 2009	EU106690	India
<i>Ceropegia attenuata</i>	ITS	Surveswaran & al., 2009	EU106700	India
<i>Ceropegia bulbosa</i>	ITS	Surveswaran & al., 2009	EU106687	India
<i>Ceropegia elegans</i>	ITS	Surveswaran & al., 2009	EU106677	India
<i>Ceropegia evansii</i>	ITS	Surveswaran & al., 2009	EU106680	India
<i>Ceropegia fantastica</i>	ITS	Surveswaran & al., 2009	EU312083	India
<i>Ceropegia hirsuta</i>	ITS	Surveswaran & al., 2009	EU106688	India
<i>Ceropegia huberi</i>	ITS	Surveswaran & al., 2009	EU106694	India
<i>Ceropegia jainii</i>	ITS	Surveswaran & al., 2009	EU106693	India
<i>Ceropegia lawii</i>	ITS	Surveswaran & al., 2009	EU106689	India
<i>Ceropegia mahabalei</i>	ITS	Surveswaran & al., 2009	EU106692	India
<i>Ceropegia media</i>	ITS	Surveswaran & al., 2009	EU106696	India
<i>Ceropegia mohanramii</i>	ITS	Surveswaran & al., 2009	EU106698	India
<i>Ceropegia noorjahaniae</i>	ITS	Surveswaran & al., 2009	EU106697	India
<i>Ceropegia oculata</i>	ITS	Surveswaran & al., 2009	EU106679	India
<i>Ceropegia odorata</i>	ITS	Surveswaran & al., 2009	EU106701	India
<i>Ceropegia panchganiensis</i>	ITS	Surveswaran & al., 2009	EU106682	India
<i>Ceropegia rollae</i>	ITS	Surveswaran & al., 2009	EU106686	India
<i>Ceropegia sahyadrica</i>	ITS	Surveswaran & al., 2009	EU106684	India
<i>Ceropegia santapau</i>	ITS	Surveswaran & al., 2009	EU106695	India
<i>Ceropegia sp1 SS2007</i>	ITS	Surveswaran & al., 2009	EU106683	India
<i>Ceropegia vincifolia</i>	ITS	Surveswaran & al., 2009	EU106681	India
<i>Desmidorchis acutangula</i>	ITS	Meve & Liede 2002	AJ488786	Somalia
<i>Desmidorchis adenensis</i>	ITS	Meve & Liede 2002	AJ488787	Yemen, Oman
<i>Desmidorchis arabica</i>	ITS	Meve & Liede 2002	AJ488788	Yemen, Oman
<i>Desmidorchis flava</i>	ITS	Meve & Liede 2002	AJ488789	Yemen, Oman
<i>Desmidorchis lavranii</i>	ITS	Meve & Liede 2002	AJ488790	Yemen, Oman
<i>Desmidorchis penicillata</i>	ITS	Meve & Liede 2002	AJ488791	Yemen, Oman
<i>Duvalia angustiloba</i>	ITS	Meve & Liede 2002	AJ488792	South Africa
<i>Duvalia polita</i>	ITS	Meve & Liede 2002	AJ488794	South Africa, Zimbabwe
<i>Duvalia eilensis</i>	ITS	Meve & Liede 2002	AJ488793	Somalia
<i>Duvaliandra dioscoridis</i>	ITS	Meve & Liede 2002	AJ488795	Socotra
<i>Echidnopsis angustiloba</i>	ITS	Meve & Liede 2002	AJ488796	Kenya
<i>Echidnopsis repens</i>	ITS	Meve & Liede 2002	AJ488797	Kenya Tanzania
<i>Echidnopsis squamulata</i>	ITS	Meve & Liede 2002	AJ488798	Yemen
<i>Edithcolea grandis</i>	ITS	Meve & Liede 2002	AJ488799	Tanzania

<i>Hoodia gordonii</i>	ITS	Meve & Liede 2002	AJ488800	South Africa
<i>Hoodia gordonii</i>	ITS	Lum et al 2005	DQ231521	South Africa
<i>Hoodia officinalis</i>	ITS	Meve & Liede 2002	AJ488801	South Africa
<i>Huernia kennedyana</i>	ITS	Meve & Liede 2002	AJ488803	South Africa
<i>Huernia keniensis</i>	ITS	Meve & Liede 2002	AJ488802	Kenya, Tanzania
<i>Larrylea cactiformis</i>	ITS	Meve & Liede 2002	AJ402159	South Africa
<i>Larrylea perlata</i>	ITS	Meve & Liede 2002	AJ402158	South Africa
<i>Lavrania haagnerae</i>	ITS	Meve & Liede 2002	AJ402160	Namibia
<i>Monolluma hexagona</i>	ITS	Meve & Liede 2002	AJ488804	Yemen
<i>Monolluma quadrangula</i>	ITS	Meve & Liede 2002	AJ488805	Yemen
<i>Monolluma socotrana</i>	ITS	Meve & Liede 2002	AJ488806	Kenya, Yemen, Socotra
<i>Neoschumannia cardinea</i>	ITS	Meve & Liede 2002	AJ310790	Tanzania, Zimbabwe
<i>Neoschumannia kamerunensis</i>	ITS	Meve & Liede 2002	AJ310791	Cameroon, Congo
<i>Notechidnopsis tessellata</i>	ITS	Meve & Liede 2002	AJ402156	South Africa
<i>Ophionella arcuata</i>	ITS	Meve & Liede 2002	AJ488807	South Africa
<i>Orbea semitubiflora</i>	ITS	Meve & Liede 2002	AJ488812	Tanzania
<i>Orbea semota</i>	ITS	Meve & Liede 2002	AJ488813	Tanzania
<i>Orbea gerstneri</i>	ITS	Meve & Liede 2002	AJ488808	South Africa
<i>Orbea eithii</i>	ITS	Meve & Liede 2002	AJ488809	South Africa
<i>Orbea lutea</i>	ITS	Meve & Liede 2002	AJ488810	South Africa
<i>Orbea prognatha</i>	ITS	Meve & Liede 2002	AJ488811	South Africa
<i>Orbea valida</i>	ITS	Meve & Liede 2002	AJ488814	South Africa
<i>Orbea wissmannii</i>	ITS	Meve & Liede 2002	AJ488816	South Africa
<i>Orbea variegata</i>	ITS	Meve & Liede 2002	AJ488815	South Africa, Zimbabwe
<i>Orbea hardyi</i>	ITS	Meve & Liede 2002	AJ488817	South Africa
<i>Orphanthera albida</i>	ITS	Meve & Liede 2001	AJ310792	South Africa
<i>Orphanthera jasminiflora</i>	ITS	Meve & Liede 2001	AJ310793	South Africa
<i>Orphanthera jasminiflora</i>	ITS	Meve & Liede 2001	AJ310794	South Africa, Zimbabwe
<i>Pectinaria articulata</i>	ITS	Meve & Liede 2002	AJ402155	South Africa
<i>Piarranthus barrydalensis</i>	ITS	Meve & Liede 2002	AJ402154	South Africa
<i>Piarranthus comptus</i>	ITS	Meve & Liede 2002	AJ402153	South Africa
<i>Piarranthus decipiens</i>	ITS	Meve & Liede 2002	AJ488818	South Africa
<i>Piarranthus framesii</i>	ITS	Meve & Liede 2002	AJ488819	South Africa
<i>Pseudolithos migiurtinus</i>	ITS	Meve & Liede 2002	AJ488820	Somalia
<i>Quaqua incarnata</i>	ITS	Meve & Liede 2002	AJ488821	South Africa
<i>Quaqua ramosa</i>	ITS	Meve & Liede 2002	AJ488822	South Africa
<i>Rhytidocaulon fulleri</i>	ITS	Meve & Liede 2002	AJ488823	Arabia
<i>Rhytidocaulon macrolobus</i>	ITS	Meve & Liede 2002	AJ488824	Arabia
<i>Richtersveldia columnaris</i>	ITS	Meve & Liede 2002	AJ402157	South Africa
<i>Stapelia glanduliflora</i>	ITS	Meve & Liede 2002	AJ402152	South Africa
<i>Stapelia rufa</i>	ITS	Meve & Liede 2002	AJ488825	South Africa
<i>Stapelianthus decaryi</i>	ITS	Meve & Liede 2002	AJ488826	Madagascar
<i>Stapeliopsis neronis</i>	ITS	Meve & Liede 2002	AJ488827	South Africa
<i>Stapeliopsis saxatilis</i>	ITS	Meve & Liede 2002	AJ488828	South Africa
<i>Tavaresia barklyi</i>	ITS	Meve & Liede 2002	AJ488829	South Africa, Zimbabwe
<i>Tridentea virescens</i>	ITS	Meve & Liede 2002	AJ488830	South Africa
<i>Tromotriche longipes</i>	ITS	Meve & Liede 2002	AJ488831	South Africa
<i>Tromotriche ruschiana</i>	ITS	Meve & Liede 2002	AJ488832	South Africa
<i>Whitesloanea crassa</i>	ITS	Meve & Liede 2002	AJ488833	Somalia

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