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MONARDA SECTION *CHEILYCTIS*: PATTERNS OF
SPECIATION AND ENDEMISM

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Major Professor's Signature

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MONARDA SECTION *CHEILYCTIS*: PATTERNS OF SPECIATION AND ENDEMISM

By

Jessie Anne Keith

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ABSTRACT

Monarda Section *Cheilyctis*: Patterns of Speciation and Endemism

By

Jessie Anne Keith

Monarda Section *Cheilyctis* (Lamiaceae) includes six species. Five are narrow endemics, with four (*M. viridissima, M. fruticulosa, M. maritima* and *M. stanfieldii*) present in unique edaphic conditions in Texas and the fifth (*M. humilis*) occurring in arid regions of New Mexico. The sixth species, *M. punctata*, is widespread, occurring across much of the United States. Phylogenies based on two *Adh* loci, *Adh* type 1 (*Adh1*) and *Adh* type 2 (*Adh2*), were used to investigate patterns of speciation, species relationships and endemic status (neo- versus paleoendemic) of these *Monarda* species. It was hypothesized that narrow endemic species were neoendemics that had speciated as peripheral isolates of *M. punctata*. Both *Adh1* and *Adh2* phylogenies had three primary clades that depicted similar relationships between taxa. *Monarda punctata* was the most ubiquitous taxon across both phylogenies. *Monarda fruticulosa, M. humilis, M. maritima* and *M. viridissima* sequences exhibited polyphyly and patterns consistent with lineage sorting across both *Adh1* and *Adh2* phylogenies. In both the *Adh1* and *Adh2* phylogeny sequences of *M. stanfieldii* were sister to a large clade including all samples of the other five species. Phylogenetic results suggest that *M. humilis*, *M. fruticulosa*, *M. maritima* and *M. viridissima* arose from their widespread congener, *M. punctata*, and that *M. stanfieldii* is a sister taxon to the other five species. Likewise, it was concluded that *M. fruticulosa, M. maritima* and *M. viridissima* and *M. humilis* are most likely neoendemics while *M. stanfieldii* is likely a paleoendemic species.

FOR THE TWO MEN THAT
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INTRODUCTION

1.1 Project Summary

Many historical events, geographic and genetic, have been used to explain potential modes of speciation. Allopatric and peripatric modes use geographic isolation of populations to explain species divergence. Under these modes of speciation, geographic isolation is expected to modify the genetic constitution of divided populations eventually resulting in their morphological, ecological and genetic separation.

Phylogenetic studies of closely related species can be combined with geographic patterns of distribution to infer mode of speciation (Harrison 1991). This study utilizes a small cohesive group of North American mints (Lamiaceae) in the genus *Monarda* to test peripatric speciation using phylogenies generated from *Adh* loci. These taxa appear well suited for this purpose because the pattern of distribution found among its members corresponded to those expected for peripatric speciation.

1.2 Peripatric Speciation

Speciation by peripheral isolation was first proposed by Mayr in 1942. Mayr believed that most species diverged in allopatry but that geographic isolation of small peripheral populations had the greatest potential for rapid speciation. He maintained that marginalized populations would be subjected to a higher degree of reduced geneflow and habitat dissimilarity resulting in founder effects (genetic drift in small populations), increased selection pressures and thus rapid speciation and morphological change (Mayr 1942, 1976, 1982). Founder populations are expected to have only a fraction of the genetic composition found in parental populations (Mayr 1982). This genetic imbalance, when coupled with a change in the abiotic environment, has the potential to lead to heightened selection and ecological adaptation. This differs from the classic model of allopatric speciation where larger allopatric populations are expected to require longer periods of time to diverge phenotypically and genotypically due to larger more variable gene pools and more homogeneous habitats

Harrison (1991) predicted that ancestral population structure between sister taxa could be discerned using patterns of geographic dispersion and molecular phylogenic data. He proposed a series of repeatable, testable patterns (geographic and phylogenetic) to model allopatric, peripatric and sympatric speciation. In the model of divergence of peripheral populations (peripatric speciation), he maintained that peripheral isolates would exist along the distribution margins of a more widespread sister taxon while appearing phylogenetically derived within a gene tree.

Narrowly endemic *Monarda* are located along the geographic periphery of their widespread congener, *M. punctata.* This distribution pattern suggests that they may have speciated as peripheral isolates from *M. punctata*. Likewise, ITS and cpDNA provided little phylogenetic signal for these taxa which suggests they diversified recently (Prather et al 2002, Monfils and Prather unpubl. data). Harrison's phylogenetic model for peripheral isolation was used to test this hypothesis. In concordance with this model *M. punctata* was expected to appear in a more basal position of the phylogeny and paraphyletic to the endemic species. This pattern would indicate that *M. punctata* is an

ancestral species. For instance, in the hypothetical phylogenies below (Fig 1), *M. punctata* has a more basal position in the tree, and is paraphyletic to *M. fruticulosa* and *M. viridissima*. Furthermore, *M. fruticulosa* and *M. viridissima* are more closely related to geographically proximate *M. punctata* samples in the phylogeny.

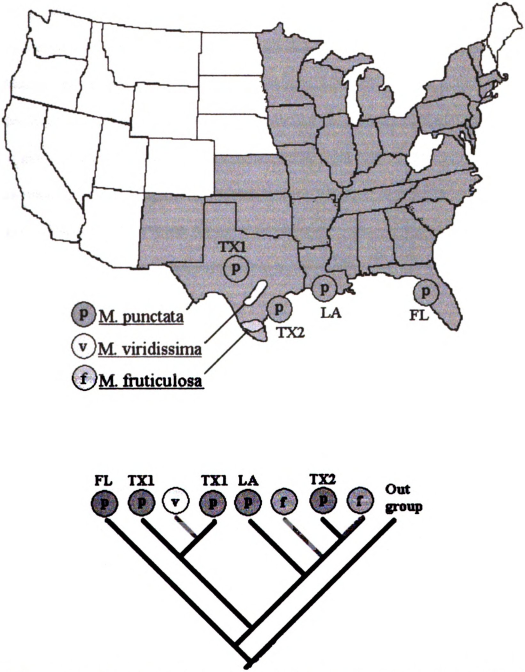

Figure 1: Geographic and hypothetical phylogenetic distributions given four samples of the widespread taxon *M. punctata* and two samples representing *M. viridissima and M. fruticulosa*.

1.3. Neoendemism versus Paleoendemism

Stebbins (1942 & 1942) defined two types of endemic species, paleoendemics and neoendemics. Paleoendemics were described as relict species whose once large distributions have been reduced to small disjunct populations that occur across a wide area (Mayer & Soltis 1994, Qian 2001). Due to their once widespread distribution, paleoendemics are expected to have highly heterozygous populations despite their small size (Macnair & Gardner 1993). In contrast, neoendemics are newer species that are expected to occur across very narrow range limits and are expected to have highly homozygous populations. The, criteria used to distinguish paleoendemics from neoendemics include geographic distribution, genetic variation and placement in the phylogeny. The majority of North America's neoendemics are restricted to the southwest. This region is both a center for neoendemics in North America and the world (Qian, 2001).

Narrow endemic *Monarda* taxa in Section *Cheilyctis* are hypothesized to have speciated as peripheral isolates, therefore they are believed to be neoendemic species. Phylogentic patterns that would support their neoendemic status would be consistent with those mentioned for speciation by peripheral isolation. Neoendemics are expected to be derived within *M. punctata* and paleoendemics are expected to exist on more basal branches separate to *M. punctata*.

1.4 Overview of Taxa

The genus *Monarda* contains 19 species that are split into two subgenera, one of which is divided into two sections (Table 1). Section *Cheilyctis* has five are narrow endemic species. *Monarda fruticulosa, M. maritima, M. stanfieldii* and *M. viridissima* are endemic to Texas, and *M. humilis*, is endemic to New Mexico.

Table 1: Species in *Monarda* (Turner, 1994, Prather et al.2002 and Prather and Keith 2003) with scientific and common names. Varieties and subspecies of *Monarda punctata* are included. Common names adapted from the National Plants Database.

Species	Common Names
SUBGENUS *CHEILYCTIS*	
SECTION *ARISTATAE*	
M. citriodora Cerv. ex Lag	Lemon Beebalm
M. clinopodioides A. Gray	Basil Beebalm
M. pectinata Nutt.	Pony Beebalm
SECTION *CHEILYCTIS*	
M. fruticulosa Epling	Shrubby Beebalm
M. humilis Prather & Keith	Spreading Beebalm
M. maritima (Cory) B.L. Turner	Seaside Beebalm
M. punctata L.	Spotted Beebalm/Horsemint
- var. *arkansana* (McClintock & Epling) Shinners	Arkansas Spotted Beebalm
- var. *correllii* B.L. Turner	Correll's Spotted Beebalm
- var. *coryi* (McClintock & Epling) Cory	Cory's Spotted Beebalm
- var. *intermedia* (McClintock & Epling) Waterfall	Intermediate Spotted Beebalm
- var. *lasiodonta* Gray	Spotted Beebalm
- var. *occidentalis* (Epling) Palmer and Steyermark	Western Spotted Beebalm
- var. *villicaulis* (Pennell) Shinners	Villous Spotted Beebalm
- subsp. *punctata* Epling	Spotted Beebalm
M. stanfieldii Small	Stanfield's Beebalm
M. viridissima Correll	Green Beebalm
SUBGENUS *MONARDA*	
M. didyma L.	Scarlet Beebalm
M. bradburiana Beck	Eastern Beebalm
M. clinopodia L.	White Beebalm
M. eplingiana Standl.	Epling's Beebalm
M. fistulosa L.	Wild Beebalm or Bergamot
M. lindheimeri Engelm. & A. Gray	Lindheimer's Beebalm
M. media Willd.	Purple Beebalm/ Bergamot
M. pringlei Fernald	Pringle's Beebalm
M. russeliana Nutt. ex. Sims	Redpurple Beebalm
M. stipatoglandulosa Waterf.	Wild Beebalm

In contrast, *M. punctata* is widely distributed across the central and eastern United States, southeast Canada, and northeast Mexico (Fig.2). These species also appear to have distinct edaphic constraints in their distribution.

No formal field studies have addressed interspecific hybridization between these species, but some field observations have been made. *Monarda maritima* is sympatric with *M. puncata* (Turner 1994, Prather pers comm., Keith *pers. obs.*), Turner indicated that it was found growing with other *Monarda* (unnamed taxa) and that no hybridization appeared to occur between them. *Monarda viridissima* is also sympatric with *M. punctata* populations (Turner 1994, Prather pers comm., Keith pers. Obs.). Turner found no evidence that these two taxa overlapped in distribution but Prather and Keith observed sympatric populations of *M. viridissima* and *M. punctata* in Bastrop County Texas, although there was no evidence that they bloomed at the same time. *Monarda fruticulosa* and *M. punctata* also grow together (Turner 1994, Prather pers comm., Keith *pers. obs.*). However, Turner did not find evidence that populations were confluent while Prather and Keith found evidence of hybrid zones between them. Finally, *M. stanfieldii* has not been found to intergrade with *M. punctata* (Turner 1994, Prather pers comm., Keith *pers. obs.*). Turner indicated that *M. stanfieldii* and *M. punctata* do not intergrade, and Keith (*pers. obs*) found no evidence that *M. stanfieldii* populations in Blanco, Burnet and Llano counties were sympatric with *M. punctata*. Lack of hybridization between these species suggests that they maintain unique gene-pools and helps substantiate their species designation.

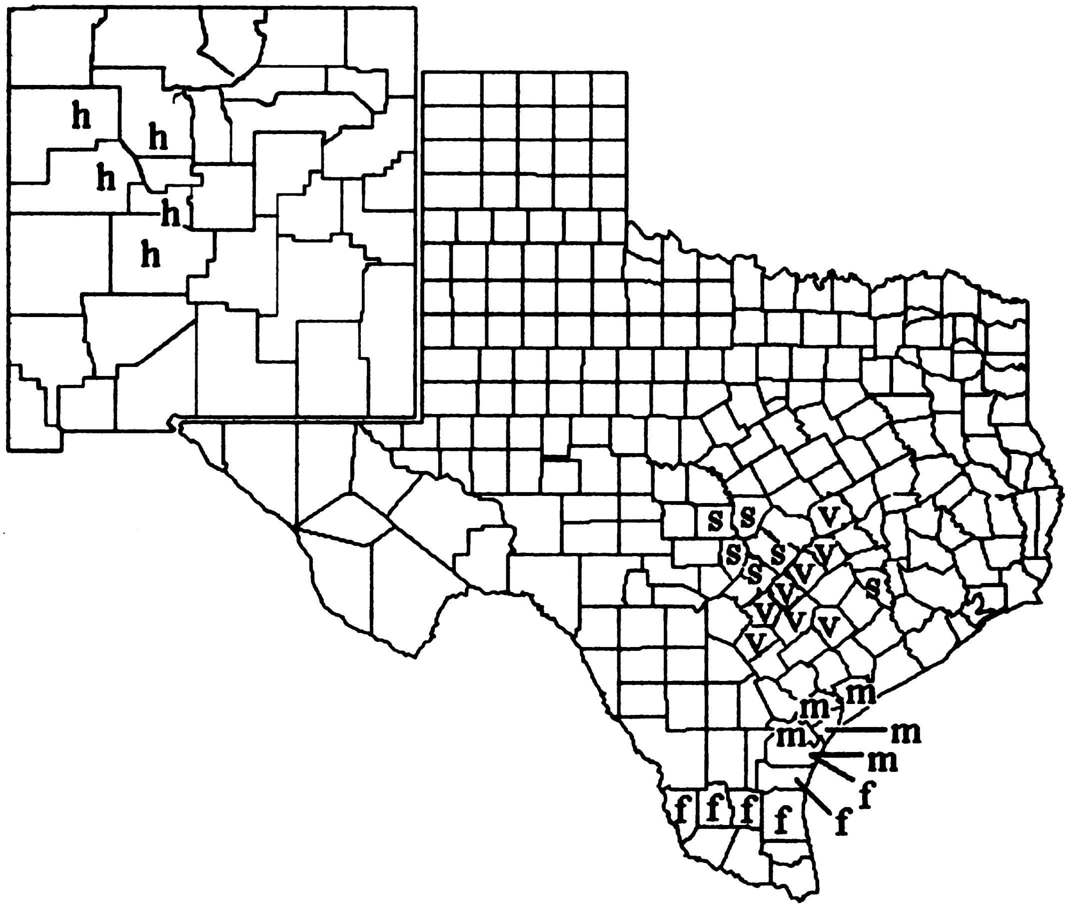

Figure 2: County distributions of Texas endemics, *Monarda viridissima* (v), *M. fruticulosa* (f), *M. maritima* (m), *M. stanfieldii* (s), and the New Mexico endemic, *M. humilis* (h). (based on Turner (1994), Johnston and Correll (1979) and herbarium material from the University of New Mexico and New Mexico State University)

1.5 Objectives

The purpose of this study was to test speciation by peripheral isolation and to determine the neo- and paleoendemic status of the six species in *Monarda* Section *Cheilyctis*. It was hypothesized that the widespread taxon, *M. punctata*, is the progenitor from which all narrow endemic species have derived. Narrow endemic *Monarda* taxa were also predicted to be neoendemic species. Geographic distributions and phylogenetic data were used to test this. The low copy nuclear gene, *Adh*, was used as the genetic marker for phylogenetic analyses. Maximum parsimony, maximum likelihood and Bayesian methods of inference were used to generate phylogenic trees.

MATERIALS AND METHODS

2.1 Study System

i. Taxonomic Classification of *Monarda* Section *Cheilyctis*.

Three of the endemics have undergone conflicting taxonomic classifications (*M. fruticulosa, M. maritima* and *M. stanfieldii*). The taxonomic ranks of these species have been addressed in treatments by six primary authors (Table 2). Epling (1935), Epling and McClintock (1942) and Turner (1994) recognized *M fruticulosa* as a species due to its distinct morphology and apparent lack of hybridization with *M. punctata*. Scora (1967) reduced its rank to a variety because he believed that did intergrade with *M. punctata* var. *immaculata* (a variety not recognized in this study). Similarly, both Cory (1936) and Scora (1967) classified *M. maritima* as a variety of *M. punctata* because they believed it shared characteristics with *M. fruticulosa*. In contrast, both Turner (1994) and Correll (1968) treated it as a species due to its distinct morphology, habitat and distribution.

Monarda humilis was first described as a variety of *M. punctata* (Torrey 1853) but was recently recognized as a species by Prather and Keith (2003). This taxon was elevated to specific status due to its distinct floral morphology and geographic distribution.

Monarda stanfieldii was first described by Small (1903) and was later accepted as a species by Turner (1994). Epling (1935) reduced it to a subspecies, and Cory (1936) and Scora (1967) treated it as a variety of *M. punctata*.

Monarda viridissima was described as a species by Correll (1968) because of its unique morphological characters and temporal reproductive isolation from *M. punctata*. Correll observed little evidence of hybridization with *M. punctata* in the field. Turner (1994) and Correll and Johnston (1979) maintained *M. viridissima* at the species rank.

Turner's recent treatment of these *Monarda* was used for this study. He recognized the Texas endemics as species due to their distinct morphology, geographic distribution and apparent lack of gene introgression with *M. punctata*. He did not include the New Mexican taxon (*M. humilis)* in his treatment.

ii. Morphology and Life History Traits

Several life history traits and morphological characters have been fundamental in distinguishing these species. Key differences between them include life cycle and phenology as well as floral and vegetative traits (Table 3).

Table 2: Taxonomic ranks of endemic *Monarda* as recognized by six principal authors that have studied them

	Epling (1935)	McClintock & Epling (1942)	Scora (1967)	Correll & Johnston (1979)	Turner (1994)	Prather & Keith (2003)
M. fruticulosa Epling	*M. fruticulosa*	*M. fruticulosa*	*M. punctata* var. *fruticulosa*	*M. fruticulosa*	*M. fruticulosa*	*M. fruticulosa*
M. humilis Prather & Keith	not treated	not treated	not treated	not treated	not treated	*M. humilis*
M. maritima (Cory) B.L. Turner	not treated	not treated	*M. punctata* var. *maritima*	*M. maritima*	*M. maritima*	*M. maritima*
M. stanfieldii Small	*M. punctata* ssp. *stanfieldii*	*M. punctata* ssp. *stanfieldii*	*M. punctata* var. *stanfieldii*	*M. punctata* var. *stanfieldii*	*M. stanfieldii*	*M. stanfieldii*
M. viridissima Correll	not treated	not treated	not treated	*M. viridissima*	*M .viridissima*	*M .viridissima*

Table 3: Key differences in the morphological characters and life history traits between *Monarda* species in Section *Cheilyctis*. Morphological information obtained from McClintock & Epling (1942), Scora (1967), Correll & Johnston (1979) and Prather and Keith (2003).

Taxon	*Monarda fruticulosa*	*Monarda humilis*	*Monarda maritima*	*Monarda punctata*	*Monarda stanfieldii*	*Monarda viridissima*
Lifecycle	Perennial	Putative annual	Perennial	Annual/ Short-lived Perennial	Short-lived Perennial	Short-lived Perennial
Bloom-time	Spring/early Summer	Spring/early Summer	Late Summer/ Fall	Spring to Fall	Spring/early Summer	Late Summer/early Fall
Habit	Shrub	Herbaceous	Sub-shrub	Herbaceous	Herbaceous	Sub-shrub
Height	30-40 (100) cm	40-60 cm	50-110 cm	25-100 cm	40-80 cm	80 cm
Stem surface	Canescent	Puberulent	Densely cottony tomentose	Pubescent	Hirsute	Puberulent
Leaf shape	Linear	Linear-lanceolate	Linear-lanceolate	Lanceolate	Broad-lanceolate	Narrowly Linear-lanceolate
Calyx teeth	Narrowly deltoid, acuminate	Narrowly triangular	Subulate	Acute, acuminate or subulate	Narrowly triangular	Sparsely hirsute-subulate
Calyx color	Green, or tinged pink	Purple-red to green	Green, or tinged pink	Green, or tinged pink	Green, or tinged pink	Purple-red
Calyx orifice	Long silky curled or spreading hairs	Pubescent	glabrous to slightly bearded	Pubescent	Densely hirsute/hispid	Short white hairs
Floral bract shape	Narrow, long-acuminate	Broadly ovate to elliptic-lanceolate, acuminate	Outer- rounded Inner- narrow, long-acuminate	Lanceolate	Broadly ovate to elliptic-lanceolate, acuminate	Broadly ovate to elliptic-lanceolate, acuminate
Floral bract color	Light pink-cerise	Purple to green-white	Purple to green-white	Purple to green-white	Purple to green-white	Deep cerise pink to purple
Corolla color	White to pink	Pale lavender, white and purple	White or tinged pink,	Pale yellow, rarely with pink	Yellow	Creamy white or tinged purple,
Corolla marks	Usually without spots	Purple, solid margin	Spots variable	Maroon spots	Maroon spots	Maroon spots

iii. Chromosome Numbers

All species in *Monarda* Section *Cheilyctis* have been found to be diploid. Scora (1967) found that several species and varieties of *M. punctata* in Section *Cheilyctis* (*M. punctata* vars. *arkansana*, *coryi* and *intermedia* and *M. fruticulosa*) had n=11 chromosomes, but *M. punctata* var. *villicaulis* had n=12 and n=11 chromosomes. This result was further confirmed in a study conducted by Bushnell (1936), which also showed the chromosome number in *M. punctata* var. *villicaulis* was n=12. *Monarda humilis* was also found to have n=12 chromosomes (Ward and Spellenberg 1984).

iv. Physiography and Vegetation

The Texas endemic *Monarda* seem to have distinct edaphic constraints on their distributions. Less is known about the edaphic conditions that may limit *M. humilis*.

Monarda fruticulosa grows in a region of South Texas called the Eolian Plain (Johnston 1963) that is divided into central and peripheral zones. The Central Eolian Plain has loose, fine sandy soils that originally sustained copses of live oak (*Quercus virginiana*) and some mesquite (*Prosopis sp.*). Many of the central plain soils are newer windblown beach deposits, but also have older soils such as Galveston deep sands (Clover 1937). The Peripheral Eolian Plain has loamy sand soils that once supported mesquite prairie. Combinations of soil types may also exist in areas such as Brooks County where thin layers of wind blown beach sands cover older soils. Suppression of natural fires, heavy grazing and agriculture have altered the vegetation of the Eolian Plain, which is now referred to as The Texas Brush Country.

Monarda humilis samples have been collected from the northwestern part of New Mexico within the Rio Grand Basin. These plants most likely inhabit Penistaja soils, which are deep, well drained, and comprised of alluvium from sandstone and shale. Penistaja soils are found primarily on upland regions such as plateaus and hills, and in drainageways (USDA National Cooperative Soil Survey 2003).

Monarda maritima inhabits the deep sandy soils of the Coastal Belt (Turner 1994) that extends across approximately a 100-mile strip from Nueces to Galveston Bays. Its deep coastal sands show little textural change with depth and are thought to be an old chain of barrier islands from the late Pleistocene or Holocene called the Ingleside Terrace (Price 1933, Shideler 1986, Otvos 1991, Blum et al. 2002). Live oak (*Quercus virginiana*) dominates these deep sands.

Monarda stanfieldii is primarily restricted to the middle course of the Colorado River (Turner 1994) within the Central Texas Uplift. This region makes up the eastern portion of The Texas Hill Country. *Monarda stanfieldii* only appears to inhabit granitic sands (Turner 1994). Original vegetation in the Central Texas Uplift consisted of grasslands and open savannah-like plains with small trees and brush scrub growing along rocky slopes and stream bottoms (Bray 1901 and Buechner 1944).

Monarda viridissima is confined to the Carrizo sand outcrop (Turner 1994) that runs adjacent to The Blackland Prairies of East central Texas. Carrizo sands are unusually homogeneous and harbor many endemic plant species (McBryde 1933). The Carrizo sand belt originally harbored post oak (*Quercus drummondii*), blackjack oak (*Q. marilandica*) and hickory (*Carya texana*) (Johnson 1963). *Monarda viridissima* grows in open post oak or pine-oak forests

v. Edaphic Constraints

Vegetation and plant growth are largely reliant on the substrate in which a plant grows (Jenny 1941). Most plant species are able to inhabit a wide range of soils but some have adapted to become limited to specific soil types (Kruckeberg and Rabinowitz 1985). These plants are referred to as edaphic endemics. Edaphic constraints can include chemical, physical and biological properties. Edaphic endemics have been identified on many substrates including soils composed of granite, limestone, Carrizo sand, oil shale, gypsum and serpentines (McBryde 1933, Kruckeberg and Rabinowitz 1985). Edaphic constraints may also be attributable to soil water holding capacity. Studies have found that landscapes with sandy soils can have soil water environments that vary widely from water permeated lowlands to arid dunes (Hoover and Parker 1991) and can sustain a highly variable landscape flora (Ramaley 1939).

Several modes of speciation have been used to explain the evolution behind edaphically restricted species including peripatric, parapatric and sympatric speciation (MacNair and Gardner 1998). The most well documented and extreme examples of edaphic endemism are in plants adapted to serpentine soils which are high in heavy metals and minerals such as magnesium and calcium (Brooks 1987). Obligate edaphic endemics inhabiting serpentine soils are reported to have speciated very rapidly (Kruckeberg 1967) and often are parapatric to sister taxa. All Texas endemic *Monarda* are reported as being edaphic endemics (Turner 1994).

vi. Species Recognition

In this study it was assumed that the *Monarda* endemics were "good" species despite a hypothesized phylogenetic outcome that did not render them reciprocally monophyletic within the gene trees. This anticipated outcome conflicts with criteria set by some species concepts, such as evolutionary, cladistic and phylogenetic species concepts, that delimit species based on their phylogenetic relationships.

The lines that delimit species phenotypically, ecologically, genetically, and phylogenetically do not always run parallel. If *Monarda* do not appear phylogenetically distinct on the *Adh* gene trees it will not discredit their status as a biological species. Based on their temporal and geographic separation they appear to be reproductively isolated. Likewise, their morphological distinction suggests that they maintain their own gene pools, and the putative edaphic constraints on their natural populations indicates that they are ecologically distinct. These characteristics conform to several species concepts, including Mayr's (1942) biological species concept, and the phenetic species concept.

Other researchers have taken a comparable approach to recognizing species when faced with marked differences in their ecological, morphological and phylogenetic distinction. A phylogenetic study using ribosomal and cpDNA revealed that the widespread *Mimulus* *guttatus* and several closely related serpentine endemic species were genetically indistinct despite being highly dissimilar morphologically and ecologically (Macnair and Gardener 1998). Despite the lack of genetic distinction between these *Mimulus*, Macnair and Gardener opted to recognize them as species because they maintained morphological and ecological differences despite the fact they existed in sympatry.

2.2 Sampling

All *Monarda* species in Section *Cheilyctis* (Table 4) were included in the *Adh* analyses. Three individuals were sampled, each from a different population of *M. fruticulosa, M. maritima, M. stanfieldii* and *M. viridissima*, one individual from a population of *M. humilis* (Fig 3), and *M. punctata* from 19 separate geographic locations across the United States (Table 4, Fig. 4).

Outgroup sequences included taxa of *Monarda* and *Pycnanthemum* (*M. clinopodioides*, *M. citriodora*, *P. loomisii*, *P. muticum* and *P. tenifolium*). The *Pycnanthemum* sequences were provided by Rachel Williams. Based on ITS phylogenies of *Monarda* and the Lamiaceae subfamily Nepetoideae, *Monarda* Section *Aristatae* (*M. citriodora* and *M. clinopodioides*) is sister to *Monarda* Section *Cheilyctis*, and the genus *Pycnanthemum* is closely related to *Monarda* (Prather et al. 2002 and Williams *pers. comm.*). I chose these outgroups based on this phylogenetic evidence.

In addition to *Adh*, some preliminary data was collected from a second molecular marker, *ncpGS*. The *ncpGS* preliminary analysis included three endemic species (*M. fruticulosa, M. maritima* and *M. viridissima*) and *M. punctata* collected from four different geographic locations (Table 5). Two *Pycnanthemum* species were used as outgroups. Samples came from greenhouse, herbarium or silica dried plant material.

Table 4: DNA collection numbers and locations for all *Monarda* species in *Adh* phylogenetic analyses.

Species	**DNA #**	**State**	**County**	**Collector**	**Collection #**
M. fruticulosa	1920	Texas	Kenedy	Prather, LA	1858
	2301	Texas	Jim Hogg	Prather, LA	1860
	2317	Texas	Kenedy	Keith, JA	TX30
	2420	Texas	Zapata	Prather, LA	2014
M. humilis	2176	New Mexico	Socorro	Tafoya, MA	94450 UNM
M. maritima	2181/2318	Texas	Refugio	Keith, JA	TX36
	2314	Texas	Aransas	Keith, JA	TX23
	2319	Texas	Aransas	Prather, LA	1940
M. punctata	2060	Arkansas	Calhoun	Thomas, DR Amanson, C	141, 500 (7296) UTH
	2303	Florida	Bay	Keith, JA	FL4
	2397	Florida	Franklin	Keith, JA	FL9
	2388	Florida	Gadsden	Keith, JA	FL1
	2398	Oklahoma	Marshall	Barclay, A	PI 326567
	2305	Louisiana	Iberville	Thomas, DR Davies, M	142, 284 (7296) UTH
	2401	S. Carolina	Florence	Churchill, JA	332325 MSU
	2373	Texas	Travis	Keith, JA	TX11
	2387	Texas	Zavala	Ertter, B	527083 RMH
	2393	Texas	Aransas	Keith, JA	TX25
	2396	Texas	Bastrop	Keith, JA	TX14
	2468	Texas	Angelina	Orzell, SL Bridges, EL	18952 TAMU
M. p. var. *intermedia*	2473	Texas	Callahan	Turner, BL, G	18900 TAMU
M. p. var. *villicaulis*	1937	Delaware	Sussex	Keith, JA	DE1
	2048	Michigan	Alleghan	Keith, JA	MI1
	2172	Missouri	Madison	Ladd, D Yatskievych G	4236830 MBG
	1946/2189	New Jersey	Burlington	Keith, JA	NJ1
M. p. var. *occidentalis*	2307	New Mexico	Eddy	Martin, WC Schmidt, B	79100 UNM (1215)
M. p. subsp. *monarda*	2389	Florida	Alachua	Keith, JA	FL11
M. stanfieldii	2339	Texas	Llano	Keith, JA	TX7
	2367	Texas	Burnet	Keith, JA	TX2
	2369	Texas	Blanco	Keith, JA	TX9
M. viridissima	2055	Texas	Milam	Keith, JA	029007 Tamu
	2441/2442	Texas	Bastrop	Keith, JA	TX39
	2444	Texas	Milam	Keith, JA	TX40

Table 5: DNA collection numbers and locations for all *Monarda* species in *ncpGS* phylogenetic analyses.

Species	DNA #	State	County
M. fruticulosa	1910	Texas	Kenedy
M. fruticulosa	1920	Texas	Kenedy
M. maritima	1977	Texas	Aransas
M. viridissima	1989	Texas	Bastrop
M. viridissima	1908	Texas	Milam
M. punctata	1907	Texas	Kleburg
M. punctata	1909	Texas	Cass
M. punctata	1905	Michigan	Allegan
M. punctata	1946	New Jersey	Burlington

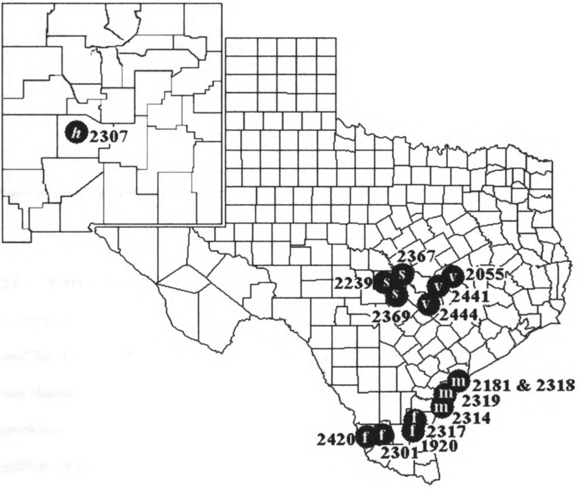

Figure 3: Collection locations of endemic species with their corresponding DNA numbers. Texas samples include *M. fruticulosa* (1920, 2301, 2317 and 2420 (**f**)), *M. maritima* (2314, 2319 and 2318/2181 (**m**)) *M. stanfieldii* (2339, 2367 and 2369 (**s**)) and *M. viridissima* (2055, 2441 and 2444 (**v**)). The New Mexico sample is of *M. humilis* (2307 (**h**))

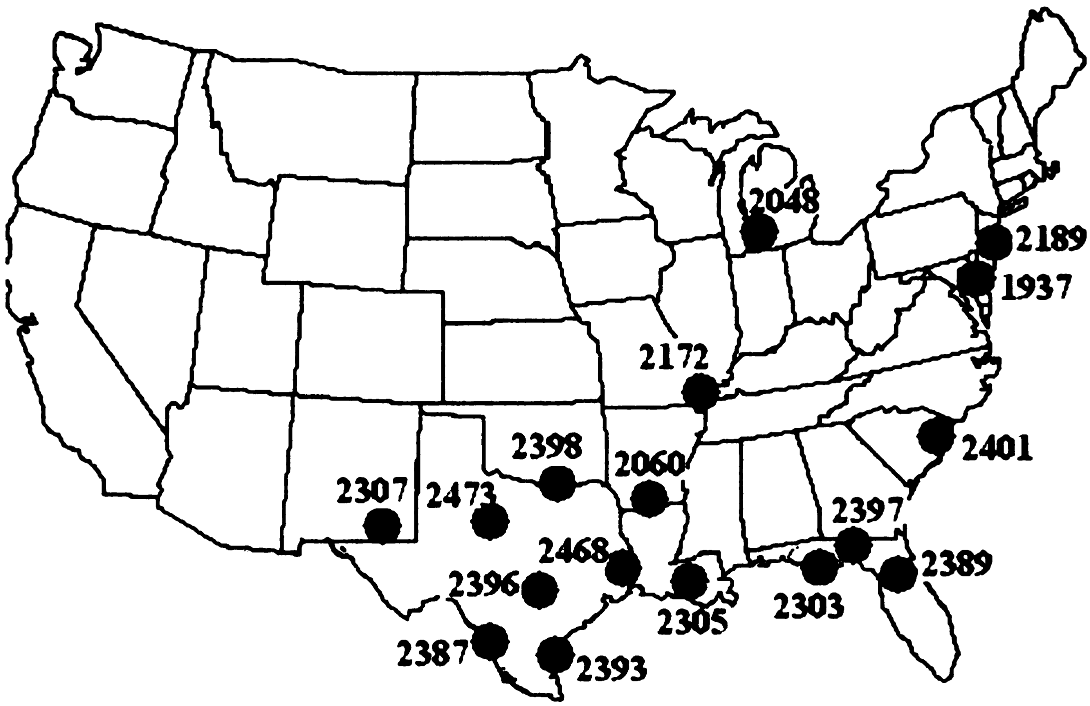

Figure 4: Collection locations of the 16 *M. punctata* samples with their corresponding DNA numbers.

2.3 Marker Choice

In this study, two homologs of the nuclear gene, Alcohol dehydrogenase (*Adh*), were used for phylogenetic analysis. In addition to *Adh* data, some preliminary results were also obtained for chloroplast expressed glutamine synthetase (*ncpGS*). Low copy nuclear genes were chosen for this work because in previous studies ITS (Prather et al 2002) and cpDNA (Prather and Monfils unpub. data) provided no phylogenetic information for *Monarda* species in Section *Cheilyctis*.

Adh has been widely used as a molecular marker in plant phylogenetics. *Adh1* produced a more resolved phylogeny in *Paeonia* with sequence divergence one and one half times higher than ITS (Sang 1997). *Adh* and cpDNA sequences were also compared in

Gossypium and *Adh* was found to be far more informative (Small et al. 1998). Likewise, in additional phylogenetic studies of *Gossypium*, *Adh1* sequences were phylogenetically informative and produced well-resolved trees (Small and Wendel 2000). *Adh* has also been used to compare inter- and intraspecific relationships in DNA variation and codon bias in the closely related brassicas *Arabis* and *Arabidopsis* (Miyashita et al. 1996), so it can provide phylogenetic informative at the highest taxonomic levels.

Adh is referred to as "classical' alcohol dehydrogenase. The alcohol dehydrogenase produced by *Adh* is NAD+ dependent and oxidizes ethanol (reviewed in Chase 1999). In most plant systems, there are two *Adh* loci. In Solanaceous plants, the loci differ in their tissue-specific expression. One *Adh* enzyme is expressed when the plants are subjected to anaerobic conditions (hypoxia) whereas the second is only expressed in anthers and seeds. Moreover, two additional *Adh* genes have been identified and described in *Lycopersicon esculentum* and *Solanum tuberosum* (Chase 1999).

Glutamine synthetase (*ncpGS*) encodes for an enzyme that functions in the assimilation of ammonium into glutamine (reviewed in Ford & Cullimore 1989). In most plants, two distinct classes of these genes exist. One class encodes for cytosolic enzymes and in most plants four to six genes have been described. The other class encodes for a plastidic protein and only one gene has been described in most plant species (Emshwiller & Doyle 1999). The choroplast-targeted glutamine synthetase was used to determine relationships between eight *Oxalis* species and sequence divergence in intron regions was shown to be higher (8.63%) than that of ITS sequences (7.75%; Emshwiller & Doyle 1999).

2.4 DNA Extraction

DNA was extracted using the 2xCTAB method (Doyle & Doyle 1987) as modified by Zhang and Stewart (2000). DNA was extracted from living plants and herbarium material. Extracted genomic DNA was cleaned using Schleicher & Schuell Elu-quick DNA purification kit (Neese, NH).

2.5 Primers

Four sets of *Adh* primers, both general and specific, were used for PCR amplification of *Monarda*. The general primers, *Adh*-R and *Adh*-F (Sang et al. 1997), amplified ~1400 basepairs of *Adh* sequence in *Paeonia* (Table 6). *Adh*-R and *Adh*-F primers were used to amplify the first *Adh* sequences in these *Monarda*, but they provided poor amplification results. Consequently, it was necessary to design *Monarda* specific general primers that provided better *Adh* amplification in these plants.

Cloned *Adh* sequences were obtained from *Monarda* and *Pycnanthemum* using *Adh*-F and *Adh*-R. Twenty of these sequences were aligned using Sequencher 3.0. (Gene Codes, Ann Arbor, MI). General primers, labeled *Adhm*-F and *Adhm*-R (*Adh*-*Monarda*-forward and reverse; Table 6), were designed at conserved regions near the 5' and 3' ends of this alignment. The *Adhm*-F and *Adhm*-R primers amplified a ~1300 basepair region of *Adh* in *Monarda* and *Pycnanthemum*.

An additional primer set, *Adhmc*-F and *Adhmc*-R (Adh-*Monarda* cut-forward and reverse), was designed to differentially amplify a ~1200 basepair region believed to be specific to a single locus, named *Adh* type 1 (*Adh1*, see below). These primers were used

to test direct sequencing of the *Adh1* locus and allowed for more direct selection of these clones for sequencing. PCR product amplified with *Adhmc*-F/*Adhmc*-R primers was directly sequenced without cloning, but direct sequencing was problematic due to allelic variation in *Adh1* sequences so as an alternative these primers were used to amplify *Adh1* sequences for cloning. Finally, an additional primer *Adhi*-F (*Adh*-internal-forward) was designed to sequence an internal region in all *Adh* homologs in *Monarda*. This was a forward primer that amplified a region starting approximately 350 bases downstream from the *Adhm* and *Adhc* forward primers that was needed for obtaining a complete sequence of the entire amplified fragment.

One set of *ncpGS* primers, GScp687-f and GScp994-r (designed by Emshwiller & Doyle 1999) (Table 6), were used to amplify a 700 basepair region of the glutamine synthetase gene in *Monarda*. This gene region was known to contain four intron regions in *Oxalis* species (Emshwiller & Doyle 1999).

Table 6: Primer sequences used for the amplification of *Adh* gene regions, and *ncpGS* regions.

Adh-f:	5'-TAC TTCTGGGAAGCYAAG G-3'
Adh-r:	3'-CCTCGCATATTT GGTCA GAA G-5'
Adhm-f	5'-TATCTCAGGCGCAAGATTCA-3'
Adhm-r	3'-GCATCTTTGTGTGGAACTCCT-5'
Adhc-f	5'- GAACATCCCAGGCTCAAGAT-3'
Adhc-r	3'- TAGAGCAGAATGCAGCCACA-5'
Adhi-f	5'- CCCGTTTACCATTTTCTT-3'
GScp687-f	5'-GATGCTCACTACAAGGCTTG-3'
GScp994-r	5'-AATGTGCTCTTTGTGGCGAAG-3'

2.6 DNA Amplification

PCR was conducted on a PTC-100 thermocycler. Three separate thermocycler programs were used (Table 7) depending on the ease at which the DNA could be amplified. DNA

extracted from herbarium tissue generally required the use of either a stepdown program or an annealing temperature of 55° C. Higher quality DNA could often be amplified at 60° C. Two Taq Polymerases were used for amplification. Platinum® Taq DNA Polymerase (Invitrogen™ Life Technologies) was used to improve specificity and yield of PCR product for DNA samples that were either difficult to amplify or showed a high rate of PCR recombination. Standard Taq DNA Polymerase (New England Biolabs®, Inc.) was used for all other PCR reactions. Amplification components follow those used by Prather and Jansen (1998) with the addition of 5% DMSO to each reaction and a 5 minute hotstart at 94°C for each thermocycler run.

Table 7: Three thermocycler programs used for PCR amplification

55° and 60° C annealing program	Stepdown program
1. 95° C for 5 minutes	1. 95° C for 5 minutes
2. 72° C for 2 minutes	2. 72° C for 2 minutes
3. 94° C for 1 minute	3. 94° C for 1 minute
4. 55° or 60° C for 1 minute	4. 56° C for 1 minute
5. 72° C for 3 minutes	5. 72° C for 3 minutes
6. 29 times to step 3	6. 2 times to step 3
7. 72° C for 5 minutes	7. Repeat steps 3 to 6 but reduce the annealing temperature by 3° C each time until an annealing temperature of 37° C is reached.
8. 15° C indefinitely	
	8. 72° C for 5 minutes
	9. 15° C indefinitely

2.7 Cloning

PCR products were gel purified from 2% agarose gels and cleaned using the Schleicher & Schuell Elu-quick DNA purification kit (Neese, NH). Purified DNA was cloned into *E.*

coli using TOPO™ TA Sequence Cloning® Kit (Invitrogen, Carlesbad, CA). Plasmid DNA was purified from bacteria by the use of either QIAGEN® QIAprep Spin Miniprep Kits (Qiagen™) or the manual DNA extraction method for bacteria (Sambrook et al. 1989).

2.8 *Adh* Clone Isolation

In several species it was necessary to pre-select sequences from a specific locus prior to cloning. Potential loci were preselected by digesting the *Adhm*-F/*Adhm*-R PCR product with two restriction enzymes. *Acc*I was used for *Adh1* selection, and *Eco*RI was used for *Adh2* and *Adh3* selection (see below). Digested DNA was gel purified and undigested bands were isolated. *Acc*I-selected and purified PCR product was cleaned and directly cloned. *Adh2* and *Adh3* selection (see below) involved additional steps due to the presence of an *Eco*RI cutting site located 43 basepairs downstream from the 5' end of the amplified sequence. It was necessary to fill this *Eco*RI overhang and adjoin an adenine-tail for insertion into the Topo® vector. Purified PCR products were cleaned and precipitated. Precipitated product was then vacuum dried for 10 minutes in a Labnet DyNAVap vacuum microfuge and rehydrated in 10 microliters of sterile distilled deionized water. *Eco*RI overhangs were filled using Klenow DNA Polymerase I Large Fragment (Tabor and Struhl, 1990) resulting in a blunt-ended product. Klenow reactions were stopped by placement on a 75° Centigrade heating block for 10 minutes. For the addition 3' adenine overhangs, the heating block was lowered to 72° C, Taq polymerase was added and, reactions were held at this temperature for 10 minutes. A-tailed DNA samples were then precipitated, rehydrated in sterile distilled deionized water and directly cloned using Topo® TA kits.

2.9 Restriction Digest Analysis of *Adh*

Prior to sequencing, *Adh* clones were digested with the restriction enzyme *EcoR*1. Digested clones exhibited three digest patterns when gel purified: no digestion, digestion at base 900 and digestion at base 400 and 900 (Fig 5). It was discovered that digested clones (both those that were digested at bases 400 and at 900) had sequences that represented one locus (*Adh1*) while undigested clones had sequences that represented the second and third locus (*Adh2* and *Adh3*). Restriction site cutting locations on sequences were confirmed using Webcutter 2.0 (Heiman 1997).

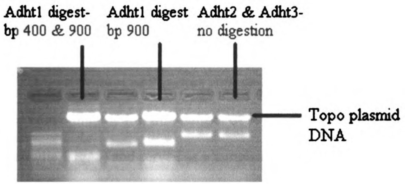

Figure 5: Cloned samples of *M. punctata* DNA (2048) digested from the Topo plasmid vector using *EcoR*1. Digested bands show three digestion patterns that were found to correspond to the three putative *Adh* loci: *Adh1* with single and double-digested bands and *Adh2* and *Adh3* with undigested bands.

2.10 Sequencing

Each *Adh* DNA insert was digested from the TOPO™ plasmid vector using *EcoR*I and quantified against a 100 basepair DNA ladder of known concentration (New England Biolabs®, Inc.). Sequence reactions were prepared using ABI PRISM® BigDye™ Terminator cycle sequencing ready reaction kit with AmpliTaq DNA polymerase (Applied Biosystems©) and thermocycler parameters were set to those specified in the kit. Each *Adh* DNA insert was sequenced from the 5' and 3' ends and internally. All sequences were obtained using an ABI-373 automated sequencer.

2.11 DNA Alignment

Sequences were aligned and edited manually using Sequencher 3.0. (Gene Codes, Ann Arbor, MI). Aligned sequences were truncated so that they were all approximately 1200 basepairs in length. Complete datasets representing each marker were aligned first followed by subsets that represented an individual locus.

2.12 Identification of Putative *Adh* and *ncpGS* Loci

A tree containing the full *Adh* dataset of 99 sequences was used to identify putative loci (see results, Fig. 8) and served as a template to identify potential PCR recombinant sequences. These sequences were manually aligned and analyzed by maximum parsimony using Paup* version 4.0bv (Swofford 2000) (see results, Fig. 6) and parsimony settings were consistent with those used for all other analyses (see below). Trees were viewed as unrooted phylograms. Phylogenetically divergent sequence sets revealed three putative loci, labeled *Adh* type 1 (*Adh1*), *Adh* type 2 (*Adh2*) and *Adh* type 3 (*Adh3*). A second parsimony tree was used to identify suitable outgroup sequences for the same three putative loci. An unrooted phylogram was generated using 22 outgroup sequences (*Pycnanthemum* and *Monarda* spp.) and nine ingroup sequences representing *Adh1*, *Adh2* and *Adh3*. The phylogeny was generated by maximum parsimony using the same methods, and two equally parsimonious trees were created and tree one was used for analysis (see results, Fig 9).

2.13 Outgroup Selection and Rooting

Outgroup sequences that appeared at the base of the ingroup sequences representing *Adh1, Adh2* and *Adh3* were used for analysis (see results, Fig 8). The *Adh1* sequence set was rooted with two sequences of *M. clinopodioides* and sequences of *P. muticum, P. loomisii* and *P. tenuifolium*. The *Adh2* and *Adh3* sequence set was rooted with *P. muticum*, *P. loomisii,* three sequences of *M. citriodora,* and three sequences of *P.*

tenuifolium. The *Adh2* dataset was rooted with two sequences of *M. citriodora* and two sequences *P. tenuifolium*. *Adh1* and *Adh2* datasets were reduced to contain the same samples. The reduced *Adh1* dataset was rooted with *P. muticum*, *P. tenuifolium*, and two sequences of *M. clinopodioides* and the reduced *Adh2* dataset was rooted with the same sequences used for the full *Adh2* dataset.

ncpGS loci were identified using a phylogeny of nineteen ingroup sequences (twelve taxa) and two outgroup sequences (*Pycnanthemum*). Phylogenetic analyses were the same as those used for *Adh*. Results showed that there were two putative *ncpGS* loci that were divided by 24 base changes (see results, Fig 20). These putative loci were labeled *GSt1* and *GSt2*.

2.14 Phylogenetic Analyses

For ease in interpreting the phylogenetic results, analyses completed for each dataset are indexed in Table 9. Sequences were analyzed using Paup* version 4.0bv (Swofford 2000). Maximum parsimony analyses were performed using Tree Bisection Reconnection, Collapse, and Multrees options and Steepest Decent was inactive. Strict consensus trees were obtained and bootstrap support was measured using 1000 bootstrap replicates (Felsenstein 1985) with 100 addition-sequence replicates per bootstrap.
The sequences were also analyzed using maximum likelihood methods. Optimal likelihood analyses were determined using Modeltest version 3.6 (Posada and Crandall 1998). The TrN+I+G model was selected for *Adh2* and the TrNef+G model was selected for *Adh1* (Table 8). The Shimodaira-Hasegawa (S-H) test was used to determine whether

maximum parsimony trees were significantly worse than the maximum likelihood trees (Goldman et al. 2000).

Table 8: Likelihood model parameters for TrN+I+G and Trnef+G

Likelihood Model	TrN+I+G	Trnef+G
Base Frequencies	Freq A= 0.2766 Freq C= 0.1752 Freq G= 0.2228 Freq T= 0.3254	Empirical frequencies
Substitution Model	[A-C]= 1.0000 [A-G]= 2.3130 [A-T]= 1.0000 [C-G]= 1.0000 [C-T]= 3.3248 [G-T]= 1.0000	[A-C]= 1.0000 [A-G]= 6.1615 [A-T]= 1.0000 [C-G]= 1.0000 [C-T]= 11.7499 [G-T]= 1.0000
Proportion if invariable sites	=0.3488	= 0
Gamma distribution	= 0.7773	= 0.1897

Maximum likelihood methods were used because data contained imbalanced base frequencies (see below) and sites that have evolved quickly (intron regions) and slowly (exon regions). When data trends show these types of anomalies, it is useful to include likelihood-based methods of analysis (Collins et al. 1994).

The base frequencies for all *Adh* datasets were calculated on PAUP * version 4.0bv (Swofford 2000) and histograms were made using Microsoft Excel (Fig. 6 and 7). Results were used to identify biases in the datasets that may potentially skew parsimony results. The nucleotide frequencies among taxa showed a character state bias in the dataset..

Table 9: List of all phylogenetic analyses completed for each *Adh* dataset. Check marks indicate a particular test was completed for that dataset.

Analysis	Full *Adh*	Outgroup	*Adh1*	*Adh2* & *Adh3*	*Adh2*	*Adh3*	*Reduced Adh1 & Adh2*
Maximum parsimony	✓	✓	✓	✓	✓	✓	✓
Parsimony strict consensus		✓	✓	✓	✓		✓
Parsimony bootstrap			✓	✓	✓		✓
Maximum likelihood			✓		✓		
Shimodaira-Hasegawa test			✓		✓		
Bayesian analysis			✓	✓	✓		✓

Bayesian analyses were run using Mr. Bayes 3.0 (Huelsenbeck, 2001). Bayesian inference is a more recent tool for phylogenetic analysis that is just beginning to gain popularity (Alfaro et al. 2003). This phylogenetic method uses Baye's theorem of inverse probability and likelihood parameters to measure tree topologies and branch lengths. Bayesian methods apply probabilities that a given tree is correct given a particular dataset and maximum likelihood parameters. In Bayesian analyses Bayesian confidence values are also applied to the tree nodes. These tree node probabilities are determined using Bayesian Markov Chain Monte Carlo (BMCMC) sampling method inference (Alfaro et al. 2003). Probabilities are determined from multiple phylogenies generated by Bayesian inference. The Markov chain samples the branch lengths and substitution parameters of a given set of Bayesian trees to generate node probabilities. Node values above 90 are considered to be well supported.

2.15 Phylogenetic Interpretation

Neoendemic species were distinguished from paleoendemic species based on their phylogenetic position. Paleoendemics were expected to appear as the sister group to *M. punctata* and to have longer branch lengths, and neoendemics were expected to be derived within *M. punctata* and have shorter branches. In addition, species that speciated as peripheral isolates of *M. punctata* are expected to show tree topologies similar to those shown in the hypothetical gene tree depicting peripatric speciation in Figure 1.

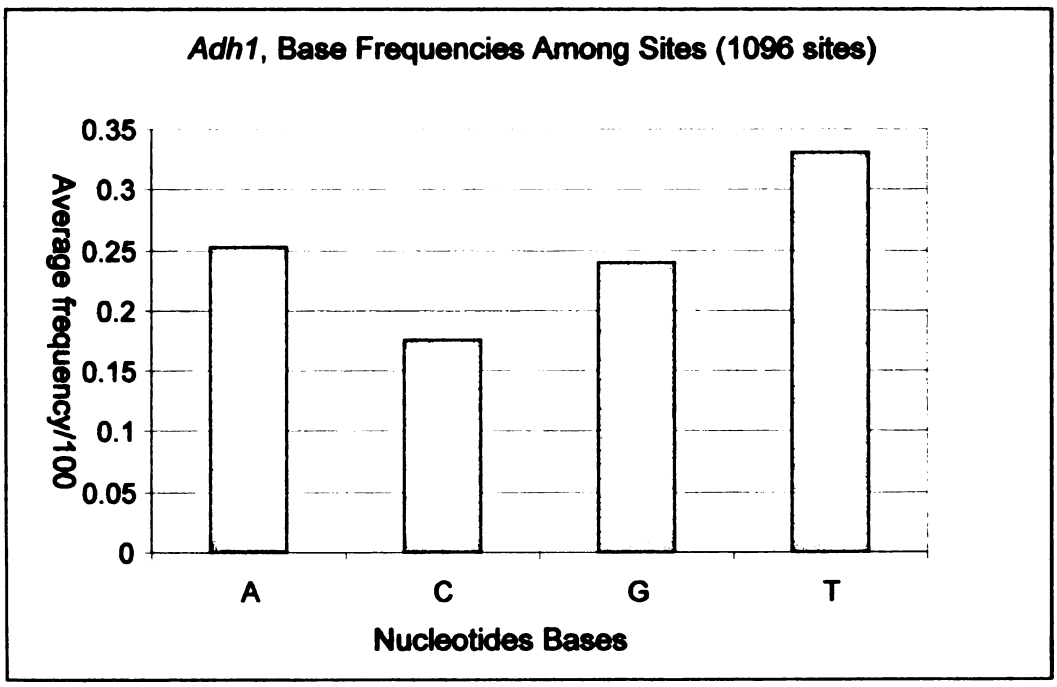

Fig 6: Histogram of the base frequencies (Average frequency/100) in the *Adh1* dataset. These results are based on 1096 base sites.

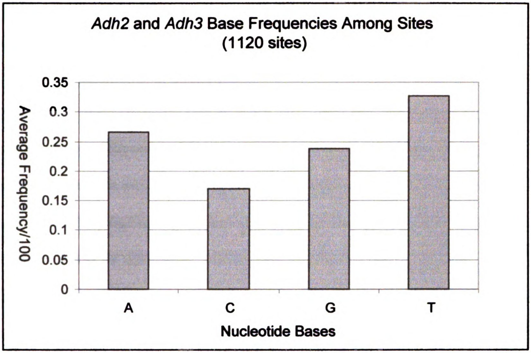

Fig 7: Histogram of the base frequencies (Average frequency/100) in the *Adh2* and *Adh3* datasets. These results are based on 1120 base sites.

RESULTS

3.1 Identification of Putative Loci

Ninety-nine *Adh* sequences, approximately 1,200 basepairs in length were obtained from the six ingroup *Monarda* species. Two separate phylogenetic analyses were used to delineate potential loci. The first phylogeny was generated by maximum parsimony and contained all 99 ingroup *Monarda* sequences. One hundred equally parsimonious trees were generated for this dataset, tree length was 1663, the consistency index (CI) was 0.518 and the retention index (RI) was 0.870. In an unrooted phylogram (Fig. 8), *Adh1* and *Adh2* were divided by 70 base changes and *Adh2* and *Adh3* were divided by 20 base changes. This phylogeny was used to determine how and where ingroup sequences parsed, and allowed for better ingroup sequence selection for the second analysis.

The second analysis contained 23 potential outgroup sequences (seven species) and nine ingroup sequences (five species) representing *Adh1*, *Adh2* and *Adh3*. The ingroup sequences were selected from several points across the each putative locus. Data were analyzed by maximum parsimony and two equally parsimonious trees were created with a length of 797, a CI of 0.649 and a RI of 0.806. In an unrooted phylogram (Fig. 9), *Adh1* and *Adh2* were separated by 43 base changes and *Adh2* and *Adh3* were separated by 12 changes. A strict consensus tree was generated from the two most parsimonious trees (Fig.10), and compared to the unrooted phylogram. Branch length disparity between the full *Adh* tree and outgroup tree was attributed to the increased sample number in the full *Adh* tree and the inclusion of outgroup samples. *Pycnanthemum* samples appear to have a fourth putative locus adjacent to *Adh1* that is not found in *Monarda*, and no *Pycnanthemum* samples appear to branch within *Adh2*.

The *Adh1* dataset was rooted with two *M. clinopodioides* samples and *P. muticum*, *P. loomisii* and *P. tenuifolium* samples. The *Adh2/Adh3* dataset was rooted with *P.-muticum*, *P. loomisii*, three *M. citriodora* samples, and three *P. tenuifolium* samples. The *Adh2* dataset was rooted with two *M. citriodora* and *P. tenuifolium* samples.

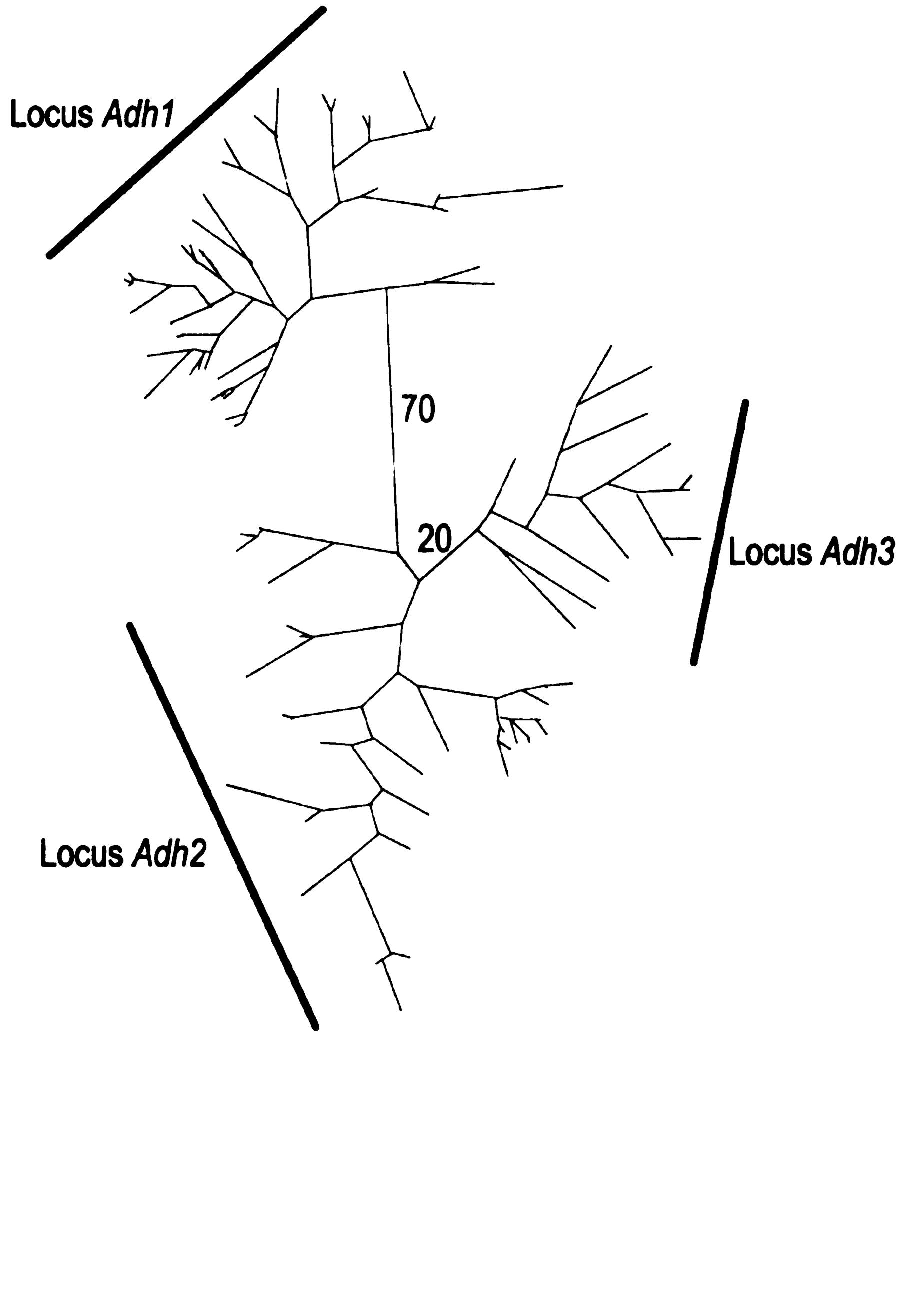

Figure 8: An unrooted phylogram of ninety-nine *Adh* sequences representing all ingroup *Monarda* samples. The three putative loci, *Adh1*, *Adh2* and *Adh3*, are labeled. Seventy steps separate *Adh1* and *Adh2* and 20 steps separate *Adh2* and *Adh3*. Several sequences branch between *Adh1* and *Adh3* but were found to fall in the *Adh2* dataset when *Adh2* and *Adh3* were separated and outgroup sequences were incorporated.

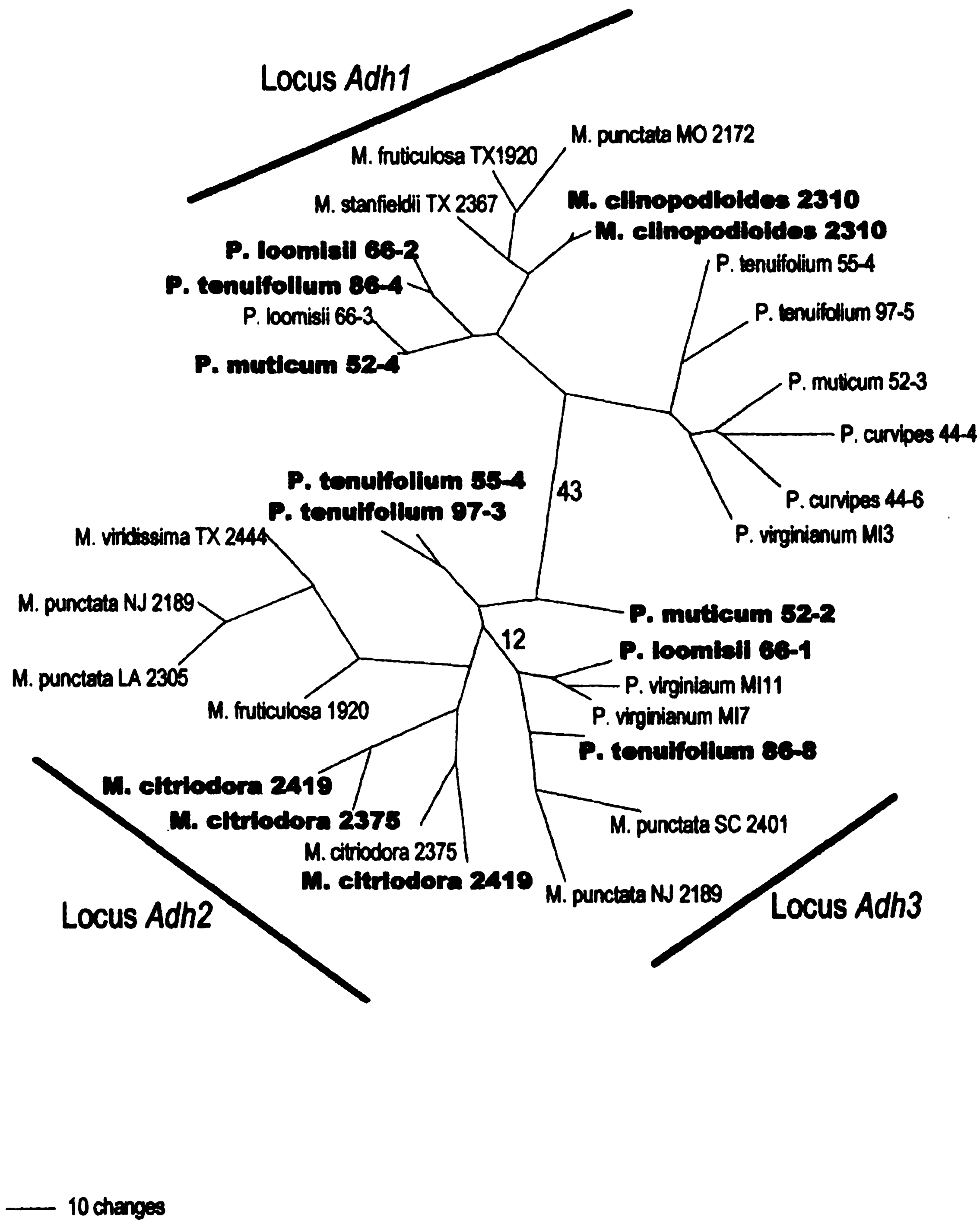

Figure 9: Phylogeny of 23 outgroup sequences and nine ingroup sequences representing all three putative loci identified (*Adh1, Adh2* and *Adh3*). The branch dividing *Adh1* and *Adh2* has 43 changes and the branch dividing *Adh2* and *Adh3* has 12 changes. Taxon labels include species and DNA numbers. Samples in bold were chosen as outgroups for later analyses.

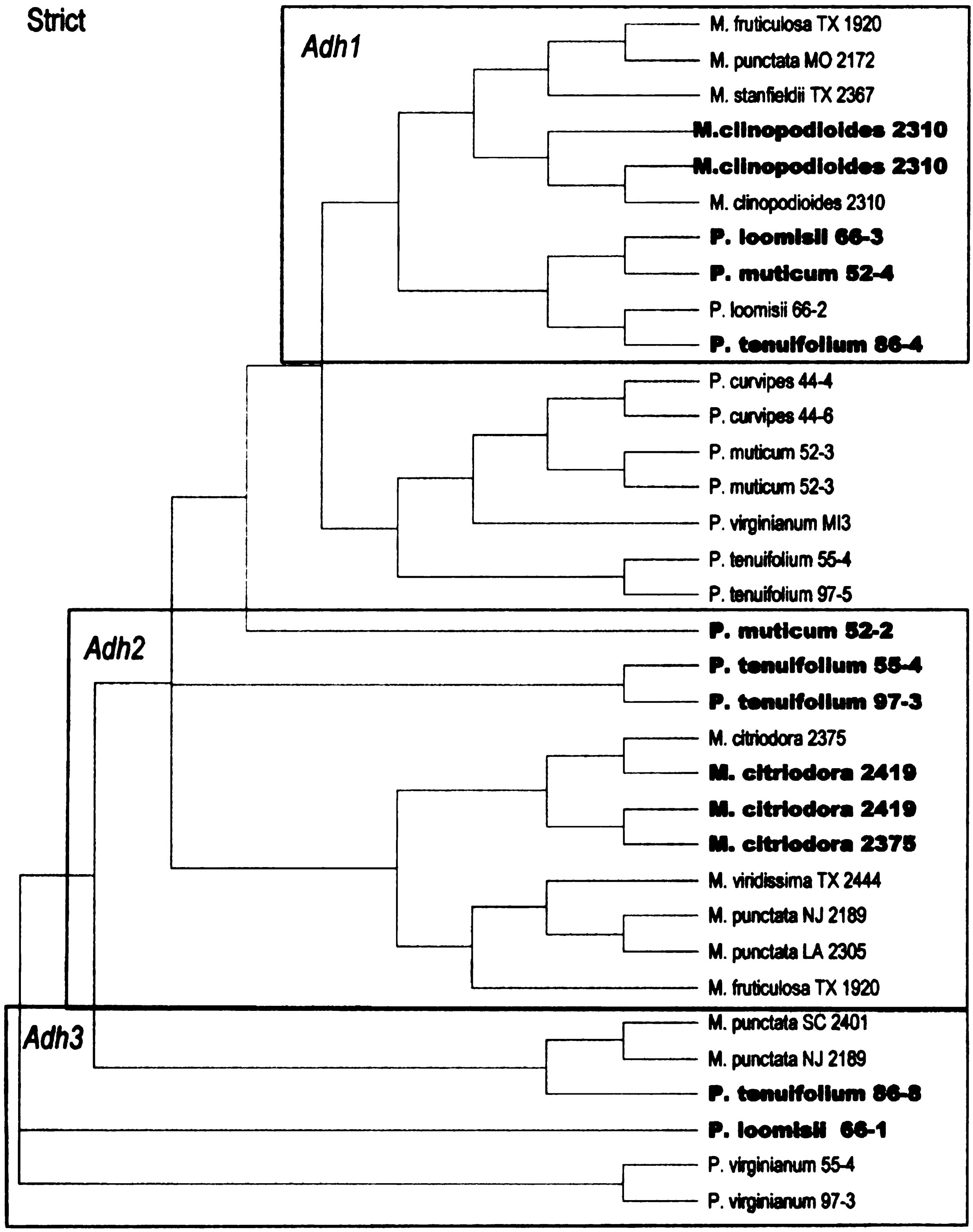

Figure 10: Strict consensus tree of 2 equally parsimonious trees representing 23 potential outgroup sequences and nine ingroup sequences from all three loci identified (Adh1, Adh2 and Adh3). The Pycnanthemum clade between Adh1 and Adh2 represents a fourth putative locus that is unique to Pycnanthemum. Sequences that are in bold were chosen as outgroups. Taxon labels include species and DNA numbers.

3.2 *Adh1*

The *Adh1* dataset had 35 ingroup sequences of all six species collected from 24 populations. Data were analyzed by maximum parsimony, parsimony bootstrap, maximum likelihood, the S-H test and Bayesian analyses. Thirty-seven most-parsimonious trees were generated and each had a length of 480, a (CI) of 0.503 and a (RI) of 0.746. All uninformative characters were removed from the datasets before CI values were obtained. The S-H test was run on all 37 most parsimonious trees and one maximum likelihood tree (TrNef+G). The best maximum parsimony tree identified (Fig 11) had several topological differences relative to the TrNef+G tree (Fig. 12) including the placement of *M. stanfieldii*, *M. maritima* and *M. fruticulosa* (2301 and 2317) samples. The parsimony strict consensus tree (Fig. 13) and Bayesian consensus tree shared the same topology, and bootstrap values and Bayesian node confidence values were applied to this phylogeny.

The strict consensus tree had one major *M. punctata* clade with *M. fruticulosa, M. humilis, M. maritima* and *M. viridissima* sequences derived within it (Fig 13). The *M. punctata* clade had a high Bayesian confidence value of 99 (NC99), but had bootstrap support less than 50 (BS-). Most of the *M. punctata* samples were together in two smaller clades: One contained nine *M. punctata* samples (2303, 2397, 2398, 2305, 2048, 2172, 2307 and 2396) and had strong support (BS81/NC100), while the second had four samples (1937, 2048, and 2189) and higher support (99BS/100NC). *Monarda fruticulosa* (2301 and 2317) and *M. maritima* (2314, 2318 and 2319) samples shared two moderately well-supported clades (-BS/99NC and 59BS/100NC) within the larger *M. punctata* clade.

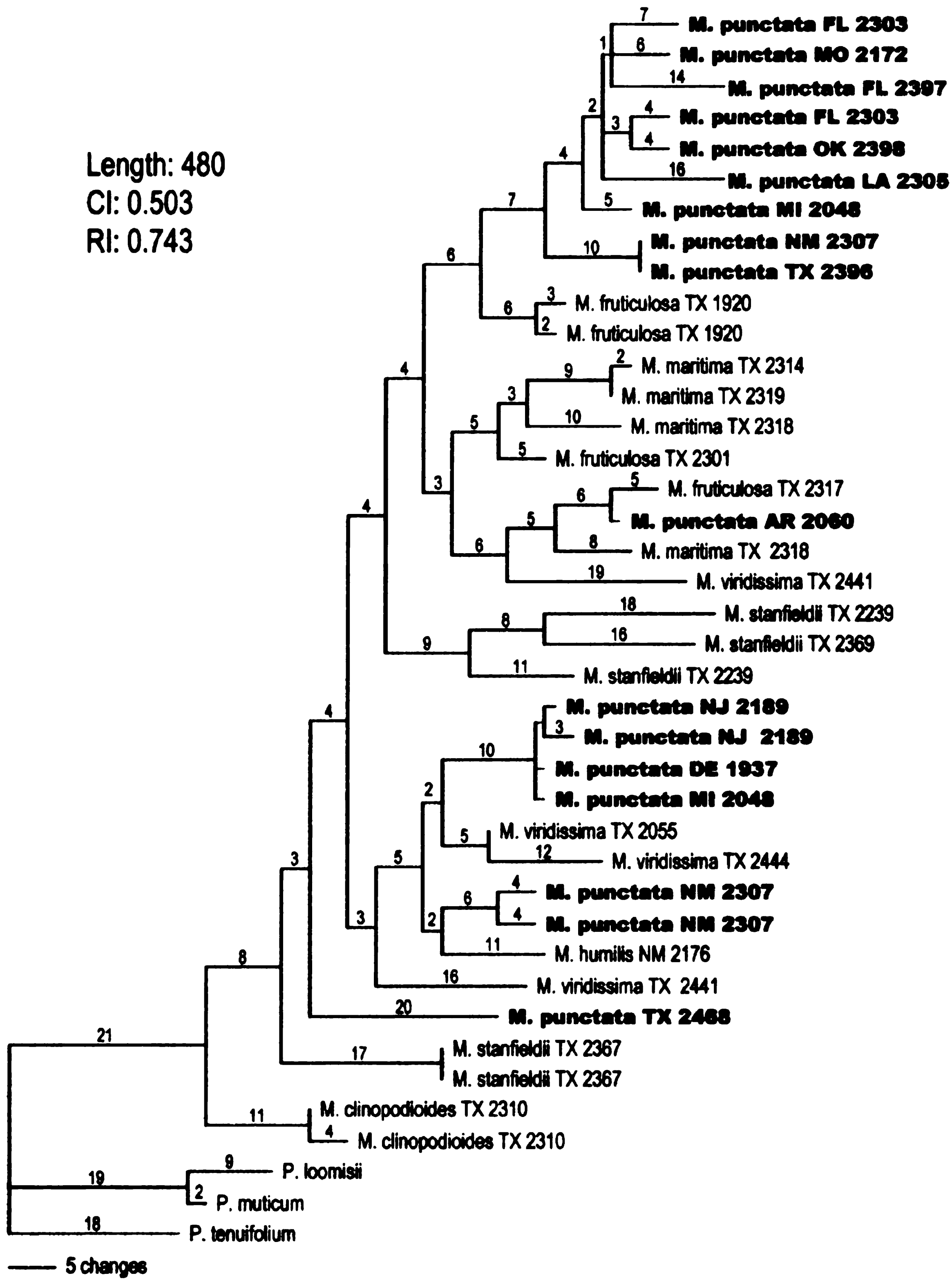

Figure 11: The *Adh1* parsimony phylogram selected by the S-H test. Branches are labeled with steps. Taxon labels include species, state of origin and DNA number. The larger *M. punctata* clade is labeled by the bar along the right margin. Tree length, CI and RI values are shown.

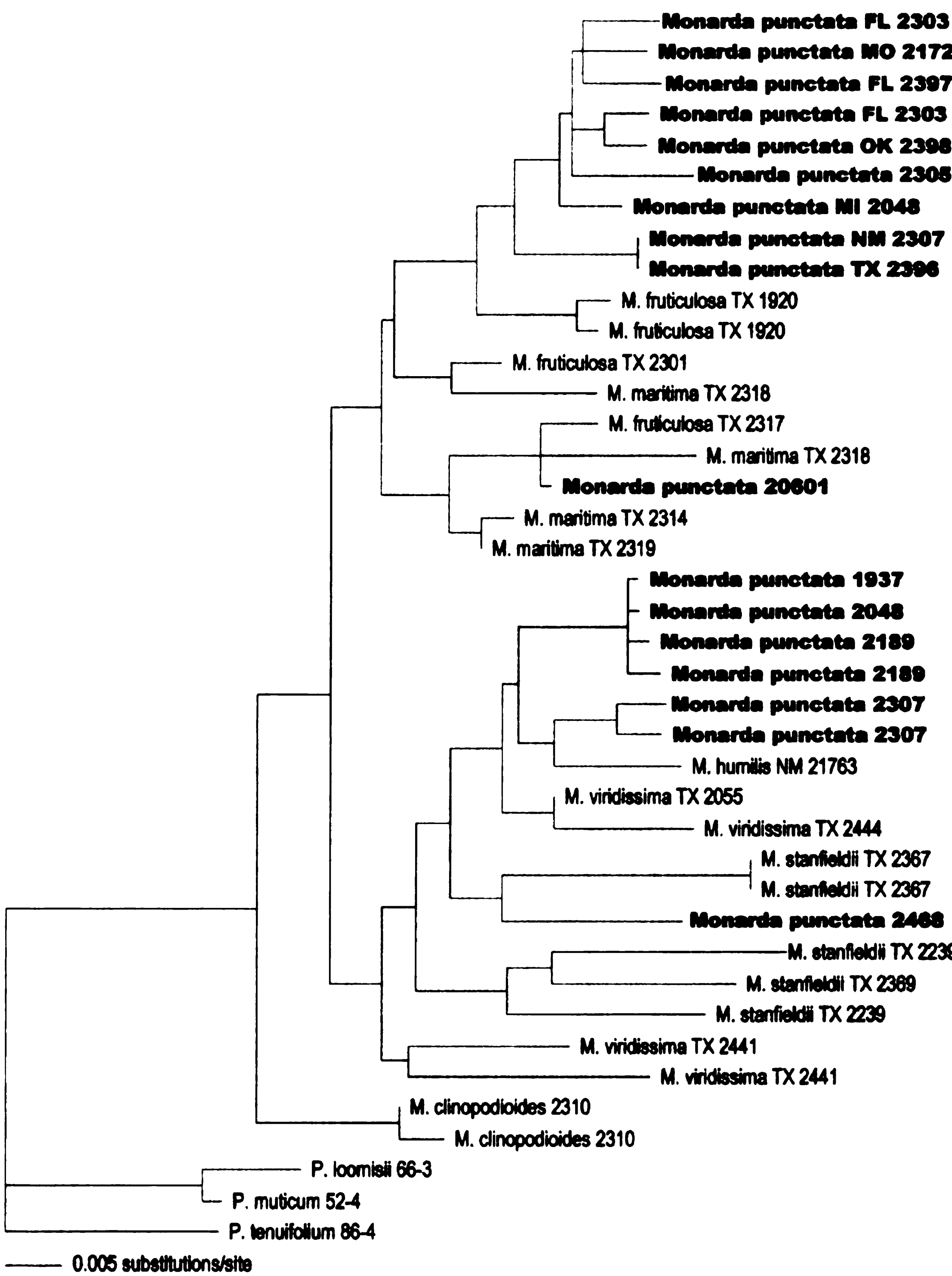

Figure 12: The *Adh1* likelihood phylogram using the TrNef+G model of substitution. Branches are labeled with values denoting substitutions per site. Taxon labels include species, state of origin and DNA number.

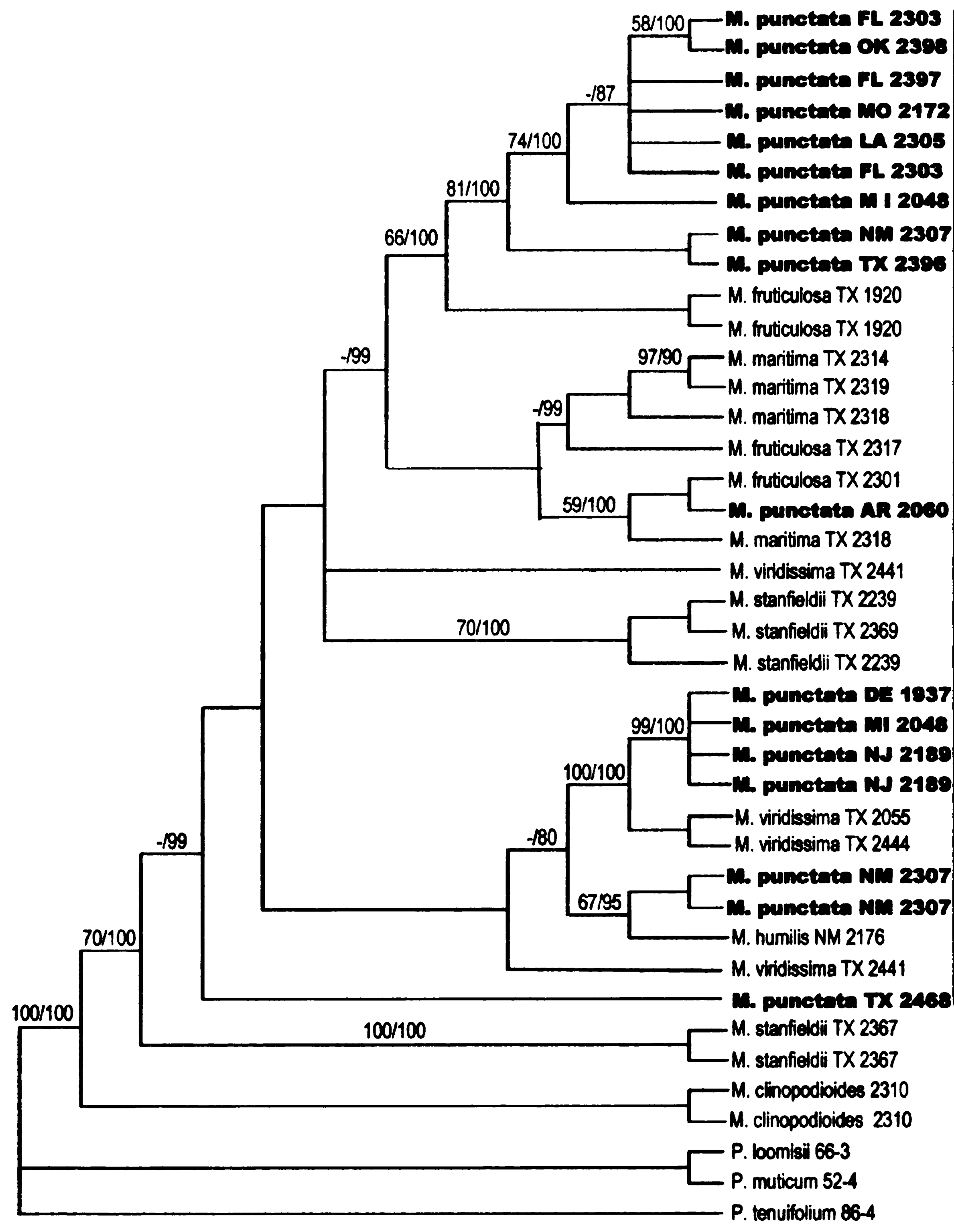

Figure 13: Strict consensus of 37 maximum parsimony trees from the full *Adh1* dataset. Taxon labels include species, state of origin and DNA number. Branches are labeled with bootstrap (left) and Bayesian node confidence values (right); only values above 50 are shown and values below 50 are labeled with dashes. The larger *M. punctata* clade is labeled by the bar along the right margin.

This was the only narrow endemic species that was not within the *M. punctata* clade. Two *M. stanfieldii* clones (2367) appeared on the most basal branch sister to the *M. punctata* clade and two additional *M. stanfieldii* samples (2239 and 2369) were derived within the larger *M. punctata* clade but with no support. *Monarda viridissima* was more widely dispersed in the phylogeny. Two samples (2055 and 2444) branched together with *M. punctata* and two clones of the third sample (2441) were not supported in the larger *M. punctata* clade. The single *M. humilis* sample (2176) had good support (-BS/95 NC) being in a clade with two *M. punctata* from New Mexico (2307).

3.3 *Adh2* and *Adh3*

These data were analyzed by maximum parsimony, parsimony bootstrap and Bayesian analyses. The *Adh2* and *Adh3* dataset included 38 sequences and generated 6 most parsimonious trees with a length of 571 steps, a CI of 0.434 and RI of 0.743. The parsimony and Bayesian consensus trees were identical and both parsimony bootstrap values and Bayesian node confidence values were applied to this tree (Fig. 14).

Many sequences were replicated in both *Adh2* and *Adh3* trees. Outgroup sample, *M. citriodora* had two sequences at the base of each putative locus (Fig. 14). The branch that delineated *Adh2* and *Adh3* had a high Bayesian node confidence value of 100 but no bootstrap support. Nearly all the samples in *Adh3* were of geographically separate *M. punctata* except for two *M. stanfieldii* sequences (2369) in the clade with *M. citriodora* (2419). Clades in *Adh3* had several high Bayesian node confidence values but little to no bootstrap support.

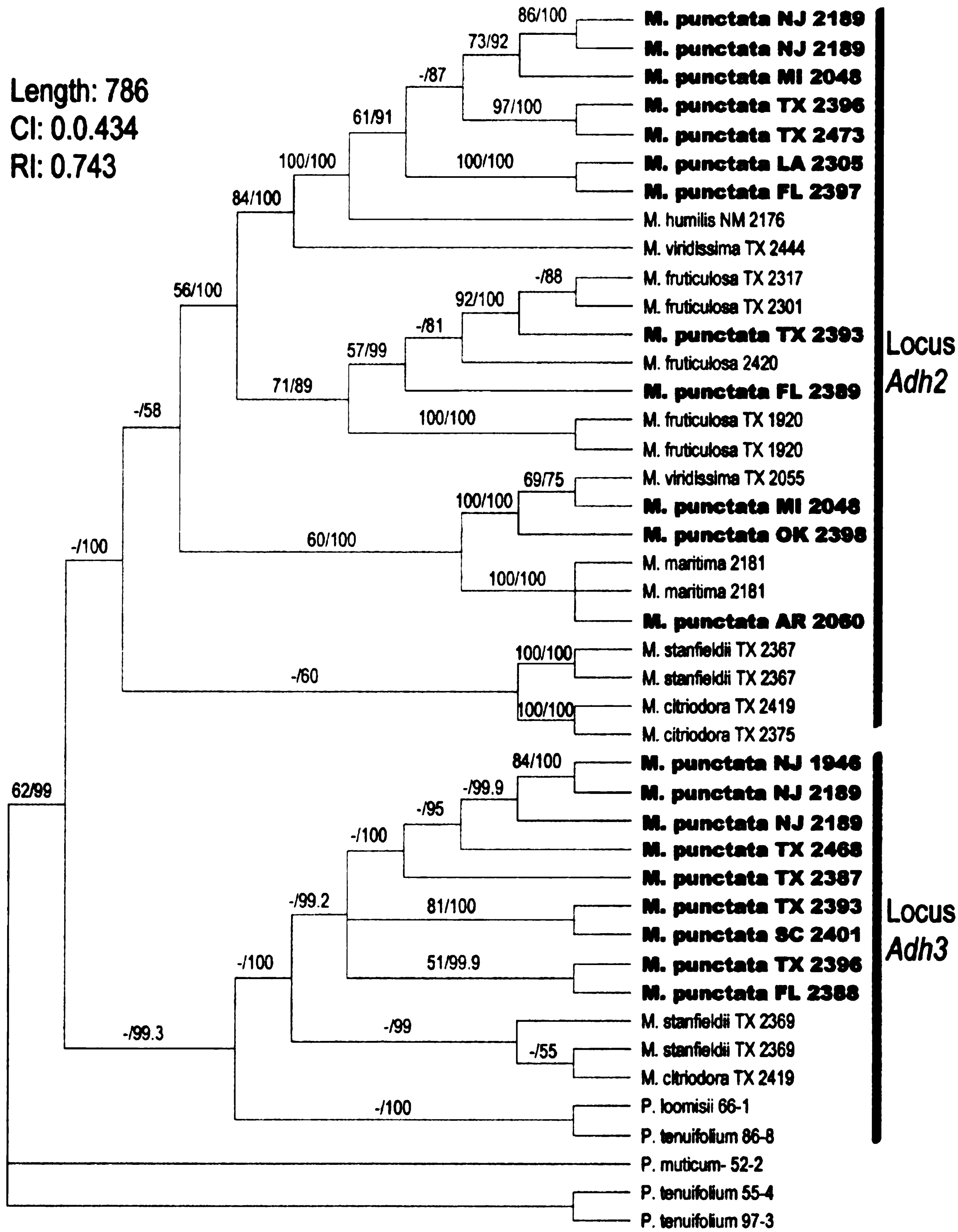

Figure 14: Strict consensus of 6 maximum parsimony trees from the full *Adh2* and *Adh3* dataset. Taxon labels include species, state of origin and DNA number. Branches are labeled with bootstrap (left) and Bayesian node confidence values (right) and only values above 50 are shown. The *Adh1* and *Adh3* loci are labeled by the bar along the right margin. Tree length, CI and RI values are shown.

3.4 *Adh2*

As with *Adh1*, these data were analyzed by maximum parsimony, parsimony bootstrap, maximum likelihood, the S-H test and Bayesian analyses. The *Adh2* dataset contained only 24 ingroup samples. This was due in part to the presence of *Adh3* and difficulties in obtaining *M. maritima* and *M. viridissima* sequences for this locus. Many of the sequences that were selected for the *Adh2* dataset fell within *Adh3* because both duplicates had the same restriction digest pattern and it was impossible to differentiate between them prior to sequencing. Likewise, I had much difficulty in obtaining *Adh2* sequences from *M. maritima* and *M. viridissima.*

Parsimony analysis of *Adh2* data generated six trees with 446 steps, CI value of (0.588) and RI value (0.830) than the *Adh2* and *Adh3* combined tree. The topology of the best tree (Fig. 15) was identical to an additional tree generated by likelihood (Trn+I+G, Fig. 16) with the exception to its placement of *M. stanfieldii* sequences relative to *M. citriodora*.

The parsimony strict consensus tree and the Bayesian tree shared the same topology, and parsimony bootstrap values and Bayesian node confidence values were applied to its branches/nodes. This tree also contained one major clade of *M. punctata* that had *M. fruticulosa, M. humilis, M. maritima* and *M. viridissima* sequences nested within it (Fig. 14), but the clade had poor Bayesian and bootstrap support (55BS/64NC). Like the *Adh1* tree, two clones of *M. stanfieldii* (2367) were on a basal branch adjacent to the outgroup and were not derived within *M. punctata*.

Most of the *M. punctata* samples were together on one supported branch (74BS/89NC) that contained seven *M. punctata* samples (2189, 2048, 2305, 2397, 2396 and 2473) with one *M. humilis* (2176) and one *M. viridissima* (2444) sample nested within. All three *M. fruticulosa* samples were on one well-supported branch (68BS/93NC) with two *M. punctata* samples.

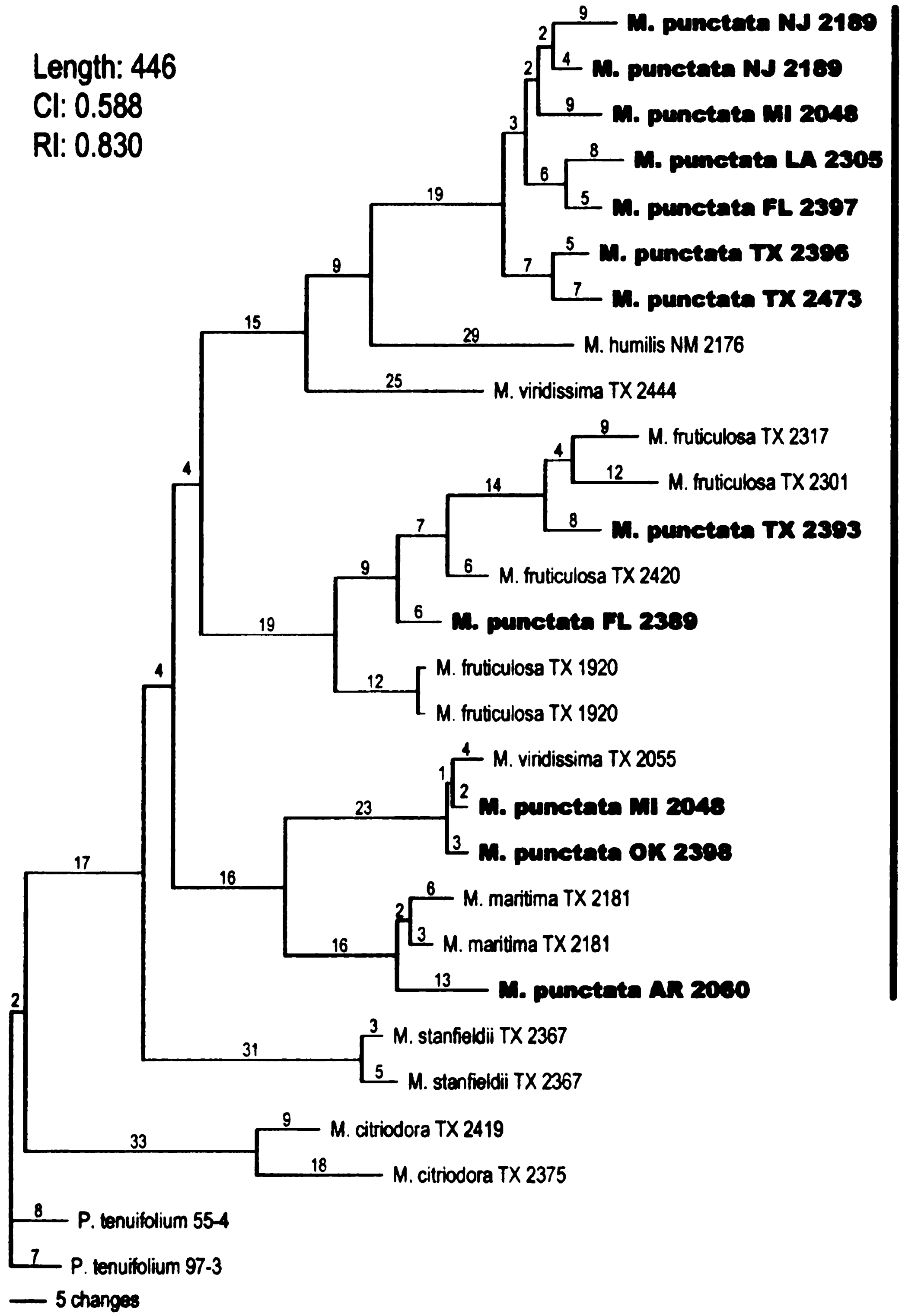

Figure 15: A phylogram of the full *Adh2* tree. Taxon labels include species, state of origin, DNA number. Branches are labeled with base change values. The larger *M. punctata* clade is labeled with a bar along the right margin.

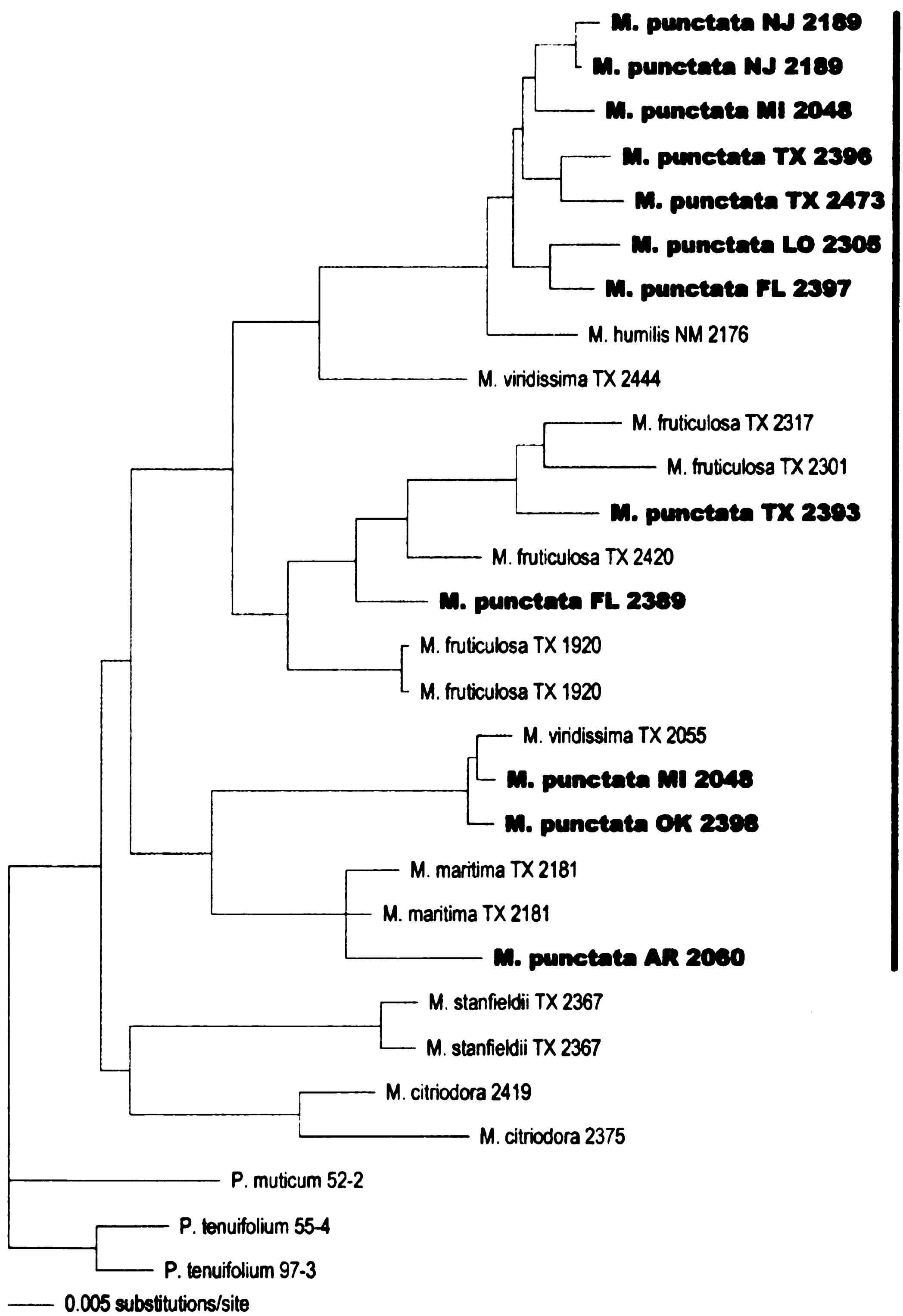

Figure 16: The *Adh2* likelihood phylogram using the Trn+I+G model of substitution. Branches are labeled with values denoting substitutions per site. Taxon labels include species, state of origin and DNA number.

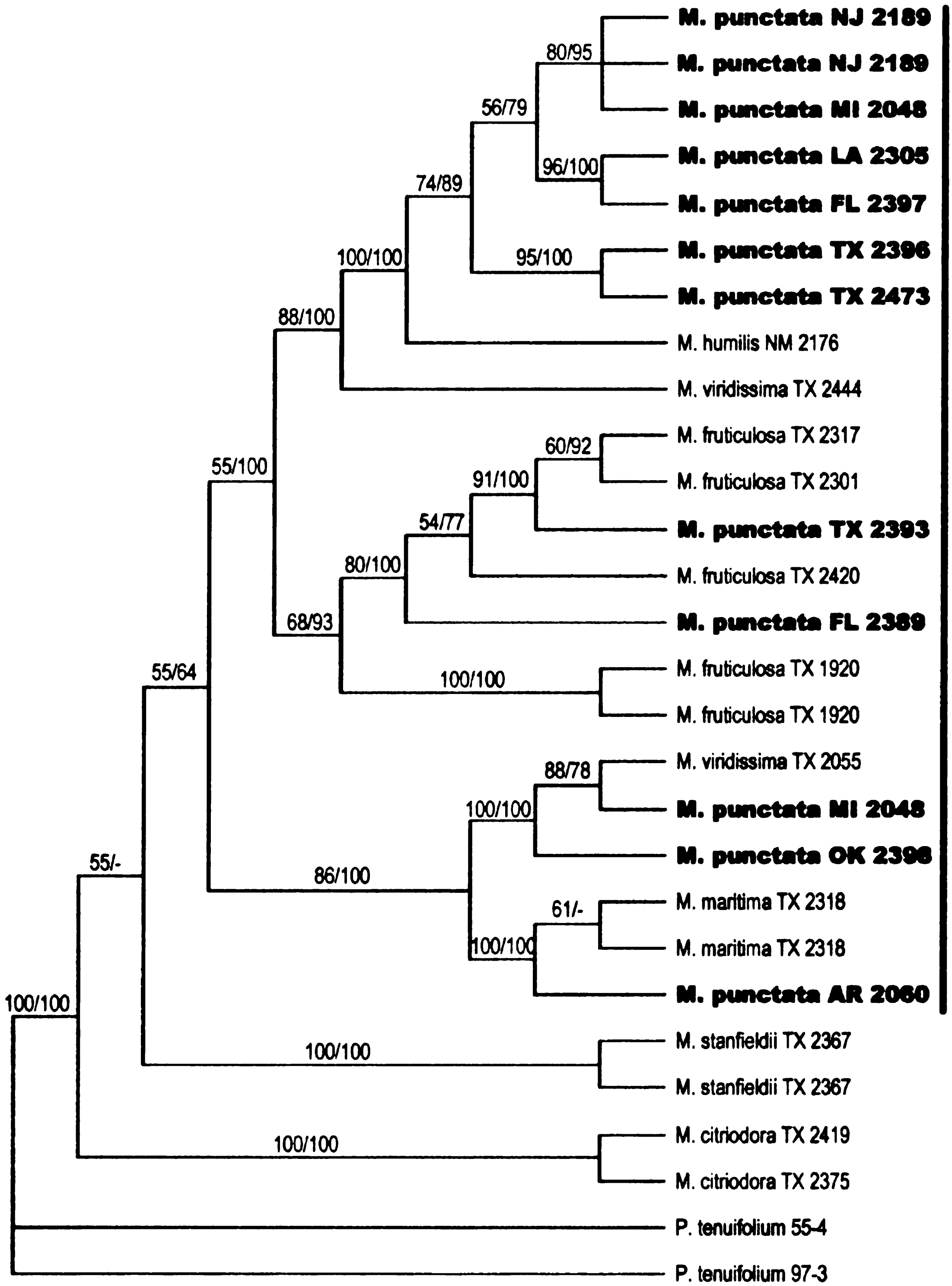

Figure 17: Strict consensus of the six most parsimonius trees of *Adh2* with 20 ingroup sequences. Taxon labels include species, state of origin, and DNA number. Branches are labeled with bootstrap (left) and Bayesian node confidence values (right) and only values above 50 are shown. The larger *M. punctata* clade is labeled by the bar along the right margin.

3.5 *Adh3*

This dataset contained eight *M. punctata* samples and two *M. stanfieldii* samples and was analyzed by parsimony analysis only. One maximum parsimony tree was generated and it had a length of 358, a CI of 0.676 and a RI of 0.408. *Monarda stanfieldii* samples were at the base of the tree with a *M. citriodora* outgroup sequence. *Monarda punctata* samples were in two clades. One had *M. punctata* samples only and the second included the *M. stanfieldii* and *M. citriodora* samples.

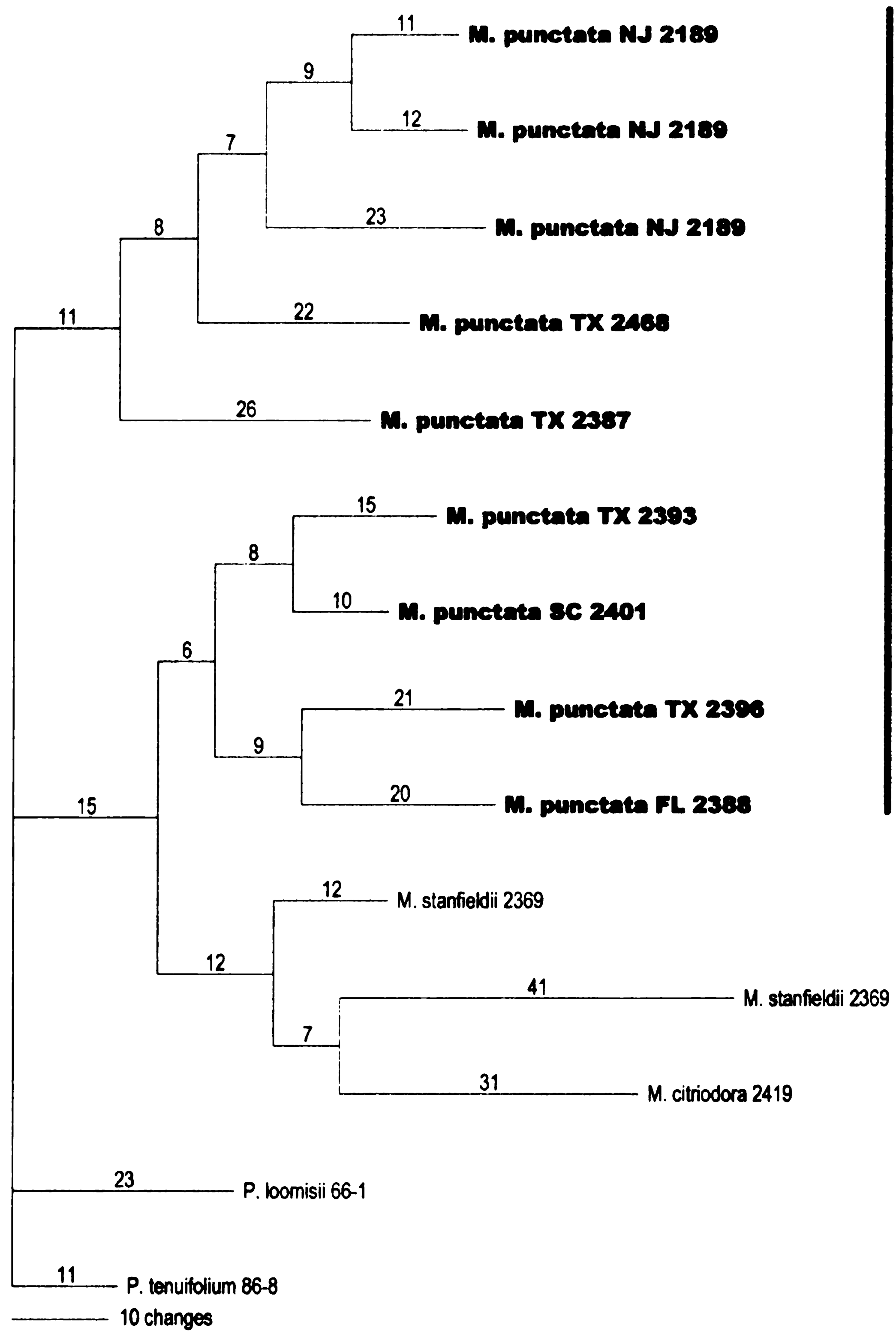

Figure 18: Adh3 parsimony tree with 11 ingroup sequences. Branches are labeled with steps. Taxon labels include species, state of origin and DNA number. The *M. punctata* clades are labeled by the bar along the right margin.

3.6 Combined and Reduced *Adh1* and *Adh2*

As with full *Adh1* and *Adh2* datasets, these data were analyzed by maximum parsimony, parsimony bootstrap and Bayesian analyses. *Adh1* and *Adh2* datasets were reduced so they shared the same samples (Fig 19). Eighteen trees were generated in the maximum parsimony analysis of the reduced *Adh1* dataset (length: 200, CI: 0.585, RI: 0.771). The parsimony strict consensus tree and the Bayesian tree shared the same tree topology (Fig. 15). Two trees were generated in the maximum parsimony analysis of the reduced *Adh2* dataset (length: 275, CI: 0.618, RI: 0.835) and the parsimony strict consensus tree and Bayesian tree were also topologically the same.

Both trees placed *M. stanfieldii* (2367) sequences at the most basal branch of the tree. *Monarda punctata* was in two primary clades in both trees. Endemic species (*M. fruticulosa*, *M. humilis*, *M. maritima* and *M. viridissima*) showed a higher degree of variability regarding their placement in the trees, although each phylogeny had a clade that consistently contained the majority of the *M. fruticulosa* sequences included in the study.

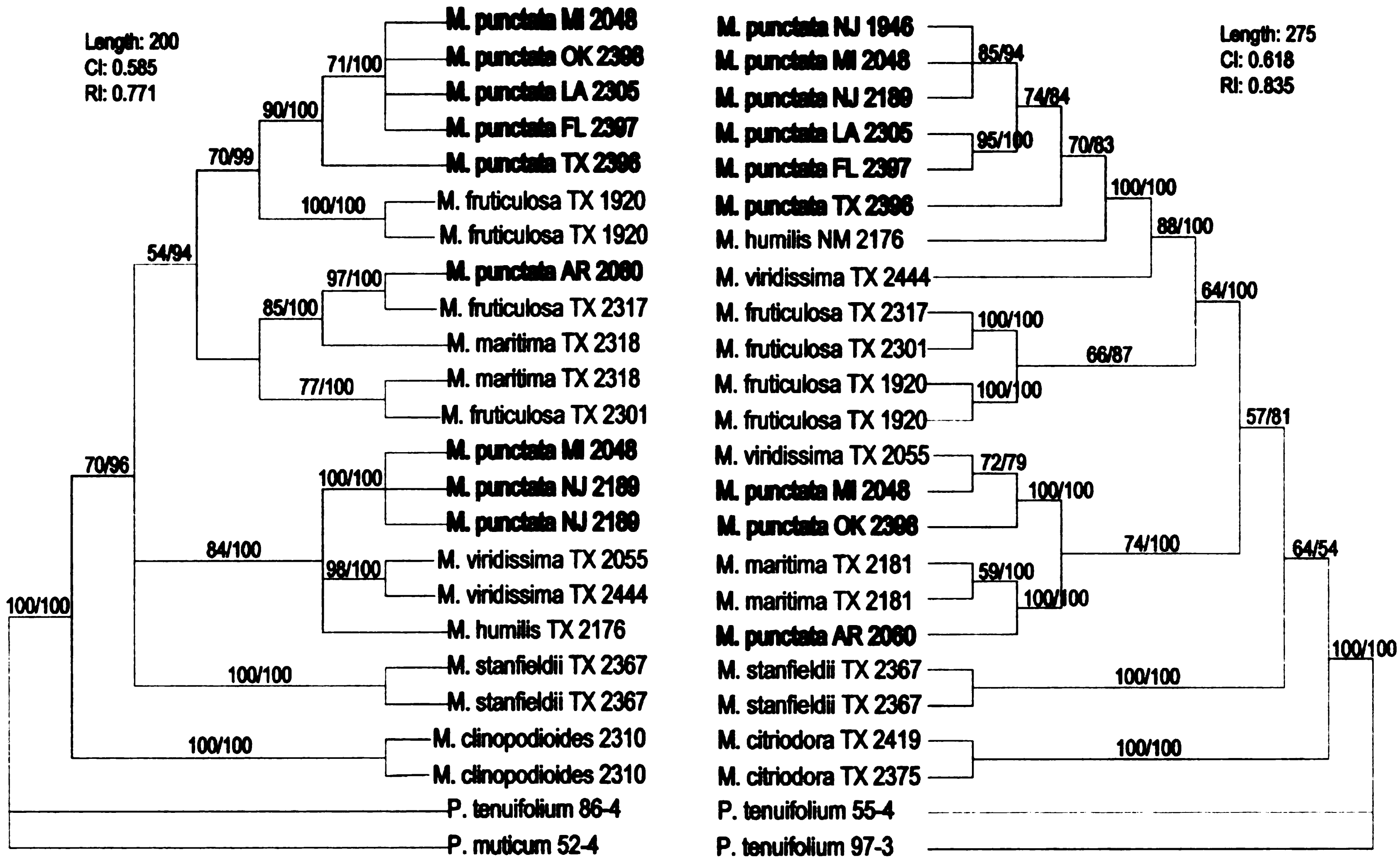

Figure 19: Reduced *Adh1* and *Adh2* phylogenies. The larger *M. punctata* clade is labeled by the bar along the right margin. Branches are labeled with bootstrap (left) and Bayesian node confidence values (right) and only values above 50 are shown.

3.7 *ncpGS*

Nineteen *ncpGS* sequences, approximately 600 basepairs in length were obtained from four *Monarda* species (*M. fruticulosa*, *M. maritima M. punctata* and *M. viridissima*) with two *Pycnanthemum* sequences set as outgroups. Results showed that there were two distinct *ncpGS* loci (Fig.16) with 264 steps, a CI of 0.586 and a RI of 0.842. The two putative loci were separated by 24 base changes. Due to the limited number of taxa in this dataset, no further analyses were run on these trees.

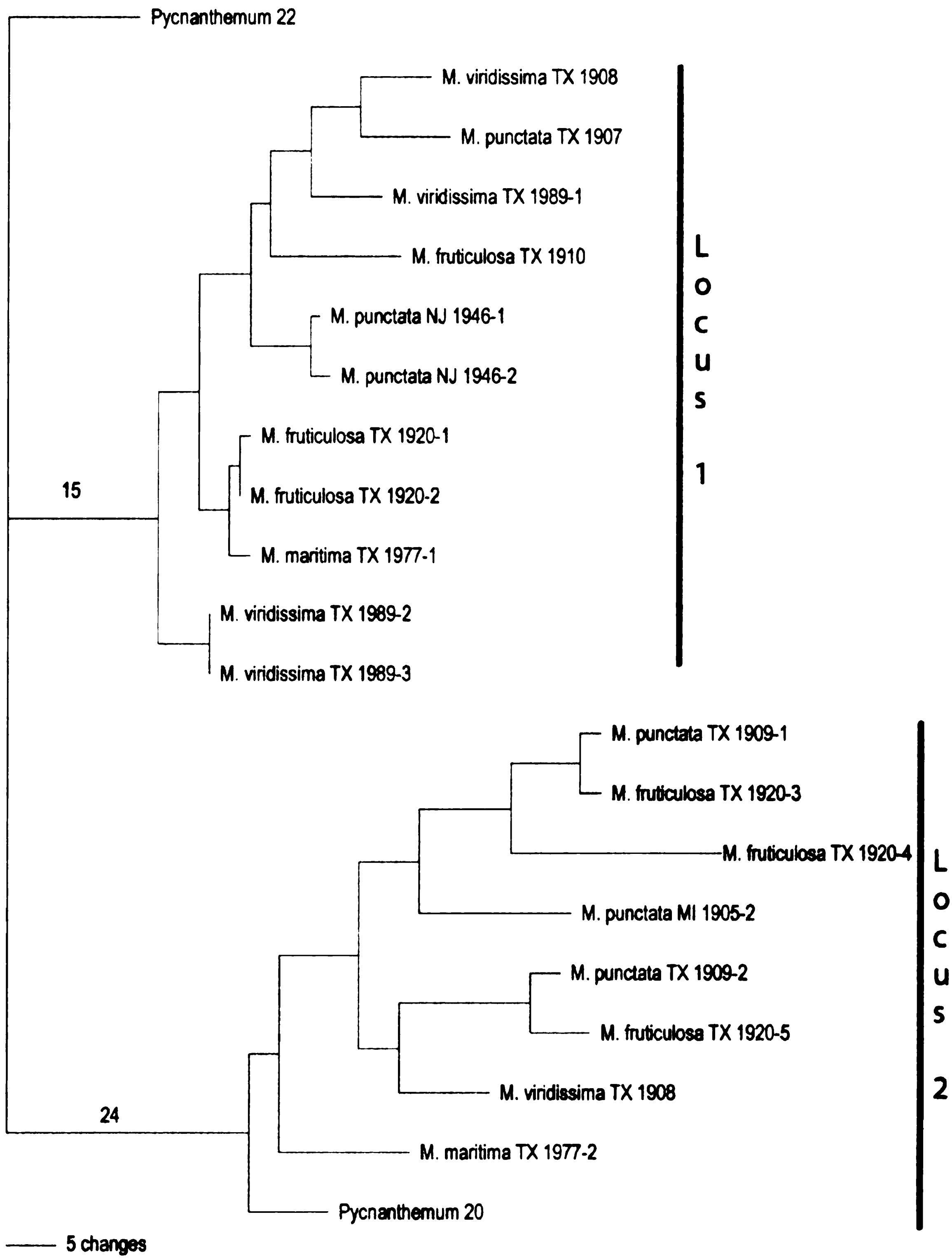

Figure 20: Full *ncpGS* sequence data representing ten different taxa. Taxon labels include genus/species, state of origin and DNA number. Locus 1 and 2 are listed along the right margin.

DISCUSSION

4.1 General Overview of Results

The objectives of this project were to use the species in *Monarda* Section *Cheilyctis* to test whether speciation by peripheral isolation had occurred among the species of the section, and to determine whether the endemic species were paleo- or neoendemics. Data showed a high degree of *Adh* allelic variability within and between *Monarda* species. However, the phylogenetic results provided by *Adh* loci offered insight in answering these questions.

In each dataset all of the methods employed, maximum parsimony, maximum likelihood, and Bayesian analyses consistently produced trees with similar topologies. Consistency in their phylogenetic results increased the chances that the best trees were found for interpretation. The *Adh1* phylogeny had the most complete representation of samples. All the endemic species were represented in the *Adh2* phylogeny samples. Both phylogenies were used for interpretation. The *Adh3* phylogeny had only *M. punctata* and *M. stanfieldii* samples. It is unknown whether this putative *Adh* locus is a pseudogene or functional duplicate, but its distinction from *Adh2* suggests that there was enough variation in this duplicate to enable it to be distinguished as a separate type.

Phylogenetic data of *ncpGS* were not complete enough to be included in the analysis, although *Monarda* to have two loci for the chloroplast-expressed *ncpGS* gene as opposed a single locus, as documented in other plant systems (Emshwiller and Doyle 1999).

4.2 Gene Trees and Species Trees

There are limits that are inherent to the use of low copy nuclear genes for phylogenetic analysis. Phylogenies are hypotheses that can be useful tools for the inference of species relationships but there are caveats to those based on DNA markers. It is important to recognize that gene trees, particularly those based on nuclear genes, may not clearly reflect the same relationships as a true species tree (Doyle 1992, Schaal and Olsen 2000). Coding and noncoding gene regions can accrue genetic variation from point mutations, insertions/deletions and meiotic recombination that can disseminate or be disseminated within and among populations independent of speciation events. Genetic changes such as these can convolute gene trees when species have not undergone complete lineage sorting. Homoplasy can also be a source of incongruence between gene trees and species trees (Doyle 1992). Because of these problems, it is prudent to obtain molecular phylogenies from at least two different genetic markers. In this study only *Adh* sequences were used for analysis. Nonetheless, *Adh* has been widely used in phylogenetic studies (Sang 2002) and has gene regions that are highly conserved between distant organisms therefore greater confidence may be placed in its results.

Additional complications can arise when using low copy nuclear genes for phylogenetic inference depending on whether gene homology is paralogous or orthologous. Orthologous homologs precede speciation and are followed by divergence of an ancestral sequence (Gogarten and Olendzenski 1999, Sang 2002). Therefore, orthologous sequences can be used for phylogenetic reconstruction of species. Paralogous homologs result from either a duplication or deletion event after that occurs after speciation.

Paralogous sequences have been found to confound phylogenetic results, although some studies have shown them to be phylogenetically useful for both rooting purposes and to test comparative rates of divergence (Sang 2002). *Adh1* and *Adh2* are believed to be orthologous because they duplicated prior to the divergence of monocotyledonous and dicotyledonous plants (Sang *pers. corr.*). These orthologs may be synonymous to *Adh1* and *Adh2* loci identified in this study, but this cannot be confirmed because much information about these genes is lacking. This conjecture was drawn from the fact that *Adh1* and *Adh2* sequences were found in all six species while *Adh3* sequences were only found in *M. punctata* and *M. stanfieldii.* There is no evidence to suggest that *Adh3* is orthologous.

4.3 Gene Trees as Tools for Macroevolutionary Inference

It is important to draw a clear distinction between population level research and studies like this where species-level gene trees are used to infer population level processes. Coalescent theory has supplied much of the theoretical foundation for predicted gene tree topologies given different demographic histories of the populations they represent (Maddison 1995, Avise 2000). In the absence of gene flow, inter-specific gene trees can depict shared evolutionary histories and allelic variation that may coalesce to a common ancestral gene (Harrison 1991). Population structure and genetic structure are key in understanding how gene trees can be used to infer speciation events. If discontinuity in population structure reflects historic barriers to geneflow then one might expect comparable phylogenetic discontinuity in the genetic variation of neutral genetic markers.

This provides the underlying theory used by Harrison (1991) for his gene tree models of speciation.

4.4 Peripatric Speciation

The hypothesis that narrow endemic *Monarda* taxa speciated as peripheral isolates of *M. punctata* had phylogenetic support for some species but not all. In addition to being the most morphologically variable and geographically widespread, *M. punctata* was the most ubiquitous taxon throughout both *Adh1* and *Adh2* phylogenies. All narrow endemic species were derived within the large *M. punctata* clade with the exception of *M. stanfieldii*. This suggests that *M. punctata* is the progenitor of *M. fruticulosa, M. humilis, M. maritima* and *M. viridissima* and a sister taxon to *M. stanfieldii*. The *Adh3* phylogeny included few samples, but was consistent with the result that *M. stanfieldii* is the sister group to *M. punctata*

It was unexpected that *M. punctata* samples did not tend to exist on longer branches closer to outgroup samples. Factors that might explain why most *M. punctata* appeared on shallow terminal tree branches include recent divergence of species resulting in shared ancestral polymorphisms, inter-specific gene introgression (Schaal et al. 1998, Templeton et al. 1995) or inadequate sampling.If allopatric species are sexually compatible and their populations expand resulting in a sympatric or parapatric distribution genetic distinction between them can be blurred (Macnair and Gardener 1998). In addition, shared ancestral polymorphisms that are maintained in sister species may also convolute gene tree results and can be misinterpreted as evidence for recent gene flow (Schaal and Olsen 2000). Based on what is known about the current geography, morphology, and life cycles of these species these results are likely due to either low sampling or shared ancestral polymorphisms. Species are either geographically or temporily separated and they maintain unique morphological characteristics. It is likely that they speciated recently and rapidly, and it would have been prudent to include more *M. punctata* samples from Texas populations.

In the *Adh1* parsimony trees, *M. fruticulosa* and *M. maritima* sequences were consistently on the same clades. Similarly, in the *Adh2* parsimony trees all *M. fruticulosa* sequences shared the same clade, although the only *M. maritima* sample in the phylogeny existed in a different clade. Based on their placement in the *Adh1* phylogeny results suggest that *M. fruticulosa* and *M. maritima* share more allelic variation with each other than any of the other narrow endemic species. This might suggest that there has been recent gene flow between these species, or that they diverged recently from a common ancestor. However, the results do not rule out the possibility that some of the endemics are sister taxa that derived independently from *M. punctata*.

4.5 Neoendemic and Paleoendemic Species

Adh phylogenies provided useful information that could be used to infer the paleo- and neoendemic status of these species. Most *M. stanfieldii* (2367, 2369) samples were not derived within the larger *M. punctata* clade and had long branch lengths. This short-lived herbaceous perennial is thought to be completely geographically isolated from *M. punctata* and inhabits a unique substrate (granitic sands) relative to the other narrow endemic species. Overall, the phylogenies provided strong evidence that *M. stanfieldii* is a paleoendemic

In both *Adh1* and *Adh2* parsimony trees, one clade consisted almost entirely of *M. maritima* and *M. fruticulosa* sequences as well as *M. punctata* samples from southeastern Arkansas (2060), southeastern Texas (2393) and northcentral Florida (2389) to name a few. The close phylogenetic relationship between *M. fruticulosa* and *M. maritima* is not surprising considering they share a woody habit, perennial life cycle and they are the most geographically proximate of the narrow endemics. These results suggest these species are neoendemics, but also may indicate they may share a common ancestor.

Monarda viridissima sequences are found in different positions across both phylogenies which suggests they have a high degree of allelic variability. Regardless, most sample sequences were on branches that were close to *M. punctata* samples, which suggests they are closely related. Their close genetic relationships were most apparent in the *Adh1* tree where *M. viridissima* sequences (2055 and 2444) clustered with *M. punctata* sequences. Geographic and phylogenetic data support that *M. viridissima* is a neoendemic species.

Monarda humilis was not well represented in either dataset but some inferences can be made regarding its placement in the phylogenies. This species is the most geographically disjunct relative to the other southwestern narrow endemics, and like *M. viridissima* it was found within the larger *M. punctata* clade. Even though this species was represented by only one sample its apparently close genetic relationship suggests that it is also a neoendemic that speciated from *M. punctata*.

4.6 Lineage Sorting and Noncoalescence

Several samples in the phylogeny appear to have allelic variation at given locus. In the *Adh1* tree, two *M. punctata* (2307 and 2048) and one *M. maritima* (2318) had alleles that consistently fell within the two separate clades. Likewise, two *M. viridissima* sequences (2055, 2444) were within one clade, while the two remaining samples (2441) were in two separate locations in the phylogeny. Allelic variation in a phylogenetic marker leads to incongruence between gene trees and species trees. Such allelic variation may be caused by several phenomena such as lineage sorting, noncoalescence and gene flow between species.

Lineage sorting refers to the fixation of different ancestral alleles for a given marker into a daughter species at speciation (Small and Wendel 2000). In cases of lineage sorting fixed alleles should be present throughout the species. If samples of a species from multiple populations had the same patterns of allelic variation in a phylogeny it may provide evidence for lineage sorting. In addition, shared ancestral polymorphisms caused by lineage sorting should be divided by many steps in a phylogeny, while newer alleles that have arisen after speciation should have fewer steps dividing them. Lineage sorting is a more common problem in species that have diverged recently (Sang 2002).

Noncoalescence refers to the introgression of alleles that are maintained as ancestral polymorphisms in a multi-gene family (Small and Wendel 2000). The events that lead to lineage sorting and noncoalescence both involve the maintenance of ancient allelic polymorphisms and can produce phylogenetic results that show widely disparate taxa closely related on a gene tree.

Introgression and hybridization both involve the transfer of genes from one species to another (Small and Wendel 2000). Introgression results in the permanent fixation of genes between species while species still maintain phenotypic distinction. In contrast, hybridization results in phenotypic intermediates and progeny with novel gene combinations which can either lead to a merging of species or create a platform for speciation.

It is not certain which phenomena are the cause of allelic variation in the *Adh* phylogenies. Phylogenetic data alone is not sufficient to distinguish between lineage sorting, noncoalescence and gene flow between species. Further research is needed to determine this.

4.7 Species Protection and Conservation

The Endangered Species Act does not use biological terms alone to define species. Instead species are defined based on the most up to date knowledge of the genetics, evolution and speciation of a given taxon. There are several considerations that may warrant species protection for some of the *Monarda* taxa used in this study.

Monarda maritima has the most limited distribution of the Texas endemics. It is only known to exist within the Ingleside Terrace sand body that extends approximately 100 miles along the Texas coast. The fact that it is a coastal endemic indicates that it has likely suffered much habitat loss due to ranching and development associated with the oil industry. This plant is challenging to find in the field and has not been extensively collected, which suggests that it is not common in its range. All evidence indicates that this species is a good candidate for conservation.

Monarda viridissima is limited to the Carrizo sands of the Blackland Prairies that extend in a discrete belt from northeastern to southwestern Texas. Populations have been found in only the central region of this belt. *Monarda viridissima* is not common in its range, but I was able to find it in moderate sized populations (>25 individuals). It is also noted as being rare in a list of southern U. S. endemics (Estill and Cruzan, 2001). Field observations suggested that it inhabits more established plant communities rather than newly disturbed sites, which concurs with its tendency to grow in established post-oak and pine-oak forests. Like *M. maritima*, it may be in need of protection due to its limited range and propensity to exist in more established plant communities.

Monarda fruticulosa is the most abundant of the Texas endemic *Monarda* species. It occurs across the southern tip of the state in the coastal prairies and interior coastal plains. Within its range it can commonly be found in large populations that are often distributed along roadsides. Therefore, *M. fruticulosa* is the least likely to be in immediate need of conservation, despite its narrow endemic status.

Monarda stanfieldii has a narrow range across the Central Texas Uplift. Like *M. viridissima*, it only appears to grow in more established plant communities, and tends to prefer open woodlands (*pers. obs.*). This species was also difficult to find in the field, although one of the populations had a relatively good size (>50). *Monarda stanfieldii* is also likely to be in need of protection particularly because of its apparent paleoendemic status. It exists in more in established plant communities, its range is very small and it grows in very specific soils.

4.8 Prospects for Future Studies of *Monarda* Section *Cheilyctis*

Several changes in our experimental design might have helped to better resolve phylogenetic relationships between these species. An increase in sampling, particularly of Texas *M. punctata*, might have added useful information. Five varieties of *M. punctata* were not included in this study. A more complete sampling of these taxa may have provided a better understanding of the origins of the Texas endemics. Additional samples could also better resolve patterns due to incomplete lineage sorting and noncoalescence.

It would also would have been advantageous to include data from an additional low copy nuclear gene. Molecular phylogenies from distinct genetic markers can be used to compare and hopefully strengthen phylogenetic hypotheses, thus providing more tools for distinguishing gene trees and species trees (Schaal and Olsen 2000)

A population-level study using Amplified Fragment Length Polymorphisms (AFLPs) for analysis may have resolved complicated reticulating patterns between these taxa. In several studies of Cichlid fishes, various genetic markers were used to determine the relationships between species, but all showed a high level of DNA polymorphisms among species (Klein et al. 1998, Moran and Kornfield 1995). Relationships between these Cichlids were not fully resolved until AFLPs were used for analysis (Albertson et al.1999). AFLPs are advantageous because thousands of genetic regions can be used to generate an organism'sgenetic profile, and no preexisting knowledge of its genome is required before use.

Some individual relationships between species may also spur additional investigation regarding the history of these plants and their speciation. *Monarda fruticulosa* and *M. maritima* share more allelic variation with each other than any of the other endemics. This may suggest that there has been recent gene flow between them, or that they diverged recently from either a common ancestor. Our current knowledge of these species show that they do not overlap geographically or phenologically, which better supports the latter, although they exist is such close proximity that their geographic distributions may have overlapped recently. These species inhabit comparable substrates (homogenous beach sands), they are the most geographically proximate and they are both woody perennials. Geologic and physiographic history suggests that *M. maritima* may have been separated from mainland species when the Ingleside Terrace was a barrier island. If *M. fruticulosa*, or a shared *M. fruticulosa/M. maritima* ancestor had become isolated on the barrier-island this may have given it a window of time to diverge.

Questions also arise regarding the speciation mechanism acting to maintain distinction between *M. punctata* and *M. fruticulosa*. These are the only two species in the study that grow in sympatry, bloom at the same time and are thought to have hybrid zones (*pers. obs*). They have been observed growing together along hilly sandy landscapes with *M. fruticulosa* growing at the sandy hilltops, *M. punctata* at the base of the hills, and possible hybrids along the cline between have been observed at one locality (Prather *pers. comm.*). This distribution better fits a parapatric species distribution with disruptive selection acting to maintain genetic distinction between species. In a study by Leuth and Prather (unpubl.), soils were collected from some of these sites and reciprocal seed plantings of *M. punctata* and *M. fruticulosa* were conducted. Results showed that *M. fruticulosa* had better survivorship on its own soil than it did on *M. punctata* soil. Other factors that may be involved include differences in water availability in high and low areas of the sandy soils or subsoil component, such as high salt content.

4.9 Conclusions

Few studies have used phylogenies based on low copy nuclear genes to infer population-level processes (Schaal 2000) such as speciation by peripheral isolation.

This research revealed a high degree of variation between alleles, loci and individuals in both *Adh1* and *Adh2* datasets. *Monarda punctata* sequences were widely distributed across both phylogenies and *M. humilis, M. fruticulosa, M. maritima* and *M. viridissima* sequences derived within this larger *M. punctata* clade. These results support the hypothesis that these narrow endemic *Monarda* speciated as peripheral isolates of *M. punctata*. In contrast, phylogenies suggest that *M. stanfieldii* speciated as sister to of *M. punctata*. The data suggest that *Monarda fruticulosa*, *M. humilis*, *M. maritima* and *M. viridissima* are neoendemics while *M. stanfieldii* is a paleoendemic. Likewise, the high degree of lineage sorting and noncoalescence in the dataset suggests that these species diverged recently and rapidly. Despite the lack of phylogenetic distinction between these species they have remained morphologically, geographically and phenologically distinct.

Adh1 Sequence Alignment
~1200 nucleotides in length

P. tenuifolium 86-4	GCAGGGTATGCA-NCATCAATCTTTCACAAAAATCTTGAATTTTTGAT	TTAGCATTTCTGAGTATATAT-NACAAATTGTAATACACTTACAGAAT
P. loomisii 66-3	GCAGGGTATGCA-NCATCAATCTTTCTCAAGAATCTTGAATTTTTTAT	TTAACATTTCTGAGTATATCT-NACAAATTGTAATACACATACAGAAT
P. muticum 52-4	GCAGGGTATGCA-NCATCAGTCTTTCTCAAGAATCTTGAATTTTTTAT	TTAACATTTCTGAGTATATCT-NACAAATTGTAATACACATACAGAAT
M. clinopodioides 2310-1	TCAGGGTATGCA-NGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGT-NNNNNNNNNNAATTGTAATACACATACAGAAT
M. clinopodioides 2310-2	TCAGGGTATGCA-NGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGT-NNNNNNNNNNAATTGTAATACACATACAGAAT
M. fruticulosa TX 1920-1	TCAGGGTATGCACAGATCAATCATTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATAT-NACAAAT?GTAATACACATACAGAAT
M. fruticulosa TX 1920-2	TCAGGGTACGCACAGATCAATCATTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATAT-NACAAATTGTAATACACATACAGAAT
M. fruticulosa TX 2301	TCAGGGTATGCACAGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATAT-NACAAATTGTAATACACATACAGAAT
M. fruticulosa TX 2317	TCAGGGTATGCACAGATCAATCATTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATAT-NACAAATTGTAATACACATACAGAAT
M. punctata NM 2307-1	TCAGGGTATGCACAGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATATATACAAATTGTAATACACATACAGAAT
M. punctata NM 2307-2	NNNNNNTATGCG-NCATAAATCTTTCTCAAGATTCTTGAATTTTTGAT	T-AGCATTTCTGAGTATATAT-NACAAATTGCAATACACATACAGAAT
M. punctata NM 2307-3	NNNNNNNNNNNNNNNNNNAATCTTTCTCAAGATTCTTGAATTCTTGAT	TAAGCATTTCTGAGTATATAT-NACAAATTGTAATACACATACAGAAT
M. humilis NM 2176	TCAGGGTATGCACGGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	T-AGCATTTCTGAGTATATAT-NACAAATTGTAATACGCATACAGAAT
M. maritima TX 2314	TCAGGGTATGCACAGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATAT-NACAAATTGTAATACACATACAGAAT
M. maritima TX 2319	TCAGGGTATGCACAGATCAATC?TTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATAT-NACAAATTGTAATACACATACAGAAT
M. maritima TX 2318-1	TCAGGGTATGCACAGATCAATCATTCTCAAGATTCTTGAATTCTTGAT	TAAGCATTTCTGAGTATATAT-NACAAATTGTAATACACATACAGAAT
M. maritima TX 2318-2	TCAGGGTATGCACAGAACAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATAT-NACAAATTGTAATACACATACAGAAT
M. stanfieldii TX 2367-1	TCAGGGTATGCACAGATCAATCATTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATAT-NACGAATTGTAATACACATACAGAAT
M. stanfieldii TX 2367-2	TCAGGGTATGCACAGATCAATCATTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATAT-NACGAATTGTAATACACATACAGAAT
M. stanfieldii TX 2239-1	TCAGGGTGTGCACAGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATAT-NACAAATTGTAATACACATACAGAAT
M. stanfieldii TX 2239-2	TCAGGGTATGCACAGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATAT-NACAAATTGTAATACACATACAGAAT
M. stanfieldii TX 2369-1	TCAGGGTATGCACAGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATATATACAAATCGTAATACACATACAGAAT
M. viridissima TX 2055	TCAGGGTATGCACAGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAG?ATATAT-NACAAATTGTAATACACATACAGAAT
M. viridissima TX 2441-1	TCAGGGTATGCACAGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATAT-NACAAATTGTAATACACATACAGAAT
M. viridissima TX 2444	TCAGGGTATGCACAGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TAAGCATTTCTGAGTATATAT-NCCAAATTGTAATACACATACAGAAT
M. viridissima TX 2441-2	TCAGGGTATGCACAGATCAATCATTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATAT-NACAAATTGTAATACACATACAGAAT
M. punctata AR 2060	TCAGGGTATGCACAGATCAATCATTCTCAAGATTCTTGAATTCTTGAT	TAAGCATTTCTGAGTATATAT-NACAAATTGTAATACACATACAGAAT
M. punctata TX 2468	TCAGGGTATGCACAGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGTGTAAATAT-NACAAATTGTAATACGCATACAGAAT
M. punctata FL 2303-1	TCAGGGTATGCACAGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGTGTATATAT-NACAAATTGTAATACGCATACAGAAT
M. punctata FL 2303-2	NNNNNNNNNNNNCAGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATAT-NACAAATTGTAATACGCATACAGAAT
M. punctata MO 2172	TCAGGGTATGCACAGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATAT-NACAAATTGTAATACGCATACAGAAT
M. punctata OK 2398	TCAGGGTATGCA-NGATCAATCTTTCTCAAGATTCTTGAATTCTTGAA	T-AGCATTTCTGAGTATATAT-NACAAATTGCAATACACATACAGAAT
M. punctata TX 2396	CCAGGGTATGCG-NCATAAATCTTTCTCAAGATTCTTGAATTTTTGAT	TAAGCATTTCTGAGTATGTAT-NACAAATTGTAATACGCATACAGAAT
M. punctata LA 2305	GCAGGGTACGCA-NCATCAATCTTTCTCATGATTCTTGAATTTTTGAT	TAAGCATTTCTGAGTATATAT-N?CAAATTGTAATACGCATACAGAAT
M. punctata FL 2397	TCAGGGTATGCA-NGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTAAATAT-NACAAATTGTAATACACATACAGAAT
M. punctata DE 1937	TCAGGGTATGCACAGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTAAATAT-NACAAATTGTAATACACATACAGAAT
M. punctata MI 2048-1	TCAGGGTATGCACAGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTATATAT-NACAAATTGTAATACGCATACAGAAT
M. punctata MI 2048-2	TCAGGGTATGCA-NGATCAATCTTTCTCAAGATTCTTGAATTCTTGAA	TTAGCATTTCTGAGTATATAT-NACAAATTGTAATACGCATACAGAAT
M. punctata NJ 2189-1	TCAGGGTATGCACAGATCAATCTTTCTCAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTAAATAT-NACAAATTGTAATACACATACAGAAT
M. punctata NJ 2189-2	TCAGGGTATGCACAGATCAATCTTTCACAAGATTCTTGAATTCTTGAT	TTAGCATTTCTGAGTAAATAT-NACAAATTGTAATACACATACGGAAT

P. tenuifolium 86-4	TGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
P. loomisii 66-3	TGTCGAGAGCGTGGGCGAAGGCGTGACGGAGCAGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
P. muticum 52-4	TGTCGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. clinopodioides 2310-1	TGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. clinopodioides 2310-2	TGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAAAGCAGAGAATGTGCTCACTGTAA
M. fruticulosa TX 1920-1	TGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGGGAATGTGCTCACTGTAA
M. fruticulosa TX 1920-2	TGTGGAGAGCGTGGGCGAAGGCGTGACGGA?CTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGGGAATGTGCTCACTGTAA
M. fruticulosa TX 2301	TGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAAAATGTGCTCACTGTAA
M. fruticulosa TX 2317	TGTGGAGAGTGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGGGAATGTGCTCACTGTAA
M. punctata NM 2307-1	CGTGGAGAGCATGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. punctata NM 2307-2	CGTG?AGAGCGTGG-CGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. punctata NM 2307-3	CGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. humilis NM 2176	CGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. maritima TX 2314	TGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. maritima TX 2319	TGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAG?GAATGTGCTCACTGTAA
M. maritima TX 2318-1	TGTGGAGAGCGTGG-CGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGGGAATGTGCTCACTGTAA
M. maritima TX 2318-2	CGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. stanfieldii TX 2367-1	TGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. stanfieldii TX 2367-2	TGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. stanfieldii TX 2239-1	CGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGCGAATGCAGAGAATGTGCTCACTGTAA
M. stanfieldii TX 2239-2	CGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGCGAATGCAGAGAATGTGCTCACTGTAA
M. stanfieldii TX 2369-1	CGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGCGAATGCAGGGAATGTGCTCACTGTAA
M. viridissima TX 2055	CGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGCGAATGCAGAGAATGTGCTCACTGTAA
M. viridissima TX 2441-1	CGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. viridissima TX 2444	CGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGCGAATGCAGAGAATGTGCTCACTGTAA
M. viridissima TX 2441-2	TGTGGAGAGCGAGGGCGAAGGCGTGACGGAGCTGTTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGGGAATGTGCTCACTGTAA
M. punctata AR 2060	TGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGGGAATGTGCTCACTGTAA
M. punctata TX 2468	CGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGGTCA	CGTTCTTCCGGTGTTCGCCGGCGAATGCAGAGAATGTGCTCACTGTAA
M. punctata FL 2303-1	CGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. punctata FL 2303-2	CGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. punctata MO 2172	CGTGGAGAGCGTGGGCGAAGGCGCGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. punctata OK 2398	CGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. punctata TX 2396	CGTG?AGAGCGTGGGCGAAGGCGTGACGGAGCTG?TCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. punctata LA 2305	CGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTG?AA
M. punctata FL 2397	CGTGGAGAACGTGGGCGAAGGCGTGACGGAGCTG?TCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCACTGTAA
M. punctata DE 1937	CGTGGAGAGCGTGGG?GAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGCGAATGCAGAGAATGTGCTCACTGTAA
M. punctata MI 2048-1	CGTGGAGAGCGTGGGTGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGCGAATGCAGAGAATGTGCTCACTGTAA
M. punctata MI 2048-2	CGTGGAGAACGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCACACTGTAA
M. punctata NJ 2189-1	CGTGGAGAGCGTGGGTGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGCGAATGCAGAGAATGTGCTCACTGTAA
M. punctata NJ 2189-2	CGTGGAGAGCGTGGGTGAAGGCGTGACGGAGCTGGTCCCCGGCGATCA	CGTTCTTCCGGTGTTCACCGGCGAATGCAGAGAATGTGCTCACTGTAA

P. tenuifolium 86-4	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACTGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
P. loomisii 66-3	ATCCGAAGAGAGCAAAATGTGCAGCCTCCTCAGAATCAACGCTGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
P. muticum 52-4	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACTGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. clinopodioides 2310-1	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACCGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. clinopodioides 2310-2	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACCGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. fruticulosa TX 1920-1	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTCATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. fruticulosa TX 1920-2	ATCCGAAGAGAGCAATATGTGCAG?CTCCTCAGAATCAACACGGAGAG	GGGAGTCATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. fruticulosa TX 2301	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGA?AG	GGGAGTCATGATCAGTGATGGAAAATCAAGATTCTCCATCAAGGGAAA
M. fruticulosa TX 2317	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTCATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. punctata NM 2307-1	ATCCGCAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. punctata NM 2307-2	ATCCGCAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACTGAGAG	GGGAGTCATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. punctata NM 2307-3	ATCCGCAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. humilis NM 2176	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. maritima TX 2314	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTCATGATCAGTGATGGAAAATCAAGATTCTCCATCAAGGGAAA
M. maritima TX 2319	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTCATGATCAGTGATGG?AAATCAAGATTCTCCATCAAGGGAAA
M. maritima TX 2318-1	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTCATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. maritima TX 2318-2	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTCATGATCAGTGATGGAAAATCAAGATTCTCCATCAAGGGAAA
M. stanfieldii TX 2367-1	ATCCGCAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTCATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. stanfieldii TX 2367-2	ATCCGCAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTCATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. stanfieldii TX 2239-1	ATCCGCAGAGAGCAACATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTCATGATCAGTGACGGGAAATCAAGATTCTCCATCAAGGGAAA
M. stanfieldii TX 2239-2	ATCCGCAGAGAGCAACATGTGCAGCCTCCTCGGAATCAACACGGAGAG	GGGAGTGATGATCGGTGACGGGAAATCAAGATTCTCCATCAAGGGAAA
M. stanfieldii TX 2369-1	ATCCGCAGAGAGCAACATGTGCAGCCTCCTCAGAATCAACACGGATAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. viridissima TX 2055	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCGACACGGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. viridissima TX 2441-1	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. viridissima TX 2444	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATAGACACGGAGAG	GGGAGTGATGATCGGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. viridissima TX 2441-2	ATCCGAAGAGAGCAATATGC?CAGCCTCCTCAGAATCAACACGGAGGG	GGGAGTCATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. punctata AR 2060	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTCATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. punctata TX 2468	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCGACACGGAGAG	GGGAGTGATGATCAGTGATGGGAA?TCAAGATTCTCCATCAAGGGAAA
M. punctata FL 2303-1	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCGACACGGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. punctata FL 2303-2	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAGCACGGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. punctata MO 2172	ATCCGGAGAGAGCAATATGTGCAGCCTCCTCAGAATCGACACGGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. punctata OK 2398	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. punctata TX 2396	ATCCGCAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACTGAGAG	GGGAGTCATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. punctata LA 2305	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTGATGATCAGTGATGGGAATTCA-GAATCTCCATCAAGGGAAA
M. punctata FL 2397	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCGACACGGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. punctata DE 1937	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCGACACTGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAG?TTCTCCATCAAGGGAAA
M. punctata MI 2048-1	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCGACACTGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. punctata MI 2048-2	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCAACACGGAGAG	GGGAGTGATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. punctata NJ 2189-1	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCGACACTGAGAG	GGGAG?GATGATCAGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA
M. punctata NJ 2189-2	ATCCGAAGAGAGCAATATGTGCAGCCTCCTCAGAATCGACACTGAGAG	GGGAGTGATGATCGGTGATGGGAAATCAAGATTCTCCATCAAGGGAAA

P. tenuifolium 86-4	TCCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCTAAGATCAACCCTCTGGCCCCACTCGT
P. loomisii 66-3	ACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTACACTGT	TCTACACGTTGGCTGTGTTGCTAAGATTAACCCTCTGGCCCCACTCGA
P. muticum 52-4	ACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTACACTGT	TCTACATGTTGGCTGTGTTGCTAAGATTAACCCTCTGGCCCCACTCGA
M. clinopodioides 2310-1	ACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. clinopodioides 2310-2	ACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. fruticulosa TX 1920-1	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. fruticulosa TX 1920-2	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. fruticulosa TX 2301	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. fruticulosa TX 2317	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. punctata NM 2307-1	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. punctata NM 2307-2	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGTGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. punctata NM 2307-3	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. humilis NM 2176	AC?TGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. maritima TX 2314	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACCGT	TCTTCATGTTGGCTGTGTCGCCAAGATCAACCCTCTGGCCCCACTTGA
M. maritima TX 2319	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACAC?GT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. maritima TX 2318-1	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. maritima TX 2318-2	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACCGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAGCCCTCTGGCCCCGCTTGA
M. stanfieldii TX 2367-1	ACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGCGAGTACACTGT	TCTTCACGTTGGATGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. stanfieldii TX 2367-2	ACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGCGAGTACACTGT	TCTTCACGTTGGATGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. stanfieldii TX 2239-1	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. stanfieldii TX 2239-2	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCGACCCTCTGGCACCACTTGA
M. stanfieldii TX 2369-1	ACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGACCAACC-TCTGGCCCCACTTGA
M. viridissima TX 2055	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. viridissima TX 2441-1	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. viridissima TX 2444	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTTTGGCCCCACTTGA
M. viridissima TX 2441-2	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTATACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. punctata AR 2060	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. punctata TX 2468	ACCCGTTTACCATTTTCTTGGAACT?CCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCGACCCTCTGGCCCCACTTGA
M. punctata FL 2303-1	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. punctata FL 2303-2	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. punctata MO 2172	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. punctata OK 2398	ACCCGTTTACCATTTTCTTGGAACTTCCACCTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. punctata TX 2396	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGTGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. punctata LA 2305	ACCCGTT?ACAATTTCCT?GGAA?TTCCAC-TTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. punctata FL 2397	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGTGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. punctata DE 1937	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. punctata MI 2048-1	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. punctata MI 2048-2	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. punctata NJ 2189-1	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACCCTCTGGCCCCACTTGA
M. punctata NJ 2189-2	ACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGCGAGTACACTGT	TCTTCATGTTGGCTGTGTTGCCAAGATCAACC?TCTGGCCCCACTTGA

P. tenuifolium 86-4	TAAAGTCTGCATCCTGAGCTGCGGAATTTCCACTGGTATTCATCGTTT	CCTTTGATGATTT-CTTTTC-NNNN-NNNNNNNNNNTTGATGAGGGA-
P. loomisii 66-3	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTTGATGATTTTCTTTTC-NNNN-NNNNNNNNNNTTGATGAGGGA-
P. muticum 52-4	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTTGATGATTTTCTTTTC-NNNN-NNNNNNNNNNTTGATGAGGGA-
M. clinopodioides 2310-1	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CATTTAAAGATTTTCTTTTCTTTTCGTTTCTTTT-CTTGATG-GGGA-
M. clinopodioides 2310-2	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CATTTAAAGATTTTCTTTTCTTTTCGTTTCTTTT-CTTGATG-GGGA-
M. fruticulosa TX 1920-1	TAAAGCCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGCTT	CATCT-AAGATTTTCTTTTC-NNNNGTTTCTCTTTCTTGATG-GGGA-
M. fruticulosa TX 1920-2	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGCTT	CATTT-AAGATTTTCTTTTC-NNNNGTCTCTTT?TCTTGATG-GGGA-
M. fruticulosa TX 2301	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTCGATGATTTTCTTTTC-NNNNGTTTCTTTT-CTTGATG-GGGA-
M. fruticulosa TX 2317	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CATTTAAAGATTTTTTTTTC-NNNNGTTTCTTTT-CTTGATG-GGCA-
M. punctata NM 2307-1	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTTGATGATTTTCTTTTC-NNNN-NNNNNNNNNNTTGATG-GGGAA
M. punctata NM 2307-2	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTTGATGATTTTCTTTTC-NNNNGTTTCTTTT-CTTGATG-GGGA-
M. punctata NM 2307-3	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTACTCATCGTTT	CCTTTGATGATTTTCTTTTC-NNNN-NNNNNNNNNNTTGATG-GGGAA
M. humilis NM 2176	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCTCTGGTATTCATCGTTT	CCTTTGATGATTTTCTTTTC-NNNN-NNNNNNNNNNTTGATG-GGGAA
M. maritima TX 2314	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTCGATGATTCTCTTTTC-NNNNGTTTCTTTT-CTTGATG-GGGA-
M. maritima TX 2319	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	C?TTC?A?GATTCTCTTTTC-NNNNGTTTCTTTT-CTTGATG-GGGA-
M. maritima TX 2318-1	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CATTTAAAGATTTTTTTTTC-NNNNGTTTCTTTT-CTTGATG-GGCA-
M. maritima TX 2318-2	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTCGATGATTCTCTTTTC-NNNNGTTTCTTTTTCTTGATG-GGGA-
M. stanfieldii TX 2367-1	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTTGATGATTTTCTTTTC-NNNN-NNNNNNNNNNTTGATG-GGGAA
M. stanfieldii TX 2367-2	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTTGATGATTTTCTTTTC-NNNN-NNNNNNNNNNTTGATG-GGGAA
M. stanfieldii TX 2239-1	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CATTTGATGATTTTCTTTTC-NNNNGTTTCTTTT-CTTGATG-GGGA-
M. stanfieldii TX 2239-2	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACCGGTATTCATCGTTT	CATTTAAAGATTTTCTTTTC-NNNNGTTTCTTTT-CTTGATG-GGGA-
M. stanfieldii TX 2369-1	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CATTTAAAGATTTTCTTTTC-NNNNGTTTCTTTT-CTTGATG-GGGA-
M. viridissima TX 2055	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTTGATGATTTTCTTTTC-NNNNGTCTCCTTT-CTTGATG-GGGA-
M. viridissima TX 2441-1	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTCGATGATTTTCTTTTC-NNNNGTTTCTTTT-CTTGATG-GGGA-
M. viridissima TX 2444	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTTGATGATTTTCTTTTC-NNNNGTCTCCTTT-CTTGATG-GGGA-
M. viridissima TX 2441-2	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGATT	CATTTAAAGATTTTCTTTTC-NNNNGTTTCTTTT-CTTGATG-GGGA-
M. punctata AR 2060	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CATTTAAAGATTTTTTTTTC-NNNNGTTTCTTTT-CTTGATG-GGCA-
M. punctata TX 2468	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTTGATAATTTTCCTTTC-NNNNGTCTCCTTT-CTTGATG-GGGA-
M. punctata FL 2303-1	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTAT?CATCGTTT	CCTTCGATGATTCTCTCTTC-NNNNGTTTCTTTT-CTTGATG-GGGA-
M. punctata FL 2303-2	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATCCATCGTTT	CCTTCGATGATTCTCTCTTC-NNNNGTTTCTTTTTCTTGATG-GGGA-
M. punctata MO 2172	TAAAGTCTGCATTCTGAGCTACGGAATCTCCACTGGTATCCATCGTTT	CCTTCGATGATTCTCTTTTC-NNNNGTTTCTTTTTCTTGATG-GGGA-
M. punctata OK 2398	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATCCATCGTTT	CCTTCGATGATTCTCTTTTC-NNNNGCTTCTTTTTCTTGATG-GGGA-
M. punctata TX 2396	CAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTTGATGATTTTCTTTTC-NNNNGTTTCTTTT-CTTGATG-GGGA-
M. punctata LA 2305	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATCCATCGTTT	CCTTCGATGATTCTCTTTTC-NNNNGTTTCTTTTTCTTGATG-GGGA-
M. punctata FL 2397	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATCCATCGTTT	CCTTCGATGATTCTCTTTTC-NNNNGTTTCTTTTNCTTGATG-GGGA-
M. punctata DE 1937	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTTGATGATTTTCTTTTC-NNNNGTCTCCTTT-CTTGATG-GGGA-
M. punctata MI 2048-1	TAAAGTCCGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTTGATGATTTTCTTTTC-NNNNGTCTCCTTT-CTTGATG-GGGA-
M. punctata MI 2048-2	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTCGATGATTCTCTTTTC-NNNNGTTTCTTTTTCTTGATG-GGGA-
M. punctata NJ 2189-1	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTTGATGATTTTCTTTTC-NNNNGTCTCCTTT-CTTGATG-GGGA-
M. punctata NJ 2189-2	TAAAGTCTGCATTCTGAGCTGCGGAATCTCCACTGGTATTCATCGTTT	CCTTTGATGATTTTCTTTTC-NNNNGTCTCCTTT-CTTGATG-GGGA-

P. tenuifolium 86-4	TCTGAAATTAATGAATTGAAGTAGTAATGTTT-GGATTGAATTCTTGT	TCTGAAATTAATGAATTGAAGTAGTAATGTTT-GGATTGAATTCTTGT
P. loomisii 66-3	TCTGAAATTAATGAGTTGAAGTAGTAATGTTT-GGACTGGATTCTTGT	TCTGAAATTAATGAGTTGAAGTAGTAATGTTT-GGACTGGATTCTTGT
P. muticum 52-4	TCTGAAATTAATGAATTGAAGTAGTAATGTTT-GGACTGGATTCTTGT	TCTGAAATTAATGAATTGAAGTAGTAATGTTT-GGACTGGATTCTTGT
M. clinopodioides 2310-1	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT
M. clinopodioides 2310-2	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT
M. fruticulosa TX 1920-1	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT
M. fruticulosa TX 1920-2	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT
M. fruticulosa TX 2301	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT
M. fruticulosa TX 2317	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT
M. punctata NM 2307-1	TCTGAAATTAATGAATTGAAGTAGTAATGTTTTGGATTGGATCCTTGT	TCTGAAATTAATGAATTGAAGTAGTAATGTTTTGGATTGGATCCTTGT
M. punctata NM 2307-2	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT
M. punctata NM 2307-3	TCTGAAATTAATGAATTGAAGTAGTAATGTTTTGGATTGGATCCTTGT	TCTGAAATTAATGAATTGAAGTAGTAATGTTTTGGATTGGATCCTTGT
M. humilis NM 2176	TCTGAAATTTATGAATTGAAGTAGTAATGTTTTGGATTGGATCCTTGT	TCTGAAATTTATGAATTGAAGTAGTAATGTTTTGGATTGGATCCTTGT
M. maritima TX 2314	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT
M. maritima TX 2319	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT
M. maritima TX 2318-1	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT
M. maritima TX 2318-2	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT
M. stanfieldii TX 2367-1	TCTGAAATTAATGAATTGAAGTAGTAATGTTTTGAATTGGATCCTTGT	TCTGAAATTAATGAATTGAAGTAGTAATGTTTTGAATTGGATCCTTGT
M. stanfieldii TX 2367-2	TCTGAAATTAATGAATTGAAGTAGTAATGTTTTGAATTGGATCCTTGT	TCTGAAATTAATGAATTGAAGTAGTAATGTTTTGAATTGGATCCTTGT
M. stanfieldii TX 2239-1	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT
M. stanfieldii TX 2239-2	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT
M. stanfieldii TX 2369-1	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT
M. viridissima TX 2055	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT
M. viridissima TX 2441-1	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT
M. viridissima TX 2444	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT
M. viridissima TX 2441-2	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT
M. punctata AR 2060	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT
M. punctata TX 2468	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT
M. punctata FL 2303-1	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTG?ATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTG?ATTCTTGT
M. punctata FL 2303-2	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT
M. punctata MO 2172	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT
M. punctata OK 2398	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT
M. punctata TX 2396	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT
M. punctata LA 2305	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT
M. punctata FL 2397	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT
M. punctata DE 1937	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT
M. punctata MI 2048-1	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCT-GT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCT-GT
M. punctata MI 2048-2	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGAATTCTTGT
M. punctata NJ 2189-1	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT
M. punctata NJ 2189-2	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT	NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNTTGGATTCTTGT

P. tenuifolium 86-4	GTTT-AGGGCTTGGTGCTACTTTGAATGTTGCTAG-CCATTCAAGG-T	TCTTCTGTTG-NCTGTTTT-GGGCTTGGAGCTGTAGGACTTGGTGTAT
P. loomisii 66-3	GTTT-AGGGCTTGGTGCTACTTTGAATGTTGCTAA-CCATTCAAGG-T	TCTTCTGTTG-NCTGTTTT-GGGCTTGGAGCTGTTGGACTTGGTGTAT
P. muticum 52-4	GTTT-AGGGCTTGGTGCTACTTTGAATGTTGCTAAGCCATTCAAGG-T	TCTTCTGTTG-NCTGTTTT-GGGCTTGGAGCTGTTGGACTTGGTGTAT
M. clinopodioides 2310-1	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCTTTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. clinopodioides 2310-2	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCTTTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. fruticulosa TX 1920-1	GTTT-AGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. fruticulosa TX 1920-2	GTTT-AGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. fruticulosa TX 2301	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. fruticulosa TX 2317	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTGCTCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. punctata NM 2307-1	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. punctata NM 2307-2	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. punctata NM 2307-3	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. humilis NM 2176	GTTTTAGGGCTCGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACT-AGTG-AT
M. maritima TX 2314	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAA?CCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. maritima TX 2319	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. maritima TX 2318-1	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGACTTGGGGCTGTTGGACTTGGTGTAT
M. maritima TX 2318-2	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAA-CCATTCAAGG-T	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTA?
M. stanfieldii TX 2367-1	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. stanfieldii TX 2367-2	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. stanfieldii TX 2239-1	GTTTTAGGGCTTGGTGCCACTTTGAATGTGGCTAAACCATTCAAGGGT	TCCTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. stanfieldii TX 2239-2	GTTTTAGGGCTTGGTGCCACTTTGAATGTGGCTAAACCATTCAAGGGT	TCCTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGCGTAT
M. stanfieldii TX 2369-1	GTTTTAGGGCTTGGTACCACTTTGAATGTGGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGCGTAT
M. viridissima TX 2055	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. viridissima TX 2441-1	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGATGGACTTGGTGTAT
M. viridissima TX 2444	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTTAACCATTCAANGG-	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGNGTAT
M. viridissima TX 2441-2	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. punctata AR 2060	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. punctata TX 2468	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATCCAAGGGT	TCTTCTGTTG-NCTTTTTTTGGGCTCGGGGCTGTTGGACTTGGTGTAT
M. punctata FL 2303-1	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTTAACCATTCAAGGGT	TCTTCTG-NNNNGTTTTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. punctata FL 2303-2	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. punctata MO 2172	GTTTTAGGGCTTGGTACTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTATGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. punctata OK 2398	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. punctata TX 2396	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. punctata LA 2305	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. punctata FL 2397	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. punctata DE 1937	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. punctata MI 2048-1	GTTT-AGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. punctata MI 2048-2	GTTT-AGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. punctata NJ 2189-1	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT
M. punctata NJ 2189-2	GTTTTAGGGCTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGT	TCTTCTGTTG-NCTATTTTTGGGCTTGGGGCTGTTGGACTTGGTGTAT

P. tenuifolium 86-4	GTTTTTGAATCCTTTACTGATCAATTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTTTGATATTTTTTTGATTTTCTTTTTTNN-
P. loomisii 66-3	GTTTTTTAATCCTTTACTGGTTAATTAAAACC-NNNNNNNATTGAGGA	AAGATGGATAGAAGAGATTCTGATATTTTCTTGATTTTTTTTTTTNN-
P. muticum 52-4	GTTTTTTAATCCTT-ACTGATTAATTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGAGATTTTGATATTTTCTTGATTTTCTTTTTTTTT
M. clinopodioides 2310-1	GTTCTTGAATCCTTTACTGA-NNNNNNNNNN-NNNNNNN-NNNNGGA	AAGATGGATAGAAGGGATTGTGATATTTTCTTGATTTTCTTTTTTT-
M. clinopodioides 2310-2	GTTCTTGAATCCTTTACTGA-NNNNNNNNNN-NNNNNNN-NNNNGGA	AAGATGGATAGAAGGGATTGTGATATTTTCTTGATTTTCTTTTTTT-
M. fruticulosa TX 1920-1	GTTTTTGAATCCTTTACTGATTAATTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTGTGATATTTTCTTGATTTCCTTTTTTTN-
M. fruticulosa TX 1920-2	GTTTTTGAATCCTTTACTGATTAATTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTGTGATATTTTCTTGATTTCCTTTTTTTN-
M. fruticulosa TX 2301	GTTTTTGAATCCTTTACTGATTAATTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTGTGATATTTTCTCGATTTCCCTTTTTTT-
M. fruticulosa TX 2317	GTTTTTGAATCCTTTACTGATTAGTTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTGTGATATTTTCTTGATTTTCTTATTTTT-
M. punctata NM 2307-1	GTTTTTGAATCCTTTACTGATTAGTTAAA-CC-NNNNNNNATGGAGGA	AAGATGGATAGAAGGGATTGTGATATTTTCTTGATTTCCTTTTTTTT-
M. punctata NM 2307-2	GTTTTTGAATCCTTTACTG-NTAATTAAAACC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTTTGATATTTTCTTGATTTTCTTTTTTTT-
M. punctata NM 2307-3	GTTTTTGAATCCTTTACTGATTAGTTAAA-CC-NNNNNNNATGGAGGA	AAGATGGATAGAAGGGATTGTGATATTTTCTTGATTTCCTTTTTTTT-
M. humilis NM 2176	GTTTT-GAATCTTT-ACTGATTAGTTAAA-CC-NNNNNNNATGGAGGA	AAGATG-ATAGAAGGGATTGTGATATTTTCTTGATTTCCTTTTTTTT-
M. maritima TX 2314	GTTTTTGAATCCTTTACTGATTAGTTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTGTGATATTTTCTTGATTTTCTTATTTTT-
M. maritima TX 2319	GTTTTTGAATCCTTTACTGATTAGTTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTGTGATATTT-CTTGATTTTCTTATTTTT-
M. maritima TX 2318-1	GTTTTTGAATCCCTTACTGATTAGTTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTGTGATATTTTCTTGATTTTCTTATTTTT-
M. maritima TX 2318-2	GTT?TTGAATCCTTTACTGATTAGTTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTGTGATATTTTCT?GATTTCCTTTTTTTT-
M. stanfieldii TX 2367-1	GTTTTTGAATCCTTTACTGATTAATTAAAACC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTGTGATATTTTCTTGATTTTCTTTTTTTT-
M. stanfieldii TX 2367-2	GTTTTTGAATCCTTTACTGATTAATTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTGTGATATTTTCTTGATTTTCTTTTTTTT-
M. stanfieldii TX 2239-1	GTTTTTGAATCCTTTACTGATTAATTAAA-TC-NNNNNNNATTCAGGA	AAGATGGATAGAAGGGATTGTGTTATTTTCTTGATTTTCCTTTTTTT-
M. stanfieldii TX 2239-2	GTTTTTGAATCCTTTACTGATTAATTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTTTGAAACTTTCTTGATTTCCTTTTTGTT-
M. stanfieldii TX 2369-1	GTTTTTGAATCCTTTACTGATTAGTTAAAACCATTAAGCCATTAAGGA	AAGATGGATAGAAGGGATTGTGTTATTTTCTTGATTTCCTTTTTTTT-
M. viridissima TX 2055	GTTTTTGAATCCTTTACTGATTAGTTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATT-TGATATTTTCTTGATTTTTTTTTTTTT-
M. viridissima TX 2441-1	GTTTTTGAATCCTTTACTGATTAGTTAAA-CC-NNNNNNNATGGAGGA	AAGATGGATAGAAGGGATTGTGATATTTTCTTGATTTACTTTTTTTT-
M. viridissima TX 2444	GTTTTTGAATCCTTTACTGATTAGTTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATT-TGATATTTTCTTGATTTTTTTTTTTTT-
M. viridissima TX 2441-2	GTTTTTGAATCCTTTACTGATTAATTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTGTGATATTTTCTTGATTTCCTTTTTTTT-
M. punctata AR 2060	GTTTTTGAATCCTTTACTGATTAGTTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTGTGATATTTTCTTGATTTTCTTATTTTT-
M. punctata TX 2468	GTTTTCGAATCCTTTACTGATTAATTAAA-CC-NNNNNNNACTGAGGA	AAGATGGATAGAAGGGATTGTGATATTTTCTTGATTTCCTTTTTTTT-
M. punctata FL 2303-1	GTTTTTGAATCCTTTACTG-NTAATTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTTTGATATTTTCTTGATTTTCTTTTTTTT-
M. punctata FL 2303-2	GTTTTTGAATCCTTTACTG-NTAATTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTTTGATATTTTCTTGATTTTCTTTTTTTT-
M. punctata MO 2172	GTTTTTGAATCCTTTACTG-NTAATTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTTTGATATTTTCTTGATTTTCTTTTTTTT-
M. punctata OK 2398	GTTTTTGAATCCTTTACTG-NTAATTAAAACC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTTTGATATTTTCTTGATTTTCTTTTTTTT-
M. punctata TX 2396	GTTTTTGAATCCTTTACTG-NTAATTAAAACC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTTTGATATTTTCTTGATTTTCTTTTTTTN-
M. punctata LA 2305	GTTTTTGAATCCTTTACTG-NTAATTAAAACC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTTTGTGATTTTCTTGATATTCTTTTTTTN-
M. punctata FL 2397	GTTTTTGAATCCTTTACTG-NTAATTAAAACC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTTTGATATTTTCTTGATTTTCTTTTTTTT-
M. punctata DE 1937	GTTTTTGAATCCTTTTCTGATTAGTTAAA-CC-NNNNNNNATGGAGGA	AAGATGGATAGAAGGCATTGTGATATTTTCTTGATTTCCTTTTATTT-
M. punctata MI 2048-1	GTTTTTGAATCCTTTACTGATTAGTTAAA-CC-NNNNNNNATGGAGGA	AAGATGGATAGAAGGCATTGTGATATTTTCTTGATTTCCTTTTATTT-
M. punctata MI 2048-2	GTTTTTGAATCCTTTACTG-NTAATTAAA-CC-NNNNNNNATTGAGGA	AAGATGGATAGAAGGGATTTTGATATTTTCTTGATTTCTTTTTTTNN-
M. punctata NJ 2189-1	GTTTTTGAATCCTTTACTGATTAGTTAAA-CC-NNNNNNNATGGAGGA	AAGATGGATAGAAGGCATTGTGATATTTTCTTGATTTCCTTTTATTT-
M. punctata NJ 2189-2	GTTTTTGAATCCTTTACTGATTAGTTAAA-CC-NNNNNNNATGGAGGA	AAGATGGATAGAAGGCATTGTGATATTTTCTTGATTTCCTTTTATTT-

P. tenuifolium 86-4	NNNNGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCAGNTGCT	TCAAGAGTAATTGGTGTGG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
P. loomisii 66-3	NNNGGGTGTGATT-TTAGGCTGCAGAAGGAGCCAGATTGGCTGGTGCT	TCAAGAGTAATTGGTGTGG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
P. muticum 52-4	TT-NGGTGTGATT-TTAGGCTGCAGAAGGAGCCAGATTGGCTGGTGCT	TCAAGAGTAATTGGTGTGG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. clinopodioides 2310-1	NGGGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCAAGAGTAATTGGTGTGG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. clinopodioides 2310-2	NGGGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCAAGAGTAATTGGTGTGG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. fruticulosa TX 1920-1	NNNGGGTGTGATT-TTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. fruticulosa TX 1920-2	NNNGGGTGTGATT-TTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. fruticulosa TX 2301	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCAGGTGCT	TCGAGAGTAATTGGTGTGG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. fruticulosa TX 2317	NNNGGGTGTGATT-TTAGGCTGCAGAAGGAGCCAGATTAGCTGGTGCT	TCGAGAGTAATTGGTGTGG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. punctata NM 2307-1	NNGGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTAGCTGGTGCT	TCAAGAGTAATTGGTGTTG-ACAGGAGCTCTGCTAGGTTTGAAGAAGG
M. punctata NM 2307-2	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. punctata NM 2307-3	NNGGGGTGTGATTTTTAGGCTGCAGAAGGAGC?AGATTAGCTGGCTCT	TCAAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. humilis NM 2176	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTG-CTGGTGCT	TCAAGAGTAATTGGTGTAG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. maritima TX 2314	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTGG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. maritima TX 2319	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTGG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. maritima TX 2318-1	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTGG-ACAGGAACTCTGTTAGGTTTGAAGAAGG
M. maritima TX 2318-2	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCTGG?GCT	TCAAGAGTAATTGGTGTGG-ACAGGAACTCTGCTAGGTTTGAACAAGG
M. stanfieldii TX 2367-1	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCCAGATTAGCTGGTGCT	TCAAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. stanfieldii TX 2367-2	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCCAGATTAGCTGGTGCT	TCAAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. stanfieldii TX 2239-1	NNGGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCAGGTGCT	TCGAGAGTAATTGGTGTTGGACAGGAACTCTGATAGGTTTGAAGAAGG
M. stanfieldii TX 2239-2	NNGGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTAGCTGGTGCT	TCAAGAGTAATTGGTGTTG-ACAGGAACTCTGATAGGTTTGAAGAAGG
M. stanfieldii TX 2369-1	NNNGGGTGTGATTTTTAGGCTGCAG-NNNNNNNNNNNNNNNNGTGCT	TCGAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. viridissima TX 2055	NGGGGGTGTGATT-TTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. viridissima TX 2441-1	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCAGGTGCT	TCGAGAGTAATTGGTGTGG-ACAGGAACTCTGCTAGGTTTGGAGAAGG
M. viridissima TX 2444	NGGGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. viridissima TX 2441-2	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCAGGTGCT	TCGAGAGTAATTGGCGTGG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. punctata AR 2060	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAAATTGGCTGGTGCT	TCGAGAGTAATTGGTGTGG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. punctata TX 2468	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCAAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. punctata FL 2303-1	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. punctata FL 2303-2	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCA-GCAAGGCTGGTGCT	TCGAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. punctata MO 2172	NNNGGGTGTGATT-TTAG-CTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. punctata OK 2398	NNNNGGTGTGATTTTTAGGCTGCAGAAGGAGCCAGCAAGGCTGGTGCT	TCGAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. punctata TX 2396	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. punctata LA 2305	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. punctata FL 2397	NNNGGGTGTGATTTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. punctata DE 1937	NNNNGGTGTGATT-TTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTGG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. punctata MI 2048-1	NNNNGGTGTGATT-TTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTGG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. punctata MI 2048-2	NNNGGGTGTGATT-TTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTTG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. punctata NJ 2189-1	NNNNGGTGTGATT-TTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTGG-ACAGGAACTCTGCTAGGTTTGAAGAAGG
M. punctata NJ 2189-2	NNNNGGTGTGATT-TTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCT	TCGAGAGTAATTGGTGTGG-ACAGGAACTCTGCTAGGTTTGAAGAAGG

P. tenuifolium 86-4	GAATTTGTGAATACAAAAGACCACAACAAGCCCGTTCAAGAG-GTTTG	CTCTAGCTATTCCTCAATTAGTACAGTTCATTCATCATGCCCTCCATG
P. loomisii 66-3	GAATTTGTGAATACAAATGACCACAACAAGCCCGTTCAAGAG-GTTTG	CTCTAGCTATTCCTCAATTAGTACAATTCGTTCATCATGCCCTCCATG
P. muticum 52-4	GAATTTGTGAATACAAATGACCACAACAAGCCCGTTCAAGAG-GTTTG	CTCTAGCTATTCCTCGATTAGTACAATTCGTTCATCATGCCCTCCATG
M. clinopodioides 2310-1	GAATTTGTGAACTCAAATGAGCAGAACAAGCCCGTTCAAGAG-GTTTG	CTN-NNNNN-NNNNNNNNNNNNACAATTCATTCATCATGCCCTCCATG
M. clinopodioides 2310-2	GAATTTGTGAACTCAAATGAGCAGAACAAGCCCGTTCAAGAG-GTTTG	CTN-NNNNN-NNNNNNNNNNNNACAATTCATTCATCATGCCCTCCATG
M. fruticulosa TX 1920-1	GAATTTGTGAATTCAAATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. fruticulosa TX 1920-2	GAATTTGTGAATTC?AATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. fruticulosa TX 2301	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. fruticulosa TX 2317	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata NM 2307-1	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGT-CAAGAG-GTTTG	GTG-NNNNNT-CCTCAATTAGTACAATTCATTCATCATGCCCTCCAAG
M. punctata NM 2307-2	GAATTTGTGAATTCAGATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata NM 2307-3	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. humilis NM 2176	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. maritima TX 2314	GAATTTGTGAATTCAAAGGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. maritima TX 2319	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. maritima TX 2318-1	GAATTTGTGAATTCAAATGACCAGTACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. maritima TX 2318-2	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. stanfieldii TX 2367-1	GAATTTGTGAATTCAAATGAGCAGAACAAGCCCGTTCAAGAG-GTTTG	CTN-NNNNN-NNNNNNNNNNNNACAATTCATTCATCATGCCCTCCATG
M. stanfieldii TX 2367-2	GAATTTGTGAATTCAAATGAGCAGAACAAGCCCGTTCAAGAG-GTTTG	CTN-NNNNN-NNNNNNNNNNNNACAATTCATTCATCATGCCCTCCATG
M. stanfieldii TX 2239-1	GAATTTGTGAATTCAAATGAGCAGAGCAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCGATTAGTACAATTCATTCATCATGCCCTCCATG
M. stanfieldii TX 2239-2	GAATTCGTGAATTCAAATGACCAGAACAAGTCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. stanfieldii TX 2369-1	GAATTTGTGAATTCAAATGAACAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. viridissima TX 2055	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. viridissima TX 2441-1	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAAGGTTTG	CTN-NNNNN-NNNNNNNNNNNNACAATTCATTCATCATGCCCTCCATG
M. viridissima TX 2444	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAATAG-GTTTG	TTG-NNNNNTTCCCCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. viridissima TX 2441-2	GAATATGTGAATTCAAATGACCAGAACAAGCCCGTTCGAGAG-GTTTG	CTN-NNNNN-NNNNNNNNNNNNACAATTCATTCATCATGCCCTCCATG
M. punctata AR 2060	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata TX 2468	GAATTTGTGAATTCAAATGAGCAGAACAAGCCCGTTCAAGAG-GTTTG	CTN-NNNNN-NNNNNNNNNNNNACAATTCATTCATCATGCCCTCCATG
M. punctata FL 2303-1	GAATTTGTGAATTCAGATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TCG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata FL 2303-2	GAATTTGTGAATTCAGATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TCG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata MO 2172	GAATTTGTGAATTCAGATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata OK 2398	GAATTTGTGAATTCAGATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata TX 2396	GAATTTGTGAATTCAGATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata LA 2305	GAATTTGTGAATTCAGATGACCAGA?CAAGCCTGTTCAAGAG-?TTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata FL 2397	GAATTTGTGAATTCAAATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata DE 1937	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata MI 2048-1	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata MI 2048-2	GAATTTGTGAATTCAGATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata NJ 2189-1	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata NJ 2189-2	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG

P. tenuifolium 86-4	GAATTTGTGAATACAAAAGACCACAACAAGCCCGTTCAAGAG-GTTTG	CTCTAGCTATTCCTCAATTAGTACAGTTCATTCATCATGCCCTCCATG
P. loomisii 66-3	GAATTTGTGAATACAAATGACCACAACAAGCCCGTTCAAGAG-GTTTG	CTCTAGCTATTCCTCAATTAGTACAATTCGTTCATCATGCCCTCCATG
P. muticum 52-4	GAATTTGTGAATACAAATGACCACAACAAGCCCGTTCAAGAG-GTTTG	CTCTAGCTATTCCTCGATTAGTACAATTCGTTCATCATGCCCTCCATG
M. clinopodioides 2310-1	GAATTTGTGAACTCAAATGAGCAGAACAAGCCCGTTCAAGAG-GTTTG	CTN-NNNNN-NNNNNNNNNNNNACAATTCATTCATCATGCCCTCCATG
M. clinopodioides 2310-2	GAATTTGTGAACTCAAATGAGCAGAACAAGCCCGTTCAAGAG-GTTTG	CTN-NNNNN-NNNNNNNNNNNNACAATTCATTCATCATGCCCTCCATG
M. fruticulosa TX 1920-1	GAATTTGTGAATTCAAATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. fruticulosa TX 1920-2	GAATTTGTGAATTC?AATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. fruticulosa TX 2301	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. fruticulosa TX 2317	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata NM 2307-1	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGT-CAAGAG-GTTTG	GTG-NNNNNT-CCTCAATTAGTACAATTCATTCATCATGCCCTCCAAG
M. punctata NM 2307-2	GAATTTGTGAATTCAGATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata NM 2307-3	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. humilis NM 2176	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. maritima TX 2314	GAATTTGTGAATTCAAAGGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. maritima TX 2319	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. maritima TX 2318-1	GAATTTGTGAATTCAAATGACCAGTACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. maritima TX 2318-2	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. stanfieldii TX 2367-1	GAATTTGTGAATTCAAATGAGCAGAACAAGCCCGTTCAAGAG-GTTTG	CTN-NNNNN-NNNNNNNNNNNNACAATTCATTCATCATGCCCTCCATG
M. stanfieldii TX 2367-2	GAATTTGTGAATTCAAATGAGCAGAACAAGCCCGTTCAAGAG-GTTTG	CTN-NNNNN-NNNNNNNNNNNNACAATTCATTCATCATGCCCTCCATG
M. stanfieldii TX 2239-1	GAATTTGTGAATTCAAATGAGCAGAGCAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCGATTAGTACAATTCATTCATCATGCCCTCCATG
M. stanfieldii TX 2239-2	GAATTCGTGAATTCAAATGACCAGAACAAGTCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. stanfieldii TX 2369-1	GAATTTGTGAATTCAAATGAACAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. viridissima TX 2055	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. viridissima TX 2441-1	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAAGGTTTG	CTN-NNNNN-NNNNNNNNNNNNACAATTCATTCATCATGCCCTCCATG
M. viridissima TX 2444	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAATAG-GTTTG	TTG-NNNNNTTCCCCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. viridissima TX 2441-2	GAATATGTGAATTCAAATGACCAGAACAAGCCCGTTCGAGAG-GTTTG	CTN-NNNNN-NNNNNNNNNNNNACAATTCATTCATCATGCCCTCCATG
M. punctata AR 2060	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata TX 2468	GAATTTGTGAATTCAAATGAGCAGAACAAGCCCGTTCAAGAG-GTTTG	CTN-NNNNN-NNNNNNNNNNNNACAATTCATTCATCATGCCCTCCATG
M. punctata FL 2303-1	GAATTTGTGAATTCAGATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TCG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata FL 2303-2	GAATTTGTGAATTCAGATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TCG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata MO 2172	GAATTTGTGAATTCAGATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata OK 2398	GAATTTGTGAATTCAGATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata TX 2396	GAATTTGTGAATTCAGATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata LA 2305	GAATTTGTGAATTCAGATGACCAGA?CAAGCCTGTTCAAGAG-?TTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata FL 2397	GAATTTGTGAATTCAAATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata DE 1937	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata MI 2048-1	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata MI 2048-2	GAATTTGTGAATTCAGATGACCAGAACAAGCCTGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata NJ 2189-1	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG
M. punctata NJ 2189-2	GAATTTGTGAATTCAAATGACCAGAACAAGCCCGTTCAAGAG-GTTTG	TTG-NNNNNTTCCTCAATTAGTACAATTCATTCATCATGCCCTCCATG

P. tenuifolium 86-4	TATTTT-NNGCATCAATCAATTT-NNN-NNNNNNTACTGTATTGTGTG	TGTAGGTGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGTGTCG
P. loomisii 66-3	TATTTT-NNGCATCAATCAAATT-NNNAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGTGTCG
P. muticum 52-4	TATTTT-NNGCATCAATCAAATT-NNNAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. clinopodioides 2310-1	TATTTT-NNGCATCAATCAAATT-NNNAACTTTGTACT-TACTGTGTG	TGTAGGTGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGTCTCG
M. clinopodioides 2310-2	TATTTT-NNGCATCAATCAAATT-NNNAACTTTGTACT-TACTGTGTG	TGTAGGCGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGTCTCG
M. fruticulosa TX 1920-1	TATTTT-NNGCATCAATCAAATT-NNNAACTCTGTACT-TATTGTGT?	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. fruticulosa TX 1920-2	TATTTT-NNGCATCAATCAAATT-NNNAACTCTGTACT-TATTGTGTG	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. fruticulosa TX 2301	TATTTT-NNGCATCAATTAAACT-NNNAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. fruticulosa TX 2317	TATTTT-NNGCATCAATCAAATT-NNNAACTCTGTACT-TATTGTGTG	TGCAGGTGATAGCTGAGATGACCGATGGAGGGGTGGATCGAAGTCTCG
M. punctata NM 2307-1	TATTAA-NN-NNTCAATCAAGCT-NNNAACTTTGTACT-TATTGTGTG	TGTANNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN
M. punctata NM 2307-2	TATTTT-NNGCATCAATCAAATT-NNNAAATCTGTACT-TATTGTGTG	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. punctata NM 2307-3	TATTAA-NN-NNTCAATCAAGCT-NNNAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGCGTCG
M. humilis NM 2176	TATTAA-NN-NNTCAACCAAGCT-NNNAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGCGTCG
M. maritima TX 2314	TATTTT-NNGCATCAATCAAATT-NNNAACTCTGTACT-TATTGTGTG	TGCAGGTGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGTCTCG
M. maritima TX 2319	TATTTT-NNGCATCAATCAAATT-NNNAACTCTGTACT-TATTGTGTG	TGCAGGTGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGTCTCG
M. maritima TX 2318-1	TATTTT-NNGCATCAATTAAACT-NNNAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. maritima TX 2318-2	TATTTC-NNGCATCAATTAAACT-NNNAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. stanfieldii TX 2367-1	TATTTT-NNGTTTGCATCAATCAAACTAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. stanfieldii TX 2367-2	TATTTT-NNGTTTGCATCAATCAANNTAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. stanfieldii TX 2239-1	TATTTT-NNGCATCAATCAAACT-NNNAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGCGTCG
M. stanfieldii TX 2239-2	TATTTT-NNGCATCAATCAAATT-NNNAACTCTGTACT-TATTGTGTG	TGTAGGTGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGCGTCG
M. stanfieldii TX 2369-1	TATTAA-NN-NNTCAATCAAACT-NNNAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGCGTCG
M. viridissima TX 2055	TATTAA-NN-NNTCAATCAAGCT-NNNAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGCGTCG
M. viridissima TX 2441-1	TATTTT-NNGCATCAATCAAACC-NNNAACTTTGTACT-TATTTTGTG	TGAAGGTGATAGCTGAGATGACCAATGGAGGAGTGGATCGAAGCGTCG
M. viridissima TX 2444	TATTAA-NN-NNTCAATCAAGCT-NNNAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGAGATGTCCAATGGAGGAGTGGATCGAAGCGTCG
M. viridissima TX 2441-2	TATTTT-NNGCATCAATCAAACT-NNNAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGCGTCG
M. punctata AR 2060	TATTTT-NNGCATCAATCAAATT-NNNAACTCTGTACT-TATTGTGTG	TGCAGGTGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGTCTCG
M. punctata TX 2468	TATTTTTTTGCATCAATCAA-NNNNNTAACTTTGTACT-TATTGTGTG	TGTCGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. punctata FL 2303-1	TATTTT-NNGCATCAATCAAATT-NNNAACTCTGTACT-TATTGTGTG	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. punctata FL 2303-2	TATTTT-NNGCATCAATCAAATT-NNNAACTCTGTACT-TATTGTGTG	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. punctata MO 2172	TATTTT-NNGCATCAATCAAATT-NNNAACTCTGTACT-TATTGTGTG	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. punctata OK 2398	TATTTT-NNGCATCAATCAAATT-NNNAACTCTGTACT-TATTGTGTG	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. punctata TX 2396	TATTTT-NNGCATCAATCAAATT-NNNAAATCTGTACT-TATTGTGTG	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. punctata LA 2305	TATTTT-NNGCACCAATCAAATT-NNNAACTCTGTACT-TATTGTGTG	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. punctata FL 2397	TATTTT-NNGCATCAACCAAATT-NNNAACTCTGTACT-TATTGTGTG	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. punctata DE 1937	TATTAA-NN-NNTCAATCAAGCT-NNNAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. punctata MI 2048-1	TATTAA-NN-NNTCAATCAAG?T-NNNAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. punctata MI 2048-2	TA?TTT-NNGCATCAATCAAATT-NNNAAATCTGTACT-TATTGTGTG	TGTAGGTGATAGCTGATATGACCGATGGAGGAGTGGATCGAAGTGTCG
M. punctata NJ 2189-1	TATTAA-NN-NNTCAATCAAGTT-NNNAACTTTGTACT-TATTGTGTG	TGTAGGTGATAGCTGAGA?GACGGATGGAGGAGTGGATCGAAGTGTCG
M. punctata NJ 2189-2	TATTAA-NN-NNTCAATCAAG?T-NNNAACTTT?TACT-TATTGTGTG	TGTAGGTGATAGCTGAGATGACCGATGGAGGAGTGGATCGAAGTGTCG

Adh2 Sequence Alignment
~1200 nucleotides in length

M. punctata NJ 1946-27	CAGGGTATGCGCA-?TAAATCTTTCTCAAGATTCTTGAATTTTTGATT	TAGCATA???GAGTATATATACAAATT-????????GCAATACACATA
M. punctata MI 2048-1	CAGGGTATGCGCA-?TAAATCTTTCTCAAGATTCTTGAATTTTTGATT	TAGCATATCTGATTATATATACAAATT-????????GCAATACACATA
M. punctata NJ 2189-7	CAGGGTATGCGCA-?TAAATCTTTCTCAAGATTCTTGAATTTTTGATT	TAGCAT?TCTGATTATATATACAAATT-????????GCAATACACATA
M. punctata LA 2305-2	CAGGGTATGCGCA-?TAAATCTTTCTCAAGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATATACACAAATT-????????GCAATACACATA
M. punctata FL 2397-1	CAGGGTATGCGCA-?TAAATCTTTCTCAAGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATATATACAAATT-????????GCAATACACATA
M. punctata TX 2396-3	CAGGGTATGCGCA-?TAAATCTTTCTCAAGATTCTTGAATTTTTGATT	AAGCATTTCTGAGTATATATACAAATT-????????GCAATACACATA
M. punctata TX 2473-3	CAGGGTATGCGCA-?TAAATCTTTCTCAAGATTCTTGAATTTTTGATT	AAGCATTTCTGAGTATATATACAAATT-????????GCAATACACATA
M. punctata TX 2393-3	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTCGAATTTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GAAATACACATA
M. punctata FL 2048-9	CAGGGTACGCACA-?ACAATCTTTCTCATGATTCTTGAATTTTTGATT	AAGCAT?TCTGAGTATGTATACAAATT-????????GCAATACACATA
M. punctata OK 2398-2	CAGGGTACGCACA-?ACAATCTTTCTCATGATTCTTGAATTTTTGATT	AAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. punctata FL 2389-1	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. punctata AR 2060-1	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	AAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. humilis 2176-3	CAGGGTATGCGCA-?TAAATCTTTCTCAAGATTCTTGAATTTTTGATT	AACCATTTCTGA-TATATAT?CAAATT-????????GCAATACACATA
M. viridissima 2055	CAGGGTACGCACA-?ACAATCTTTCTCATGATTCTTGAATTTTTGATT	AAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. viridissima 2444-3	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. fruticulosa 2317-3	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GAAATACACATA
M. fruticulosa 2420-1	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. fruticulosa 2301-1	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GAAATACACATA
M. fruticulosa 1920-4	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	AAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. fruticulosa 1920-10	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	AAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. maritima 2181-3	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. maritima 2181-4	CAGAGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. stanfieldii 2367-2	CAGGGTATGCACA-?TAAATCTTTTTCGTGATTCTAGAATCTTTGATT	AAGCATTTCTGAG?ATGTATACCAATT-????????GCAATACACATA
M. stanfieldii 2367-1	CAGGGTATGTACA-?TAAATCTTTTTCGTGATTCTTGAATCTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. citriodora 2419-1	CAGGGTACGCACA-?ACAGTCTTTCTCAAGATTCTTGAATTTTTGATT	TATCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. citriodora 2375-4	CAGG-TACGCACA-?ACAGTCTTTCTCAAGATTCTTGAATTTTTGATT	AATCATTTCTGAGTATGAATACAAATT-????????GCAATACACATA
P. tenuifolium 55-4	CAGGGTATGCAGA-?T?A-TCTCTCTCATGATTCTTGAATTTTTGATT	CAGCATTTCTAAGTATATATACAAATT-????????GCAATACACATA
P. tenuifolium 97-3	CAGGGTATGCAGA-?T?A-TCTCTCTCATGATTCTTGAATTTTTGATT	CAGCATTTCTAAGTATATATACAAATT-????????GCAATACACATA
	48	96

M. punctata NJ 1946-27	CAGGGTATGCGCA-?TAAATCTTTCTCAAGATTCTTGAATTTTTGATT	TAGCATA???GAGTATATATACAAATT-????????GCAATACACATA
M. punctata MI 2048-1	CAGGGTATGCGCA-?TAAATCTTTCTCAAGATTCTTGAATTTTTGATT	TAGCATATCTGATTATATATACAAATT-????????GCAATACACATA
M. punctata NJ 2189-7	CAGGGTATGCGCA-?TAAATCTTTCTCAAGATTCTTGAATTTTTGATT	TAGCAT?TCTGATTATATATACAAATT-????????GCAATACACATA
M. punctata LA 2305-2	CAGGGTATGCGCA-?TAAATCTTTCTCAAGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATATACACAAATT-????????GCAATACACATA
M. punctata FL 2397-1	CAGGGTATGCGCA-?TAAATCTTTCTCAAGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATATATACAAATT-????????GCAATACACATA
M. punctata TX 2396-3	CAGGGTATGCGCA-?TAAATCTTTCTCAAGATTCTTGAATTTTTGATT	AAGCATTTCTGAGTATATATACAAATT-????????GCAATACACATA
M. punctata TX 2473-3	CAGGGTATGCGCA-?TAAATCTTTCTCAAGATTCTTGAATTTTTGATT	AAGCATTTCTGAGTATATATACAAATT-????????GCAATACACATA
M. punctata TX 2393-3	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTCGAATTTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GAAATACACATA
M. punctata FL 2048-9	CAGGGTACGCACA-?ACAATCTTTCTCATGATTCTTGAATTTTTGATT	AAGCAT?TCTGAGTATGTATACAAATT-????????GCAATACACATA
M. punctata OK 2398-2	CAGGGTACGCACA-?ACAATCTTTCTCATGATTCTTGAATTTTTGATT	AAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. punctata FL 2389-1	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. punctata AR 2060-1	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	AAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. humilis 2176-3	CAGGGTATGCGCA-?TAAATCTTTCTCAAGATTCTTGAATTTTTGATT	AACCATTTCTGA-TATATAT?CAAATT-????????GCAATACACATA
M. viridissima 2055	CAGGGTACGCACA-?ACAATCTTTCTCATGATTCTTGAATTTTTGATT	AAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. viridissima 2444-3	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. fruticulosa 2317-3	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GAAATACACATA
M. fruticulosa 2420-1	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. fruticulosa 2301-1	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GAAATACACATA
M. fruticulosa 1920-4	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	AAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. fruticulosa 1920-10	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	AAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. maritima 2181-3	CAGGGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. maritima 2181-4	CAGAGTATGCACA-?TAAATCTTTCTCATGATTCTTGAATTTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. stanfieldii 2367-2	CAGGGTATGCACA-?TAAATCTTTTTCGTGATTCTAGAATCTTTGATT	AAGCATTTCTGAG?ATGTATACCAATT-????????GCAATACACATA
M. stanfieldii 2367-1	CAGGGTATGTACA-?TAAATCTTTTTCGTGATTCTTGAATCTTTGATT	TAGCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. citriodora 2419-1	CAGGGTACGCACA-?ACAGTCTTTCTCAAGATTCTTGAATTTTTGATT	TATCATTTCTGAGTATGTATACAAATT-????????GCAATACACATA
M. citriodora 2375-4	CAGG-TACGCACA-?ACAGTCTTTCTCAAGATTCTTGAATTTTTGATT	AATCATTTCTGAGTATGAATACAAATT-????????GCAATACACATA
P. tenuifolium 55-4	CAGGGTATGCAGA-?T?A-TCTCTCTCATGATTCTTGAATTTTTGATT	CAGCATTTCTAAGTATATATACAAATT-????????GCAATACACATA
P. tenuifolium 97-3	CAGGGTATGCAGA-?T?A-TCTCTCTCATGATTCTTGAATTTTTGATT	CAGCATTTCTAAGTATATATACAAATT-????????GCAATACACATA

M. punctata NJ 1946-27	CAGAATCGTGGAGAGCGTGGGAGAAGGCGTGACGGAGCTGGTCCCAGG	CGATCACGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCA
M. punctata MI 2048-1	CAGAATCGTGGAG?GCGTGGGAGAAGGCGTGACGGAGCTGGTCCTAGG	CGATCACGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTG?TCA
M. punctata NJ 2189-7	CAGAATCGTGGAGAGCGTGGGAGAAGGCGTGACGGAGCTGGTCCCAGG	CGATCACGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCA
M. punctata LA 2305-2	CAGAATCGTGGAGAGCGTGGGAGAAGGCGTGACGGAGCTGGTCCCAGG	CGATCACGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCA
M. punctata FL 2397-1	CAGAATCGTGGAGAGCGTGGGAGAAGGCGTGACGGAGCTGGTCCCAGG	CGATCACGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCA
M. punctata TX 2396-3	CAGAATCGTGGAGAGCGTGGGAGAAGGCGTGACGGAGCTGGTCCCAGG	CGATCACGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCA
M. punctata TX 2473-3	CAGAATCGTGGAGAGCGCGGGAGAAGGCGTGACGGAGCTG?TCCCAGG	CGATCACGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCA
M. punctata TX 2393-3	CAGAATTGTGGAGAGCGTGGGCGAAAGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGAGAATGCAGAGAATGTGCTCA
M. punctata FL 2048-9	CAGAATCGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGCGAATGCAGAGAATGTGC?CA
M. punctata OK 2398-2	CAGAATCGTGGAGGGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGCGAATGCAGAGAATGTGCTCA
M. punctata FL 2389-1	CAGAATCGTGGAGAGTGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACTGGAGAATGCAGAGAATGTGCTCA
M. punctata AR 2060-1	CAGAATCGTGGAGAGTGAGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGAGAATGCAGAGAATGTGCTCA
M. humilis 2176-3	CAGAATCGTGGAGAGCGTGGGAGAAGGC?TGACGGAGCTG?TCCCAGG	CGATCACGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCA
M. viridissima 2055	CAGAGTCGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGCGAATGCAGAGAATGTGCTCA
M. viridissima 2444-3	CAGAATCGTGGAGAGTGTGG?CGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGAGAATGCAGGGAATGTGCTCA
M. fruticulosa 2317-3	CAGAATTGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGAGAATGCAGAGAATGTGCTCA
M. fruticulosa 2420-1	CAGAATCGCGGAGAGTGTGG-CGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACTGGAGAATGCAGAGAATGTGCTCA
M. fruticulosa 2301-1	CAGAATTGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGAGAATGCAGAGAATGTGCTCA
M. fruticulosa 1920-4	CAGAATCGTGGAGAGTGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACTGGAGAATGCAGAGAATGTGCTCA
M. fruticulosa 1920-10	CAGAATCGTGGAGAGTGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACTGGAGAATGCAGAGAATGTGCTCA
M. maritima 2181-3	CAGAATCGTGGAGAGTGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGGGAATGCAGAGAATGTGCTCA
M. maritima 2181-4	CAGAATCGTGGAGAGTGTGGGCGGAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGAGAATGCAGAGAATGTGCTCA
M. stanfieldii 2367-2	CAGAATCGTGGAGAGCGTGGCCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGAGAATGCAGAGAATGTGCTCA
M. stanfieldii 2367-1	CAGAATCGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGAGAATGCAGAGAATGTGCTCA
M. citriodora 2419-1	CAGAATCGTGGAGAGTGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTGTTCACTGGAGAATGCAGAGAATGTGCTCA
M. citriodora 2375-4	CAGAATCGTGGAGAGTGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTGTTCACTGGAGAATGCAGAGAATGTGCTCA
P. tenuifolium 55-4	CAGAATCGTGGAGAGTGTGGGCGAAGGCGTGAAGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACTGGAGAATGCAGAGAATGCGCTCA
P. tenuifolium 97-3	CAGAATCGTGGAGAGTGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACTGGAGAATGCAGAGAATGCGCTCA

M. punctata NJ 1946-27	CAGAATCGTGGAGAGCGTGGGAGAAGGCGTGACGGAGCTGGTCCCAGG	CGATCACGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCA
M. punctata MI 2048-1	CAGAATCGTGGAG?GCGTGGGAGAAGGCGTGACGGAGCTGGTCCTAGG	CGATCACGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTG?TCA
M. punctata NJ 2189-7	CAGAATCGTGGAGAGCGTGGGAGAAGGCGTGACGGAGCTGGTCCCAGG	CGATCACGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCA
M. punctata LA 2305-2	CAGAATCGTGGAGAGCGTGGGAGAAGGCGTGACGGAGCTGGTCCCAGG	CGATCACGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCA
M. punctata FL 2397-1	CAGAATCGTGGAGAGCGTGGGAGAAGGCGTGACGGAGCTGGTCCCAGG	CGATCACGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCA
M. punctata TX 2396-3	CAGAATCGTGGAGAGCGTGGGAGAAGGCGTGACGGAGCTGGTCCCAGG	CGATCACGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCA
M. punctata TX 2473-3	CAGAATCGTGGAGAGCGCGGGAGAAGGCGTGACGGAGCTG?TCCCAGG	CGATCACGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCA
M. punctata TX 2393-3	CAGAATTGTGGAGAGCGTGGGCGAAAGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGAGAATGCAGAGAATGTGCTCA
M. punctata FL 2048-9	CAGAATCGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGCGAATGCAGAGAATGTGC?CA
M. punctata OK 2398-2	CAGAATCGTGGAGGGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGCGAATGCAGAGAATGTGCTCA
M. punctata FL 2389-1	CAGAATCGTGGAGAGTGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACTGGAGAATGCAGAGAATGTGCTCA
M. punctata AR 2060-1	CAGAATCGTGGAGAGTGAGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGAGAATGCAGAGAATGTGCTCA
M. humilis 2176-3	CAGAATCGTGGAGAGCGTGGGAGAAGGC?TGACGGAGCTG?TCCCAGG	CGATCACGTTCTTCCGGTGTTCACCGGAGAATGCAGAGAATGTGCTCA
M. viridissima 2055	CAGAGTCGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGCGAATGCAGAGAATGTGCTCA
M. viridissima 2444-3	CAGAATCGTGGAGAGTGTGG?CGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGAGAATGCAGGGAATGTGCTCA
M. fruticulosa 2317-3	CAGAATTGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGAGAATGCAGAGAATGTGCTCA
M. fruticulosa 2420-1	CAGAATCGCGGAGAGTGTGG-CGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACTGGAGAATGCAGAGAATGTGCTCA
M. fruticulosa 2301-1	CAGAATTGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGAGAATGCAGAGAATGTGCTCA
M. fruticulosa 1920-4	CAGAATCGTGGAGAGTGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACTGGAGAATGCAGAGAATGTGCTCA
M. fruticulosa 1920-10	CAGAATCGTGGAGAGTGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACTGGAGAATGCAGAGAATGTGCTCA
M. maritima 2181-3	CAGAATCGTGGAGAGTGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGGGAATGCAGAGAATGTGCTCA
M. maritima 2181-4	CAGAATCGTGGAGAGTGTGGGCGGAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGAGAATGCAGAGAATGTGCTCA
M. stanfieldii 2367-2	CAGAATCGTGGAGAGCGTGGCCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGAGAATGCAGAGAATGTGCTCA
M. stanfieldii 2367-1	CAGAATCGTGGAGAGCGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACCGGAGAATGCAGAGAATGTGCTCA
M. citriodora 2419-1	CAGAATCGTGGAGAGTGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTGTTCACTGGAGAATGCAGAGAATGTGCTCA
M. citriodora 2375-4	CAGAATCGTGGAGAGTGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTGTTCACTGGAGAATGCAGAGAATGTGCTCA
P. tenuifolium 55-4	CAGAATCGTGGAGAGTGTGGGCGAAGGCGTGAAGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACTGGAGAATGCAGAGAATGCGCTCA
P. tenuifolium 97-3	CAGAATCGTGGAGAGTGTGGGCGAAGGCGTGACGGAGCTGGTCCCCGG	CGATCACGTTCTTCCGGTATTCACTGGAGAATGCAGAGAATGCGCTCA

M. punctata NJ 1946-27	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCACTGGCCCC
M. punctata MI 2048-1	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCACTGGCCCC
M. punctata NJ 2189-7	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCACTGGCCCC
M. punctata LA 2305-2	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCACTGGCCCC
M. punctata FL 2397-1	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTATTCATGTTGGCTGTGTTGCTAAGATCAATCCACTGGCCCC
M. punctata TX 2396-3	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCACTGGCCCC
M. punctata TX 2473-3	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCACTGGCCCC
M. punctata TX 2393-3	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCACTGGCCCC
M. punctata FL 2048-9	GGGAAAACCCGTTTACCATTTTCTTGGAACTTCAACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTAGCTAAGATCAATCCTCTGGCCCC
M. punctata OK 2398-2	GGGAAAACCCGTTTACCATTTTCTTGGAACTTCAACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTAGCT?AGATCAATCCTCTGGCCCC
M. punctata FL 2389-1	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCACTGGCCCC
M. punctata AR 2060-1	GGGAAAACCCGTTTACCATTTTCTTGGAACTTCAACATTCAGTGAGTA	CACTGTTCATCATGTTGGCTGTGTGGCTAAGATCAATCCTCTGGCCCC
M. humilis 2176-3	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCACTGGCCCC
M. viridissima 2055	GGGAAAACCCGTTTACCATTTTCTTGGAACTTCAACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTAGCTAAGATCAATCCTCTGGCCCC
M. viridissima 2444-3	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCCTCATGTTGGCTGTGTTGCTAAGATCAATCCACTGGCCCC
M. fruticulosa 2317-3	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCACTGGCCCC
M. fruticulosa 2420-1	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCACTGGCCCC
M. fruticulosa 2301-1	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCACTGGCCCC
M. fruticulosa 1920-4	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCACTGGCCCC
M. fruticulosa 1920-10	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCACTGGCCCC
M. maritima 2181-3	GGGAAAACCCGTTTACCATTTTCTTGGAACTTCAACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTGGCTAAGATCAATCCTCTGGTCCC
M. maritima 2181-4	GGGAAAACCCGTTTACCATTTTCTTGGAACTTCAACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTGGCTAAGATCAATCCTCTGGCCCC
M. stanfieldii 2367-2	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCTCTGGCCCC
M. stanfieldii 2367-1	GGGGAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCTCTGGCCCC
M. citriodora 2419-1	GGGAAAACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGTGAGTA	CACTGTTCTTCATGTTGGATGTGTTGCTAAGATCAATCCACTGGCCCC
M. citriodora 2375-4	GGGAAAACCCGTTTACCATTTTCTTGGAACTTCCACTTTCAGTGAGTA	CACTGTTCTTCATGTTGGATGTGTTGCTAAGATCAATCCACTGGCCCC
P. tenuifolium 55-4	GGGAAAACCCGTTTACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCTCTGGCCCC
P. tenuifolium 97-3	GGGAAAACCCGTATACCATTTTCTTGGAACTTCCACATTCAGTGAGTA	CACTGTTCTTCATGTTGGCTGTGTTGCTAAGATCAATCCTCTGGCCCC

M. punctata NJ 1946-27	AAT-??-?????????TAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGGT
M. punctata MI 2048-1	AAT-??-?????????TAATGTTTGGATTGGGTTGTTGTGTTT-AGGG	CTGGGTGCTACTTTGAATGCTGCT?AACCATTCAAGGGTTCTTCTGTT
M. punctata NJ 2189-7	AAT-??-?????????TAATGTTTGGATTGGGTTGTTGTGTTT-AGGG	CTGGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGGT
M. punctata LA 2305-2	AAT-??-?????????TAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTGGGTGCTACTTCGAATGTTGCTAA?CCATTCAAGGGTTCTTCTGTT
M. punctata FL 2397-1	AAT-??-?????????TAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTGGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. punctata TX 2396-3	AAT-??-?????????TAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTGGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. punctata TX 2473-3	AAT-??-?????????TAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTGGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. punctata TX 2393-3	AAT-??GAA-??GTAATAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTGGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. punctata FL 2048-9	AAT-??GAAGTAGTAGTAATGTTTGGATTGGGTTGTTGTGTTT-AGGG	CTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. punctata OK 2398-2	?AT-??GAAGTAGTAGTAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTGGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. punctata FL 2389-1	AAT-??GAA-??GTAGTAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTGGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. punctata AR 2060-1	AAT-??GAA-??GTATTAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTAGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. humilis 2176-3	AAT-??-?????????TAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	?TGGGTGTTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTC?GTT
M. viridissima 2055	AAT-??GAAGTAGTAGTAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTGGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. viridissima 2444-3	AAT-??GAA-??GTAGTAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTGGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. fruticulosa 2317-3	AAT-??GAA-??GTAATAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTGGGTGCTACTTTGAATGTTGCTAA-CCATTCAAGGGTTCTTCTGTT
M. fruticulosa 2420-1	AAT-??GAA-??GTAATAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTGGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. fruticulosa 2301-1	AAT-??GAA-??GTAATAATGTTTGGATTGGGCTGTTGTGTTTTAGGG	CTGGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. fruticulosa 1920-4	AAT-??GAA-??GTAGTAATGTTTGGAGTGGGTTGTTGTGTTT-AGGG	CTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. fruticulosa 1920-10	AAT-??GAA-??GTAGTAATGTTTGGAGTGGGTTGTTGTGTTT-AGGG	CTTGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. maritima 2181-3	AAT-??GAA-??GTATTAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTAGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. maritima 2181-4	AAT-??GAA-??GTATTAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTAGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. stanfieldii 2367-2	AAT-??GAA-??GTAGTAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTGGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. stanfieldii 2367-1	AAT-??GAA-??GTAGTAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTGGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. citriodora 2419-1	AAT-??GAA-??GTAGTCATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTAGGTGCTACTTTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
M. citriodora 2375-4	AAT-??GAA-??GTAGTAATGTTTGGATTGGGTTGTTGTGTTTTAGGG	CTAGGTGCTACTCTGAATGTTGCTAAACCATTCAAGGGTTCTTCTGTT
P. tenuifolium 55-4	AAT-??GAA-??GTAGTAATGTTTGGATTGGATTCTTGTGTTT-AGGG	CTTGGTGCTACTTTAAATGTTGCTTAACCATTCAAGGGTTCTTCTGTT
P. tenuifolium 97-3	AAT-??GAA-??GTAGTGATGTTTGGATTGGATTCTTGTGTTT-AGGG	CTTGGTGCTGCTTTAAATGTTGCTAAACCATTCAAGG-TTCTTCTGTT
	528	576

M. punctata NJ 1946-27	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTT-CTGAAT	TTTTT-?ACGGATTAATGATAACTATTGAGAAAAG-??ATGGATA-??
M. punctata MI 2048-1	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTCT-CTGAAT	TTTTT-?ACGGATTAATGATAAC-ATTGAGAAAAG-??ATGGATA-??
M. punctata NJ 2189-7	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTT-CTGAAT	TTTTT-?ACGGATTAATGATAAC-ATTGAGAAAAG-??ATGGATA-??
M. punctata LA 2305-2	GCTGTTTTTGGGCTTGGAGCAGTTGGGCTTGGTGTATGTTT-TTTAAT	CTTTT-?ACTGATTAATGATTACTATTGAGAAAAG-??ATGGATA-??
M. punctata FL 2397-1	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTT-TTTAAT	CTTTT-?ACTGATTAATGATAACTATTGAGAAAAG-??ATGGATA-??
M. punctata TX 2396-3	GCTGTTTTTGGGCTTGGAGCATTTGGACCTGGTGTATGTTT-CTGAAT	TTTTT-?ACGGATTAATGATAACTATTGAGAAAAG-??ATGGATA-??
M. punctata TX 2473-3	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTT-CTGAAT	TTTTT-?ACGGATTAATGATAACTATTGAGAAAAG-??ATGGATA-??
M. punctata TX 2393-3	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTT-CTGAAT	TTTTT-?ACTGATT-???AAAACCATTGAGAAAGG-??ATGGATC-??
M. punctata FL 2048-9	GCTGTTTTTGGTCTTGGAGCAGTTGGACTTGGTGTATGTTT-CT-AAT	CTTTT-?ACTGATTAATGATAACTAA-??GAAAAG-??ATGGATA-??
M. punctata OK 2398-2	GCTGTTTTTGGTCTTGGAGCAGTTGGACTTGGTGTATGTTT-CT-AAT	CTTTT-?ACTGATTAATGATAACTAA-??GAAAAG-??ATGGATA-??
M. punctata FL 2389-1	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTT-CTGAAT	TTTTT-?ACTGATT-???AAAACCATTGAGAAAGG-??ATGGATC-??
M. punctata AR 2060-1	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTTTCT-AAT	CTTTT-?ACTGATTAATGATA-CTAATGAGAAAAG-??ATGGATA-??
M. humilis 2176-3	GCTG?TTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTT-CTGAAT	TTTTT-?AC?GATTAATGATAACTATTGAGAAAAG-??ATGGATA-??
M. viridissima 2055	GCTGTTTTTGGTCTTGGAGCAGTTGGACTTGGTGTATGTTT-CT-AAT	CTTTT-?ACTGATTATTGGTAACTAA-??GAAAAG-??ATGGATA-??
M. viridissima 2444-3	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGCGTATGTTT-CTGAAT	TTTTT-?ACTGATTAATGATAACTATTGAGAAAAG-??ATGGGTA-??
M. fruticulosa 2317-3	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTT-CTGAAT	TTTTT-?ACTGATT-???AAAACCATTGAGAAAGG-??ATGGATC-??
M. fruticulosa 2420-1	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTT-CTGAAT	TTTTT-?ACTGATT-???AAAACCATTGAGAAAGG-??ATGGATC-??
M. fruticulosa 2301-1	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTT-CTGAAT	TTTTT-?ACTGATT-???AAAACCATTGAGAAAGG-??ATGGATC-??
M. fruticulosa 1920-4	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTT-CTGAAT	TTTTT-?ACTGATT-???AAAACCATTGAGAAAGGATTATGGATAGAA
M. fruticulosa 1920-10	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTT-CTGAAT	TTTTT-?ACTGATT-???AAAACCATTGAGAAA-GATTATGGATAGAA
M. maritima 2181-3	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTTTCT-AAT	CTTTT-?ACTGATTAATGATA-CTAATGAGAAAAG-??ATGGATA-??
M. maritima 2181-4	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTTTCT-AAT	CTTTT-?ACTGATTAATGATA-CTAATGAGAAAAG-??ATGGATA-??
M. stanfieldii 2367-2	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTT-TTGAAT	TTTTT-?ACTGATTAATGACAACAATTGAGAAAGG-??ATGGATA-??
M. stanfieldii 2367-1	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTT-TTGAAT	TTTTT-?ACTGATTAATGACAACAATTGAGAAAGG-??ATGGATA-??
M. citriodora 2419-1	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGTTT-ATGATT	TTTTTTACTGATTAATGACAACTATTGAGAAAAT-??ATGGATA-??
M. citriodora 2375-4	GCTGTTTT-GGGCTTGGAGCAGTTGGACTTGGTGTATGATT-ATGATT	TTTTTT-ACTGATTAATGACAACTATTGAGAAAAT-??ATGGATA-??
P. tenuifolium 55-4	GCTGTTTTTGGGCTTGGAGCAGTTGGACTTGGTGTATGCTT-CTGAAT	TTTTTT-ACTGATT-???AAAACCACTGAGAAAAG-??ATGGATA-??
P. tenuifolium 97-3	GCTGTTTT-GGGCTTGGAGCAATTGGACTTGGTGTATGTTT-CTGAAT	TTTTTTACTGATT-???AAAACCATTGAGAAAAG-??ATGGATA-??
	624	672

M. punctata NJ 1946-27	??GAAGGGATTTAATATTTCTTGA-?????????????????TGG	TGTGATAGTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. punctata MI 2048-1	??GAAGGGATTTAATATTTCTTGA-?????????????????TGG	TGTGATTGTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. punctata NJ 2189-7	??GAAGGGATTTAATATTTCTTGA-?????????????????TGG	TGTGAT?GTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. punctata LA 2305-2	??GAAGGGATTTAATATTTCTTGA-?????????????????TGG	TGTGATTGTTTAGGCAGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. punctata FL 2397-1	??GAAGGGATTCTGATATTTCTTGA-?????????????????TGG	TGTGATTGTTTAGGCTGCAGAAGGAGCCAGATTGGCTGGTGCTTCAAG
M. punctata TX 2396-3	??GAAGGGATTCTGATATTTCTTGA-?????????????????TGG	TGTGATTGTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. punctata TX 2473-3	??GAAGGGATTTAATATTTCTTGA-??????????????????GG	TGTGATTGTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. punctata TX 2393-3	??GAAGGGATTTTGATTTT-??????-?????????????????GGT	TGTGATTGTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. punctata FL 2048-9	??GAAGGGATTTTGATATTTCTTGA-?????????????????GGG	TGTGATTGTTTAGGCTGCGGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. punctata OK 2398-2	??GAAGGGATTTTGATATTTCTTGA-?????????????????GGG	TGTGATTGTTTAGGCTGCGGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. punctata FL 2389-1	??GAAGGGATTTTGATTTT-??????-?????????????????GGT	TGTGATTGTTTAGGCTGCAGAAG-AGCAAGGTTAGCTGGCGCTTCAAG
M. punctata AR 2060-1	??GAAGGGATTTTGATATTTCTTGA-?????????????????GGG	TGTGATTGTTTAGGATGCAGAAGGAGCAAGATCGGCTGGTGCTTCAAG
M. humilis 2176-3	??GAAGGGATTTAATATTTCTTGA-?????????????????TGG	TGTGATTGTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. viridissima 2055	??GAAGGGATTTTGATATTTCTTGA-????????????????GGGG	TGTGATTGTTTAGGCTGCGGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. viridissima 2444-3	??GAAGGGATTTAATATTTCTTGA-?????????????????TGG	TGTGATTGTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCGAG
M. fruticulosa 2317-3	??GAAGGGATTTTGATTTT-??????-??????????????????GG	TGTGATTGTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. fruticulosa 2420-1	??GAAGGGATTTTGATTTT-??????-?????????????????GGT	TGTGATTGTTTAGGCTGCAGGAGGAGCAAGATTGGCTGGTGCTTCAAG
M. fruticulosa 2301-1	??GAAGGGATTTTGATTTT-??????-?????????????????GGT	TGTGATTGTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. fruticulosa 1920-4	TAGAAGGGATTTTGATATTTCTTGA-?????????????????GGG	CGTGATTGTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. fruticulosa 1920-10	TAGAAGGGATTTTGATATTTCTTGA-?????????????????GGG	CGTGATTGTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. maritima 2181-3	??GAAGGGACTTTGATATTTCTTGA-?????????????????GGG	TGTGATTGTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. maritima 2181-4	??GAAGGGATTTTGATATTTCTTGA-?????????????????GGG	TGTGATTGTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. stanfieldii 2367-2	??GAAGGGATTTTGATATTTCTTGA-?????????????????????	TG-GATTTTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. stanfieldii 2367-1	??GAAGGGATTTTGATATTTCTTGA-?????????????????????	TG-GATTTTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. citriodora 2419-1	??GAAGGGATTTTGATATTTCTTGA-?????????????????GGG	TGTGATTGTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
M. citriodora 2375-4	??GAAGGGATTTTGATATTTCTTGAA-????????????????GGG	TGTGATTGTTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
P. tenuifolium 55-4	??GGAGGGATTTTGATATTTCTTGAATTTTTTTTTTT????GGGGG	TGTGATT-TTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
P. tenuifolium 97-3	??GGAGGGATTTTGATATTTCTTGAATTTTTTTTTTTTTTTGGGGTG	TGTGATT-TTTAGGCTGCAGAAGGAGCAAGATTGGCTGGTGCTTCAAG
	720	768

M. punctata NJ 1946-27	AGTTATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATAC	TTGTAACTGAATATATATTGCCACCTCCGAGGTGCAAATAATAGTGTA
M. punctata MI 2048-1	AGTTATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATAC	?TGTAACTGAATATATATTGCCACCTCCGAGGTGCAAATA-TAGTGTA
M. punctata NJ 2189-7	AGTTATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATAC	TTGTAACTGAATATATATTGCCACCTCCGAGGTGCAAATA-TAGTCTA
M. punctata LA 2305-2	AGTTATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATAC	TTGTAACTGAATATATATTGCCACCTCCGAGGTGCAAATAATAGTCTA
M. punctata FL 2397-1	AGTTATTGG-TGTGGACTTGAACTCTGCTAAGTTTGAAGAAGGTATAC	TTGTAACTGAATATATATTGCCACCTCCGAGGTGCAAATAATAGTCTA
M. punctata TX 2396-3	AGTTATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATAC	TTGTAACTGAATATATATTGCCACCTCCGAGGTGCAAATAATAGTCTA
M. punctata TX 2473-3	AGTTATTGG-TGTGGACTTGAACCCTGCTAGGTTTGAAGAGGGTATAC	TTGTAACTGAATATATATTGCCACCTCCGAGGTGCAAATAATAGTCTA
M. punctata TX 2393-3	AGTTATTGG-TGTGGACTTGAACTCTACTAGGTTCGAAGAAGGTAAAC	TTGTA-CTGGATATGTATTGCCACCTTCGAGCTGCAAATAATAGCGTA
M. punctata FL 2048-9	AGTTATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTAAAC	TTGTA-CTGAATATGTATTGCTACCTTCGAGCTGCAAATA-TAGCGTA
M. punctata OK 2398-2	AGTTATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTAAAC	TTGTA-CTGAATATGTATTGCTACCTTCGAGCTGCAAATAATAGCGTA
M. punctata FL 2389-1	AGTTATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATAC	TTGTA-CTGAATATGTATTGCCACCTTCGAGCTGCAAATAATAGTGTA
M. punctata AR 2060-1	AGTAATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATAC	TTGTAGCTTAATATATATTGCCACCTTCGAGCTGCAAATAATAGTGTA
M. humilis 2176-3	AGT-ATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATAC	TTGTAACTGAATATATATTGCCACCTCCGAGGTGCAAATAATAGTCTA
M. viridissima 2055	AGTTATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTAAAC	TTGTA-CTGAATATGTATTGCTACCTTCGAGCTGCAAATA-TAGCGTA
M. viridissima 2444-3	AGTTATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATAC	TTGTAACTTAATATATATTGCCACCTTCAAGCTGCAAATA-TAGTGTA
M. fruticulosa 2317-3	AGTTATTGG-TGTGGACTCGAACTCTGCTAGGTTTGAAGAAGGTATAC	TTGTA-CTGAATATGTATTGCCACCTTCGAGCTGCAAATAATAGCGTA
M. fruticulosa 2420-1	AGTTATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTAAAC	TTGTA-CTGAATATGTATTGCCACCTTCGAGCTGCAAATAATAGCGTA
M. fruticulosa 2301-1	AGTTATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATAC	TTGTA-CTGAATATGTATTGCCACCTTCGAGCTGCAAATGATAGTGTA
M. fruticulosa 1920-4	AGTTATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATA-	?????????????????TTGCCACCTTCGAGCTGCAAATA-TAGTGTA
M. fruticulosa 1920-10	AGTAATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATA-	?????????????????TTGCCACCTTCGAGCTGCAAATA-TAGTGTA
M. maritima 2181-3	AGTAATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATAC	TTGTAGCTTAATATATATTGCCACCTTCGAGCTGCAAATAATAGTGTA
M. maritima 2181-4	AGTAATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATAC	TTGTAGCTTAATATATATTGCCACCTTCGAGCTGCAAATAATAGTGTA
M. stanfieldii 2367-2	AGTTATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATA-	?????????????????TTGCCACCTTCAGGCTGCAAAGAATAGTGTA
M. stanfieldii 2367-1	AGTTATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATA-	?????????????????TTGCCACCTTCAGGCTGCAAAGAATAGTGTA
M. citriodora 2419-1	AGTAATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATAC	TTGTAACTGAATATAGATTGCCACCTTTGAGCTGCAAATAATAGTGTA
M. citriodora 2375-4	AGTAATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATAC	TTGTAACTGAATATAGATTGCCACCTTCGAGCTGCAAATAATAGCGTA
P. tenuifolium 55-4	AGTAATTGG-TGTGGACTTGAACTCTGCTAGGCTTGAAGAAGGTATAC	TTGTAACTGAATATATATTGCCACCTTCGAGCTGCAAATAATAGTGTA
P. tenuifolium 97-3	AGTAATTGG-TGTGGACTTGAACTCTGCTAGGTTTGAAGAAGGTATAC	TTGTAACTGAATATATATTGCCACCTTCGAGCTGCAAATAATAGTGTA
	816	864

M. punctata NJ 1946-27	CT-??CAAATGTAATAGTAATTGATTCAATGGCGTGAATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAACCC-AAAAGACTACAA
M. punctata MI 2048-1	CT-??CAAATGTAATAGTAATTGATTCAATGGCGTGAATATTTT-GCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAACCC-AAAAGACTACAA
M. punctata NJ 2189-7	CT-??CAAATGTAATAGTAATTGATTCAATGGCGTGAATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAACCC-AAAAGACTACAA
M. punctata LA 2305-2	CT-??CAAATGTAATAGTAATTGATTCAATGGCGTGAATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAACCC-AAAAGACTACAA
M. punctata FL 2397-1	CT-??CAAATGTAGTAGTAATTGATTCAATGGCGTGAATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAACCC-AAAAGACTACAA
M. punctata TX 2396-3	CT-??CAAATGTAATAGTAATTGATTCAATGGCGTGAATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAACCC-AAAAGACTACAA
M. punctata TX 2473-3	CT-??CAAATGTAATAGTAATTGATTCAATGGCGTGAATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAACCC-AAAAGACTACAA
M. punctata TX 2393-3	CA-??TAGATGTAATAGTAATTGATTCAATGGTG-?AATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAATCC-AAAAGACTACAA
M. punctata FL 2048-9	AT-??CAGATTTAATAGTAATTGATTCAATGGTG-?AATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAACCC-AAAAGACTACAA
M. punctata OK 2398-2	AT-??CAGATGTAATAGTAATTGATTCAATGGTG-?AATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAACCC-AAAAGA?TACAA
M. punctata FL 2389-1	CT-??CAAATGTAATAGTAATTGATTCAATGGCGTGAATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAATCC-AAAAGACTACAA
M. punctata AR 2060-1	CT-??CAAGTATAATAGTAATTGATTCAATGGTG-?AATGTTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAATCC-ACAGGACTACAA
M. humilis 2176-3	CT-??CAAATGTAATAGTAATTGATTCAATGGCGTGAATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAACCC-AAAAGACTACAA
M. viridissima 2055	AT-??CAGATTTAATAGTAATTGATTCAATGGTG-?AATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAACCC-AAAAGACTACAA
M. viridissima 2444-3	CT-??CAAGTATAATAGCAATTGATTCAATGGTG-?AATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAATCC-AAAGGACTACAA
M. fruticulosa 2317-3	CA-??TAGATGTAATAGTAATTGATTCAATGGTG-?AATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAATCC-AAAAGACTACAA
M. fruticulosa 2420-1	CA-??TAGATGTAATGGTAATTGATTCAATGGTG-?AATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAATCC-AAAAGACTACAA
M. fruticulosa 2301-1	CT-??CAAATGTAATAGTAATTGATTCAATGGCGTGAATTTTTTGGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAATCC-AAAAGACTACAA
M. fruticulosa 1920-4	CT-??CAAATGTAATAGTAATTGATTCAATGGTGTGAATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAATCC-AAAAGACTACAA
M. fruticulosa 1920-10	CT-??CAAATGTAATAGTAATTGATTCAATGGTGTGAATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAATCC-?AAAGACTACAA
M. maritima 2181-3	CT-??CAAGTATAATAGTAATTGATTCAATGGTG-?AATATTTTTGCA	GCAAAGAAATTTGGTATCACTGAATTTGTGAATCC-AAAGGACTACAA
M. maritima 2181-4	CT-??CAAGTATAATAGTAATTGATTCAATGGTG-?AATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAATCC-AAAGGACTACAA
M. stanfieldii 2367-2	CT-??CAAGTATAATAGTAATTGATTCAACGGCGTGAATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAATCC-AAAAGACTACAA
M. stanfieldii 2367-1	CT-??CAAGTATAATAGTAATTGATTCAACGGCGTGAATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAATCC-AAAAGACTACAA
M. citriodora 2419-1	AT-???????????????????GATTCAATGGTG-?AATATGTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAATCC-AAAAGACTACAA
M. citriodora 2375-4	CT-??CAGATGTAATAGTAATTAATTCAACGGCGTGAATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAATTC-AAGAGACCACAA
P. tenuifolium 55-4	CT-??CAAATGTAATAGTAATTGATTCAATGGCGTGAATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAATCC-AAAAGACTACAA
P. tenuifolium 97-3	CT-??CAAATGTAATAGTAATTGATTCAATGGCGTGAATATTTTTGCA	GCAAAGAAATTTGGTGTCACTGAATTTGTGAATCC-AAAAGACTACAA
	912	960

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M. punctata NJ 1946-27 CAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTCCTCAATTCCT   TGTACTAT-??????????????????????-???GATGCATCAACCA
M. punctata MI 2048-1  CAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTCCTCAATTCCT   TGTACTAT-??????????????????????-???GTTGCATCAACCA
M. punctata NJ 2189-7  CAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTCCTCAATTCCT   TGTACTAT-??????????????????????-???GATGCATCAACCA
M. punctata LA 2305-2  CAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTCCTCAATTCCT   TGTACTAT-??????????????????????-???GTTGCATCAACCA
M. punctata FL 2397-1  CAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTCCTCAATTCCT   TGTACTAT-??????????????????????-???GTTGCATCAACCA
M. punctata TX 2396-3  CAAGCCGGTTCAAGAGGTTTGAT-??CT-?ACCTATTCCTCAATTCCT   TGTACTAT-??????????????????????-???GTTGCATCAACCA
M. punctata TX 2473-3  CAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTCCTCAATTCCT   TGTACTAT-??????????????????????-???GTTGCATCAACCA
M. punctata TX 2393-3  GAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTTCTCAATT-??   AGTACAATTCATTCATCATTCCCTAATTGTA-??TTCTGCATCAACCA
M. punctata FL 2048-9  CAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTCCTCAATTCCT   TGTACTAT-??????????????????????-???GTTGCATCAACCA
M. punctata OK 2398-2  CAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTCCTCAATTCCT   TGTACTAT-??????????????????????-???GTTGCATCAACCA
M. punctata FL 2389-1  CAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTCCTCAATT-??   AGTACAATTCATTCACCTTTCCCTCATTTTA-??TTTTGCAGCAATTA
M. punctata AR 2060-1  CAAGCCAGTACAAGAGGTTTGCT-?GCT-?ACCTATTCCTCAATTCCT   TGTACTAC-??????????????????????-???GTTGCATCAACCA
M. humilis 2176-3      CAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTCCTCAATTCCT   TGTACTAT-??????????????????????-???GTTGCATCAACCA
M. viridissima 2055    CAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTCCTCAATTCCT   TGTACTAT-??????????????????????-???GTTGCATCAACCA
M. viridissima 2444-3  CAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTCCTCAATTCCT   TGTACTAT-??????????????????????-???GATGCATCAATCA
M. fruticulosa 2317-3  GAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTTCTCAATT-??   AGTACAATTCATTCATCATTCCCTAAGTGTA-??TTTTGCATCAATCA
M. fruticulosa 2420-1  CAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTCCTCAATT-??   AGTACAATTCATTCACCATTCCCTCATTTTA-??TTTTGCAGCAATTA
M. fruticulosa 2301-1  GAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTTCTCAATT-??   AGTACAATTCATTCATCATTCCCTAATTGTA-??TTTTGCATCAATCA
M. fruticulosa 1920-4  CAAGCCAGTTCAAGAGGTT?GCT-??CT-?ACCTATTTCTCAATT-??   TGTACAATTCATTCACCATTCCCTCATTGTA-??TTTTGCAGCATTCA
M. fruticulosa 1920-10 CAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTTCTCAATT-??   TGTACAATTCATTCACCATTCCCTCATTGTA-??TTTTGCAGCATTCA
M. maritima  2181-3    CAAGCCAGTTCAAGAGGTTTGCT-??CT-?TCCTATTCCTCAATTCCT   TGTACTAT-??????????????????????-???GTTGCATCAACCA
M. maritima 2181-4     CAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTCCTCAATTCCT   TGTACTAT-??????????????????????-???GTTGCATCAACCA
M. stanfieldii 2367-2  CAAGCCAGTTCAAGAGGTTTTCT-??CT-?ACCTATTTCTCAATT-??   AGTACAATTCATTCATCATTCCCTAATTGTA-??TATTGCATCAATCA
M. stanfieldii 2367-1  CAAGCCAGTTCAGGAGGTTTTCT-??CT-?ACCTATTTCTCAATT-??   AGTACAATTCATTCATCATTCCCTAATTGTA-??TATTGCATCAATCA
M. citriodora 2419-1   CAAGCCAGTTCAAGAGGTTTGCTTTGCTCTACCTATTTCTCAATT-??   AGTACAATTCATTCATCATTCCCTAATTGTA-??TTTTGCATCAATCA
M. citriodora 2375-4   CAAGCCAGTTCAAGAGGTTTGCT-??CT-?ACCTATTCCTCAATT-??   AGTACAATTCATTCATCAGTCCCTCATTGTA-??TTTTGCATCAATCA
P. tenuifolium 55-4    CAAGCCAGTTCAAGAGGTTTGCT-??CT-?AGCTATTTCTCAATT-??   AGTACAATTCATTCATCATCCCCTCATTGTA-??TTTTGCATCAATCA
P. tenuifolium 97-3    CAAGCCAGTTCAAGAGGTTTGCT-??CT-?AGCTATTTCTCAATT-??   AGTACAATTCATTCATCATCCCCTCATTGTA-??TTTTGCATCAATCA
                                                                  1008                                                 1056
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M. punctata NJ 1946-27	AATT-?AACTTTGTACTTATTGTGTGTATAGGTGATAGCGGAGATGAC	CGATGGAGGAGTTGATCGAAGCGTCGAGTGCACCGGAAACATCAGCGC
M. punctata MI 2048-1	AATT-?AACTTTGTACTTATTGTGTGTATAGGTGATAGCGGAGATGAC	CGATGGAGGAGT?GATCGAAGCGTCGAGTGCACCGGAAACATCAACGC
M. punctata NJ 2189-7	AATT-?AACTTTGTACTTATTGTGTGTATAGGTGATAGCGGAGATGAC	CGATGGAGGAGTTGATCGAAGCGTCGAGTGCACCGGAAACATCAGCGC
M. punctata LA 2305-2	AATT-?AACTTTGTACTTATTGTGTGTATAGGTGATGGCGGAGATGAC	CGATGGAGGAGTTGATCGAAGCGTCGAGTGCACCGGAAACATCAACGC
M. punctata FL 2397-1	AATT-?AACTTTGTACTTATTGTGTGTATAGGTGATAGCGGAGATGAC	CGATGGAGGAGTTGATCGAAGCGTCGAGTGCACCGGAAACATCAACGC
M. punctata TX 2396-3	AATT-?AACTTTGTACTTATTGTGTGTATAGGTGATAGCGGAGATGAC	CGATGGAGGAGTTGATCGAAGCGTCGAGTGCACCGGAAACATCAACGC
M. punctata TX 2473-3	AATT-?AACTTTGTACTTATTTTGTGTATAGGTGATAGCGGAGATGAC	CGATGGAGGAGTTGATCGAAGCGTCGAGTGCACCGGAAACATCAACGC
M. punctata TX 2393-3	GATTTTAAGTTTGTACTCATTGTGTATGTAGGTGATAGCTGAGATGAC	TGATGGAGGAGTTGATAGGAGCGTCGAGTGCACCGGAAACATCAACGC
M. punctata FL 2048-9	AATT-?AACTTTGTACTTATTGTGTGTATAGGTGATAGCGGAGATGAC	CGATGGAGGAGTTGATCGAAGCGTCGAGTGCACCGGAAACATCAACGC
M. punctata OK 2398-2	AATT-?AACTTTGTACTTATTGTGTGTATAGGTGATAGCGGAGATGAC	CGATGGAGGAGTTGATCGAAGCGTCGAGTGCACCGGAAACATCAACGC
M. punctata FL 2389-1	GATTTTAAGTTTGTACTCATTGTGTGTGTAGGTGATAGCTGAGATGAC	GGATGGAGGAGTTGATAGGAGCGTCGAGTGCACCGGAAACATCAACGC
M. punctata AR 2060-1	AATT-?AACTTTGTACTTATTGTGTGTGTAGGTGATAGCTGAGATGAC	CGATGGAAGAGTTGATAGGAGCGTCGAGTGCACCGGAAACATCAATGC
M. humilis 2176-3	AATT-?AACTTTGTACTTATTGTGTGTATAGGTGATAGCGGAGATGAC	CGATGGA?GAATTGATAGGAGCGTCGAGTGCACCGGAAACATCAACGC
M. viridissima 2055	AATT-?AACTTTGTACTTATTGTGTGTATAGGTGATAGCGGAGATGAC	CGATGGAGGAGTTGATCGAAGCGTTGAGTGCACCGGAAACATCAACGC
M. viridissima 2444-3	AATT-?AATTTTGTACTTATTGCGTGTGTAGGTGATAGCTGAGATGAC	CGATGGAGGAGTTGATAGGAGCGTCGAGTGCACCGGAAACATCAACGC
M. fruticulosa 2317-3	TATTTTAAGTTTGTATTCATTGTTTGTGTAGGTGATAGCTGAGATGAC	TGATGGAGGAGTTGATAGCAGTGTCGAGTGC-CCGGAAACATCAACGC
M. fruticulosa 2420-1	GATTTTAAGTTTGTACTCATTGTGTGCGTAGGTGATAGCTGAGATGAC	TGATGGAGGAGTTGATAGGAGCGTCGAGTGCACAGGAAACATCAACGC
M. fruticulosa 2301-1	TATTTTAAGTTTGTATTCATTGTTTGTGTAGGTGATAGCTGAGATGAC	TGATGGAGGAGTTGATAGGAGCGTCGAGTGCACCGGAAACATCAACCC
M. fruticulosa 1920-4	AATTTTAAGTTTGTTT-CATTGTGTTTGTAGGTGATAGCTGAGATGAC	CGATGGAGGAGTTGATAGGAGTGTCGAGTGCACCGGAAACATCAACGC
M. fruticulosa 1920-10	AATTTTAAGTTTGTTT-CATTGTGTTTGTAGGTGATAGCTGAGATGAC	CGATGGAGGAGTTGATAGGAGCGTCGAGTGCACCGGAAACATCAACGC
M. maritima 2181-3	AATT-?AACTTTGTACTTATTGTGTGTGTAGGTGATAGCTGAGATGAC	CGATGGAGGAGTTGATAGGAGCGTCGAGTGCACCGGAAACATCAACGC
M. maritima 2181-4	AATT-?AACTTTGTACTTATTGTGTGTGTAGGTGATAGCTGAGATGAC	CGATGGAGGAGTTGATAGGAGCGTCGAGTGCACCGGAAACATCAACGC
M. stanfieldii 2367-2	TATTTTAAGTTTGTACTCATTGTGTGTGTAGGTGATAGCTGAGATGAC	TGATGGAGGAGTTGATCGAAGCGTCGAGTGCACCGGAAACATCAACGC
M. stanfieldii 2367-1	TATTTTAAGTTCGTACTCATTGTGTATGTAGGTGATAGCTGAGATGAC	TGATGGAGGAGTTGATCGAAGCGTCGAGTGCACCGGAAACATCAACGC
M. citriodora 2419-1	GATTTTAAGTTTGTACTCATTGTGTGTGTAGGTGATAGCTGAGATGAC	TGATGGAGGAGTTGATAGGAGCGTCGAGTGCACCGGAAACATCAACGC
M. citriodora 2375-4	GATTCTAAGTTTGTACTCATTGTGTGTGTAGGTGATAGCTGAGATGAC	CGATGGAGGAGTTGATAGGAGTGTCGAGTGCACCGGAAACATCAACGC
P. tenuifolium 55-4	GATTTTAAGTTTGCACTC-??GTGTGTGTAGGTGATAGCTGAGATGAC	CGATGGAGGAGTTGATAGGAGCGTCGAGTGCACCGGAAACATCAACGC
P. tenuifolium 97-3	GATTTTAAGTTTGTACTC-??GTGTGTGTAGGTGATAGCTGAGATGAC	CGATGGAGGAGTTGATAGGAGCGTCGAGTGCACCGGAAACGTCAACGC
	1104	1152

M. punctata NJ 1946-27	CATGATCTCAGCATTTGAATGTGTTCAGGATGTATATGCTCTTTTGAT	CACCAAACTCACC
M. punctata MI 2048-1	CATGATCTCAGCATTTGAATGTGTTCATGATGTATATGCTCTTTTGAT	CACCAAACTCACC
M. punctata NJ 2189-7	CATGATCTCAGCATTTGAATGTGTTCAGGATGTATATGCTCTTTTGAT	CACCAAACTCACC
M. punctata LA 2305-2	CATGATCTCAGCATTTGAATGTGTTCATGATGTATATGCTCTTTTGAT	CACCAAACTCACC
M. punctata FL 2397-1	CATGATCTCAGCATTTGAATGTGTTCATGATGTATATGCTCTTTTGAT	CACCAAACTCACC
M. punctata TX 2396-3	CATGATCTCAGCATTTGAATGTGTCCATGACGTAT-?GTTCTTTTGAT	CACCGAACTCACC
M. punctata TX 2473-3	CATGATCTCAGCATTTGAATGTGTTCATGACGTAT-?GTTCTTTTGAT	CACCGAACTCACC
M. punctata TX 2393-3	CATGATCTCAGCATTTGAATGTGTTCATGATGTAT-?GTTCTTTTGAT	CACCAAACACTCC
M. punctata FL 2048-9	CATGATCTCAGCATTTGAATGTGTTCATGATGTATATGCTCTTTTGAT	CACCAAACTCACC
M. punctata OK 2398-2	CATGATCTCAGCATTTGAATGTGTTCATGATGTATATGCTCTTTTGAT	CACCAAACTCACC
M. punctata FL 2389-1	CATGATCTCAGCATTTGAATGTGTTCATGATGTAT-?GCTCTTTTGAT	CACCAAACACACC
M. punctata AR 2060-1	CATGATCTCGGCATTTGAATGTGTGCATGATGTAT-?GCTCTTGGGAT	CACCAAACAAACC
M. humilis 2176-3	CATGATCTCAGCATTTGAATGTGTTCATGATGTAT-?GCTCTTTTGAT	AACCAAACACACC
M. viridissima 2055	CATGATCTCAGCATTTGAATGTGTTCATGATGTATATGCTCTTTTGAT	CACCAAACTCACC
M. viridissima 2444-3	CATGATCTCAGCATTTGAATGTGTTCATGATGTAT-?GTTCTTTTGAT	CACCAAACACACC
M. fruticulosa 2317-3	CATGATCTCGGCATTTGAATGTGTTCATGATGTAT-?GTTCTTT-GAT	AACCAACCACACC
M. fruticulosa 2420-1	CATGATCTCAGCATTTGAATGTGTTCATGATGTAT-?GCTCTTTTGAT	CACCAAACACACC
M. fruticulosa 2301-1	CATGATCTCAGCATTTGAATGTGTTCATGATGTAT-?GTTCTTT-GAT	CACCAAACACTCC
M. fruticulosa 1920-4	CATGATCTCAGCATTTGAATGTGTTCATGATGTAT-?GTTCGTT-GAT	CA?CAAACATACC
M. fruticulosa 1920-10	CATGATCTCAGCATTTGAATGTGTTCATGATGTAT-?GTTCGTT-GAT	CACCAAACATACC
M. maritima 2181-3	CATGATCTCGGCATTTGAATGTGTTCATGATGTAT-?GTTCTTTTGAT	CACCAAACAAACC
M. maritima 2181-4	CATGATCTCGGCATTTGAATGTGTTCATGATGTAT-?GTTCTTTTGAT	CACCAAACAAACC
M. stanfieldii 2367-2	CATGATCTCAGCATTTGAATGTGTTCATGATGTAT-?GTTCTTTTGAT	CACCAAACACTCC
M. stanfieldii 2367-1	CATGATCTCAGCATTTGAATGTGTTCATGATGTAT-?GTTCTTTTGAT	CACCAAACACTCC
M. citriodora 2419-1	CATGATCTCAGCATTTGAATGTGTTCATGATGTAT-?GTTCTTTTGAT	CACCAAACACACC
M. citriodora 2375-4	CATGATCTCGGCATTTGAATGTGTTCATGATGTAT-?GGTCTTTTGTT	AACCAAACACACC
P. tenuifolium 55-4	CATGATCTCAGCATTTGAATGTGTTCATGATGTAT-?GTTCTTTTGAT	CACCAAA??????
P. tenuifolium 97-3	CATGATCTCAGCATTTGAATGTGTTCATGATGTAT-?GTTCTTTTGAT	CACCAAA??????
	1200	1213

Monarda Field Collection Data

Field Collected *Monarda*, Jessie Keith

Species	Coll. #	Date	County	Location	GPS Coordinates	Flowering
M. punctata	FL-1	7/15/01	Godspen	1 mile East of Lake Tallavaria Housing	N-30°36.481', Wo-84°27.793'	no
M. punctata	FL-4	7/16/01	Bay	Off of 98 on the East side of the road southeast of Tyndell Air Force Base	N-29°59.663', Wo-84°58.615'	no
M. punctata	FL-9	7/17/01	Franklin	2 miles South of Sumatra in Applalachicola State Forest off hwy. 65, near ditch	N-29°57.066', Wo-82°46.529'	no
M. punctata	FL-10	7/18/01	Columbia	Across road from the Ichetucknee Springs State Park entrance off of hwy. 27	N-29°34.499', Wo-82°23.565'	no
M. punctata	FL-11	7/19/01	Alachua	3 miles South of Gainsville off of hwy. 121	N-29°58.263', Wo-85°27.479'	no
M. punctata	DE 1	6/31/2001	Sussex	Abbotts Mill Nature Area near Milford, DE.	N/A	no
M. punctata	NJ 1	7/1/01	Burlington	In New Jersey Pine Barrens Cemetary	N/A	no
M. stanfieldii	TX-2	5/9/02	Blanco	Pernales River State Park, in front of "picnic" sign along the path to beach area	N-30°18.704', Wo-98°14.384'	yes
M. citriodora	TX-3	5/9/02	Burnet	2 miles from hwy P-4 junction	N-30°43.005', Wo-98°23.857'	yes
M. punctata	TX-4	5/10/02	Burnet	Behind Galloway Hammond Recreation Center along fenceline, Marble Falls	N-30°44.629', Wo-98°13.686'	yes
M. citriodora	TX-4(2)	5/10/02	Burnet	Behind Galloway Hammond Recreation Center along fenceline, Marble Falls	N-30°44.629', Wo-98°13.686'	yes
M. citriodora	TX-5	5/10/02	Burnet	2 miles North of Buchanen off of hwy. 4	N-30°45.650', Wo-98°17.907'	yes
M. stanfieldii	TX-7	5/10/02	Burnet	In front of the Buchanen Dam in a residential area, along a wooded hillside	N-30°45.006', Wo-98°24.661'	yes
M. citriodora	TX-8	5/10/02	Burnet	Off of hwy. 2341 just above hwy. 690	N/A	yes
M. stanfieldii	TX-9	5/10/02	Llano	Across the road from the Black Rock State Park entrance	N-30°45.828', Wo-98°27.367'	yes
M. citriodora	TX-10	5/11/02	Blanco	At the junction of hwy. 71 and the Pernales River, northeast corner	N/A	yes
M. citriodora	TX-11	5/11/02	Travis	Off of hwy. 290 just northeast of Austin along the South side of the Road	N-30°12.809', Wo-97°43.348'	yes
M. citriodora	TX-12	5/11/02	Travis	Off of 290 near the junction at Royster Ave., southeast corner	N-30°12.193', Wo-97°38.433'	yes
M. punctata	TX-14	5/11/02	Bastrop	Corner of FM 141 and Bluebonnet Drive, near Bastrop	N-30°10.373', Wo-97°15.321'	yes
M. punctata	TX-15	5/11/02	Bastrop	Junction of 21 and Old Potato Road, northwest corner	N-30°10.735', Wo-97°10.462'	yes
M. punctata	TX-16	5/11/02	Bastrop	Off Old Potato Road 1.2 miles from hwy. 21 junction	N-30°11.247', Wo-97°10.593'	yes
M. viridissima?	TX-17	5/11/02	Bastrop	Off Old Potato Road 1.8 miles from hwy. 21 junction	N-30°11.549', Wo-97°10.898'	no

Species	Coll. #	Date	County	Location	GPS Coordinates	Flowering
M. clinopodioides	TX-18	5/11/02	Bastrop	Off Old Potato Road 2 miles from hwy. 21 junction	N-30°11.557', Wo-97°11.003'	yes
M. citriodora	TX-19	5/12/02	Bastrop	1.4 miles West of McDade on the Old McDade Hwy.	N-30°17.793', Wo-97°14.902'	yes
M. punctata	TX-20	5/12/02	Bastrop	East of Elgin on the Old McDade hwy. about 0.5 miles from 290 crossing	N/A	yes
M. punctata	TX-21	5/13/02	Victoria	Off of hwy. 77 on the way to Victoria South of Halletsville	N-29°10.515', Wo-96°59.151'	yes
M. citriodora	TX-22	5/13/02	Aransas	Approximately 5 miles from the AWR, 1 mile from the junction at hwy. 35	N/A	yes
M. maritima	TX-23	5/13/02	Aransas	Near the junction of hwy. 35 and 1781, 100 ft. up 35 across from oil tanks	N-28°06.547', Wo-97°01.795'	no
M. maritima	TX-24	5/14/02	Aransas	Off of hwy.13 1/4 of a mile from the junction of hwys. 35 and 13	N-28°08.321', Wo-97°00.199'	no
M. punctata	TX-25	5/14/02	Aransas	Right next to the Goose Island State Park gate house	N-28°07.999', Wo-96°59.049'	yes
M. punctata	TX-26	5/14/02	Aransas	0.75 miles from Lamar Beach off of hwy. 13 in Goose Island State Park	N-28°08.917', Wo-96°58.361'	yes
M. maritima	TX-27	5/14/02	Aransas	Behind the "Big Tree", the largest live oak in Texas.	N/A	no
M. punctata	TX-28	5/14/02	Nueces	South Corpus Christi, at the corner of Yorktown Road near the airport	N/A	yes
M. punctata	TX-29	5/14/02	Kenedy	East of Riviera, about 1.5 miles East of the junction between 77 and 701	N/A	yes
M. fruticulosa	TX-30	5/14/02	Kenedy	Off of hwy. 77 on the West side of the road about 5 miles South of Sarita	N/A	yes
M. fruticulosa	TX-31	5/14/02	Kenedy	1 mi South of Sarita along the West side of road	N/A	yes
M. fruticulosa	TX-32	5/14/02	Kenedy	7 miles South of Sarita along the road median	N/A	yes
M. fruticulosa ?	TX-33	5/14/02	Kenedy	3 miles North of Sarita along East side of road	N/A	yes
M. punctata	TX-34	5/15/02	Kenedy	Off of 188 on the South side of the road near the junction of 83, growing in loam	N/A	yes
M. punctata	TX 35	5/15/02	Refugio	Off Copano Retreat road 2.5 miles from 188 junction, 11 miles North of Rockport	N/A	yes
M. maritima	TX-36	5/15/02	Refugio	Off of 776 about 0.5 miles from the AWR entrance on the West side of the road	N/A	no
M. maritima	TX-37	5/15/02	Refugio	outside of the AWR entrance on the East side of the road ~200 ft from the shore	N/A	no
M. punctata	DE 2	7/7/02	Sussex	Abbotts Mill Nature Area near Milford, DE. Next to AMNA Center and field circle	N/A	no
M. viridissima	TX-38	10/17/02	Bastrop	Old Potato Road about 3/4 mile from hwy. 21 junction	N-30°11.238', Wo-97°10.547'	yes
M. viridissima	TX-39	10/18/02	Milam	Off of hwy. 36 between Caldwell and Milam on fencerow on West side of road	N-30°40.374', Wo-96°49.408'	yes
M. punctata	TX-40	10/18/02	Milam	Off of hwy. 36 on East side of the road 0.1 miles North of Cameron, had senesced	N/A	no
M. viridissima	TX-41	10/18/02	Bastrop	Off of hwy. 21 North of Bastrop, at the entrance of Pine View Estates	N-30°07.659', Wo-97°16.173'	yes

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