PHYTOLOGIA

An international journal to expedite botanical and phytoecological publication

Vol. 53 April 1983 No. 2

FIFTIETH JUBILEE YEAR

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Published by Harold N. Moldenke and Alma L. Moldenke
303 Parkside Road
Plainfield, New Jersey 07060
U.S.A.

Price of this number $3.00; for this volume $13.00 in advance or $14.00 after close of the volume; $5.00 extra to all foreign addresses and domestic dealers; 512 pages constitute a complete volume; claims for numbers lost in the mails must be made immediately after receipt of the next following number for free replacement; back volume prices apply if payment is received after a volume is closed.

PLANTAE MESOAMERICANAE NOVAE. VIII.*

by Luis Diego Gómez P.
Museo Nacional, San José,Costa Rica

COSTARICA *gen. nov. cucurbitacearum. Herbae graciles, scandentes, radice perennante. Folia 5-lobata, saepissime herbacea, petiolata, eglandulosa, supra glabrescens vel pauci pilis corniculatis, infra dense pilosa, pilis hyalinis. Cirrhi 2-3-fidis, rarius indivisi. Flores unisexuali. Flores masc. laxe corymbosi; calyx campanulatus, minute 5-lobus; corolla rotata, 5-partita, intus densissime glandulosa extus glaberrima. Stamina 5 in columna connata, antherae liberae, omnes 2-loculares, connectivo producto simplici. Nectaria nulla. Ovarii rudimentum corniculatum, minutissimum. Flores fem. capituli aggregati, longe pedunculati. Calyx campanulatus maris. Corolla reducta. Staminum rudimenta nectariaque nulla. Stylus columnatus, stigma 1, discoideus, carnosus. Ovarium fusiformis, 1-placentiferum. Fructus (samara est) monospermus, plano-alatus, sicco-papyraceo-inflatus, irregulariter lobatus, lobuli acuminatissimi apicibus hamatis. Semina fusiformia, fusca. Specie unica n. nota est:*

Costarica hamata sp. nov. Planta herbacea, scandens. Folia 9-10 cm longa, 8-9 cm lata, 5-lobulata, petiolata (2.5-3 cm), supra subasperula, infra densissime pilosa. Cirrhi 10-12 cm, 3-fidi. Inflorescentia masc. longe pedunculata (6-7 cm) vix 20-florae, corymbosa. Flores masc. pedicellati (2-3 cm), calyx 5 mm diametro, 5-lobus, lobii 2-3 mm; corolla pallide flava, 5-partita, segmentis 4 mm longis, 2.5-3.5 mm latis, acutis, intus densissime piloso-glandulosis. Infloresc, fem. 15-22-florae, capitulata, flores quasi sessiles, pediceli capilari 1-3 mm; calyx campanulatus 3 mm diam., 5-dentatus, lobi 1.5-2 mm long.; corolla minuta, 5-partita. Stylus columnatus 3 mm longus, stigma orbiculare-discoideum 2.5 mm diam. obscure bilobatum, carnosum. Fructus 2 cm longus, 1.8-2 cm latus, planus, obscure 4-alatus, irregulariter lobatus, lobuli spinulosi, spinis hamatis. Semina 1, fusiformia, immarginata, 6-8 mm longa, 2.5-3 mm lata, fusca, amarissima.

Holotypus: Rio Yerbabuena, SW slopes of Vulcan Irazu, 2000 m, Prov. Cartago, L. D. Gómez 19993, CR. Isotypi: MO, US, F, BM, MEXU, K.

In the Cucurbitaceae three genera have winged, samara-like, 1-seeded fruit: Pseudosicydium Harms, Cyclantheropsis Harms and Pterosicyos Brandegee. The first two belong in the Tribe Cyclanthereae because the anther loculi are in some fashion and degree united and horizontally arranged into a ring and dehisce by a continuous slit.

*Partially financed by CONICIT.

Gunnera X katherine-wilsoni hybr. nov.(G. insignis Oerst. X G. talamancana Weber & Mora). hybrida e G. insigne et G. talamancana exorta, foliis pedato-lobulatis irregulariter pinnatisectis et aliis characteribus inter parentes media.

Holotypus; Km 72 route 2, Prov. Cartago, L.D. Gomez 19722 , CR, MO. Named in honor of Mrs. Katherine Wilson of Las Cruces Tropical Bot. Garden, who spotted the hybrid many years ago, in appreciation for all her endeavors on behalf of tropical horticulture.

Gunnera insignis Oerst. f. albovariegata nov. G. insignis affinis, a qua imprimis differt foliis albomaculatis.
Plants in habit and general characteristics closely resembling typical G. insignis Oerst. but the leaves at all stages of development have achlorophyllous areas between the main veins, extending from the petiole insertion to the margin, often with spotty concentrations of red pigment.

Holotypus: Km 104 route 2, Prov. San Jose, L.D.Gomez 19709, CR, MO.

The plants have been observed for the past decade for any variation of the maculae. The actual population of 17 clumps, totalling some 40 plants, is scattered in 4-5 km along or off the Interamerican Highway. The possibility of a viral discoloration is being investigated but so far has proven negative.

The name G. pilosa Kunth I am applying to a population that closely resembles that South American taxon. The population under study consists of 6 adult plants at km 100 Rt. 2, Prov. San Jose, L.D. Gomez 19710, CR, MO. and Palkovic, G.

NEW RECORDS

Bulbostylis vestita (Kunth)Clarke, in savanna 7 km NW of Bagaces, in Guanacaste. L. D. Gomez 18606, CR, MO, F.

Lemna valdiviana Philippi, in Quebrada Costa Rica, Sta. Rosa Nat. Park, Guanacaste. Jorge Gomez-L. 8955, CR, F.

Acisanthera limnobios (DC) Triana, vernal pond 12 km from Rt. 1, S of La Cruz, Guanacaste, J. Gomez-L., 9087; 9088, CR, F, MO.

Rotala mexicana Cham. & Schlecht., vernal pond 12 km from Rt. 1, S of La Cruz, Guanacaste, J. Gomez-L., 9136; 9137; 9138, CR, F, MO.

HUMBOLDT'S ESSAY ON PLANT GEOGRAPHY: COMMENTS AND A TRANSLATION

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The term plant geography was introduced by Alexander von Humboldt in his "Essai sur la Geographie des Plantes" in 1805. Humboldt delineated the concerns and outlined the scope of interpretive plant geography as well as historical plant geography. Previous to this essay in 1792, Carl Wildenow, a colleague and friend of Humboldt, began to consider questions regarding the regularity and history of plant distribution in his "Grundriss der Krauterkunde". In 1800, Stromeyer considered plant distribution in relation to the history of man in his "Commentatio inauguralis sistens historiae vegetabilium geographicae specimen." It is, however, Humboldt who is generally credited as the founder of plant geography.

Of the major scientific contributions made by Humboldt during his active career, several are introduced in this essay. His "law of the third dimension" established the similarity of vegetation response to increasing altitude and increasing latitude, and is suggested by several passages in the essay. Humboldt's ascent of Mt. Chimborazo (18,096 feet), the highest known climb by a European for several decades, provided evidence to support this theory. Humboldt offered fifteen major plant physiognomic types in the essay and refined his descriptions in 1806 ("Ideen zu einer Geographie der Pflanzen").

Perhaps Humboldt's major contribution in this and succeeding works was his attempt to associate seemingly unrelated concepts: the biotic community with the physical environment, the physical world with our subjective descriptions (including arts and cultures), and the mechanist with the vitalist theories of life. Such syntheses foreshadowed the later victories of the evolutionist and mechanist hypotheses over the vitalist or religious explanations.

Certain of Humboldt's concerns in this essay have become the foundations of modern disciplines. The two major premises of phytosociology are: (1) plants are commonly found in distinct, recurring, non-random groupings, and (2) such groupings display complex environmental interactions. The goals of phytosociology include the determination of the composition of various groupings and of the types of causative environmental interactions. Such interests were shared by Humboldt early in his academic career; indeed, the major groups practicing phytosociological research in this century may owe much of their impetus to Humboldt. In addi-

tion , Humboldt's plant physiognomic descriptions constitute the first modern effort at standardized plant life form categorization. It was almost a century later before Raunkiaer (1934) offered a much improved version. Such categories are informative both about organismal adaptations to the environment and about plant community characteristics.

It is tempting but fruitless to assume that Humboldt intended to support any evolutionary theory in his work. He certainly did not believe that global vegetation distribution is invariable; however, he concurred with his contemporaries (the Neptunists and Cuvier) that natural history helped explain shifting patterns of vegetation. The only mechanisms for species generation advanced by the early 19th century naturalists included either the story of Genesis or the ambiguous "vital force" animating living organisms. It is intriguing to note in defense of Humboldt that botanists have still failed to identify the exact evolutionary history of the world's major cultivated grains, whereas homologies in the zoologic kingdom have been noted for centuries.

The essay was read to the French National Institute on January 7, 1805. It is, as Stearn (1960) writes, "one of the minor classics of botanical literature." The translation into German made by Humboldt was dedicated to Goethe, who shared many of Humboldt's scientific and artistic conerns. Humboldt reported in the preface that as early as 1790, he had "communicated the first sketch of a plant geography ... to Cook's celebrated companion Georges Forster." In 1794 he wrote a friend (Johann Pfaff) that he was engaged in a study which might appear under the title "Ideas on a Future History and Geography of Plants, or, The Historical Report of the Gradual Spread of Vegetation Over the Earth and the General Geological Conditions of the Same" (Meyer-Abich, 1969). Several biographers have either minimized or ignored this essay; however, at least some of the ideas presented here had already intermittently occupied Humboldt's thoughts for fifteen years. As Adolf Meyer-Abich wrote (1969):

> The essay on the geography of plants is without doubt the core of the whole work (Humboldt's Personal Narrative of Travels to the Americas, 1799-1804) as it documents most fully the universal programme behind the whole journey in the field.

Biographical notes:

Of the great naturalists and scientists of the first half of the 19th century--Lyell, Darwin, Wallace, Hooker, Gay-Lussac, Humboldt--the latter is probably least remembered, yet gained the most respect during his lifetime. Humboldt certainly exerted a powerful influence on the careers of the others. He was, by all accounts, generous, kind, responsive, successful in whatever discipline he essayed, prolific and adept in all kinds of scientific re-

search, charming, diplomatic, artistic, and sensitive. He left a lengthy record of almost everything he thought, said, and did.

Alexander and his brother Wilhelm benefitted from private instruction throughout their youth. The Humboldt family was wealthy and enjoyed whatever German culture had to offer in the late 18th century. Both brothers became acquainted with the most advanced thinkers in Europe: Goethe, Schiller, and others. Both went on to renowned academic institutions, Alexander to the University of Gottingen, where he pursued a broad field of studies--physics, anatomy, zoology, and philology; he also met Georges Forster, companion on Cook's expedition to the South Seas. Alexander was almost thirty by the time his five year voyage to the Americas began in 1799, but he had by then made numerous voyages throughout Europe.

While in Central and South America, Humboldt, with his companion Aime Bonpland, rewrote most of the maps, checked magnetic declinations, took air, land, and ocean temperature readings, noted the periodicity of meteor showers and ocean currents, charted the origin and course of tropical storms, computed population sizes, and acquired the largest European collections of South American plants, natural objects and artifacts. Humboldt eventually filled thirty-three volumes with numerous other meteorological, geological, anthropological, sociological, political, demographic, geophysical and biological observations.

Following his return to Europe, Humboldt spent about twenty years, mostly in Paris, writing and compiling information for this monumental account. During this time, he was a favorite of numerous societies, as well as an occasional diplomat of the Prussian court. He was responsible for one of the first successful instances of international scientific cooperation, the establishment of meteorological stations throughout the British colonies and Russia. This developed partly as a result of a nine-month expedition in 1829 led by Humboldt to northern Asia at the invitation of the Czar Nicholas.

Humboldt's most ambitious work, Kosmos, an account of man's knowledge of our physical and organic universe, was not entirely finished at his death in 1859. The publication of Darwin's Origin that year has historically overshadowed Kosmos, however there is no denying the great influence Humboldt's work exerted on a generation of natural scientists.

Humboldt was, first and foremost, a scientific researcher. He sacrificed wealth and home to his travels and publications. He was a specialist in so many fields that he may be remembered, perhaps somewhat unfairly, as a univeralist. Schiller's criticism of Humboldt in 1797 seems now, ironically, to justify Humboldt's work:

> His mind is that cold, dissecting kind that wants all nature to be shamelessly exposed to scrutiny; and with unbelievable impertinence he uses all scientific formulae, which are often nothing but empty words and narrow concepts, as a universal standard.

Humboldt's preface:

Separated from Europe for five years, having travelled through many countries which have never been visited by naturalists, I should have hastened perhaps to publish the abridged report of my tropical voyage and of the series of phenomena which have appeared successively in my investigations. I could have flattered myself that this eagerness would be approved by the public, a portion of which has shown the most generous interest, as much for my personal comments as for the success of my expedition. However, I thought that before speaking of myself and of the obstacles which I had to overcome in the course of my operations, it would be more beneficial to draw the attention of scientists to the grander phenomena which nature offers in the regions through which I travelled. It is the aggregate of such phenomena which I propose to consider here. This essay offers the result of observations which may be found developed in detail in other works which I am preparing for the public.

I include here all physical phenomena observed on the surface of the globe as well as in the surrounding atmosphere. The natural philosopher who discerns the actual state of science, especially meteorology, will not be surprised to see such a large number of objects treated in so few pages. If I could have spent more time editing, my work would only have become still less extensive; for a description should only present vast, sure, physical propositions, capable of expression as precise numbers.

Since my earliest youth I conceived the idea of such a work as this. I communicated the first sketch of a plant geography in 1790 to Cook's celebrated companion Georges Forster, to whom friendship and recognition had closely bound me. My studies made since then in several branches of the physical sciences have helped expland my first ideas. My tropical voyage furnished me with precious illustrations of our globe's physical history. Moreover, it was within sight of those majestic objects of my description, at the foot of Chimborazo, on the coasts of the southern ocean, that I wrote most of this work. I felt constrained to retain the title "Essay on Plant Geography;" any appellation less modest, while better exposing the imperfection of my work, would also render it less worthy of the public's indulgence.

It is primarily for the style that I must ask that indulgence: compelled to express myself for many years in several languages which are no more my own than is the French tongue, I can not dare

hope to achieve that purity of style which might be demanded of a work written in my own language.

The description which I shall present today is founded upon observations by myself and Mr. Bonpland. Joined by ties of the most intimate friendship, working together for six years, sharing the suffering to which all travellers are exposed in uncultured countries, we have resolved that all work which is the fruit of our expedition shall carry our two names together.

While reviewing that body of work, the which has been my task since returning from Philadelphia, I have often had recourse to the generous favours of celebrated men. Mr. Laplace, whose name is above my praises, has shown the most flattering interest, as much for the work which I brought back as for that which I believed obliged to deliver following my arrival in Europe. Enlightening and enlivening, so to speak, by the force of his genius all which surrounds him, his good will became as useful to me as it is to those young persons who approach him.

If it is my delight to pay tribute and express my admiration and recognition, friendship obliges me to fulfill duties no less sacred. Mr. Biot honored me with his advice during the editing of this work. Uniting the wisdom of the physician and the profundity of the geometrician, his intercourse became also a fertile source of personal instruction; in spite of his large number of occupations, he consented to calculate the tables of horizontal refraction and light extinction joined to my presentation.

The facts concerning the history of fruit trees were drawn from Mr. Sickler's work, which unites a marvelous erudition with philosophical design.

Mr. de Candolle[1] furnished me with interesting material concerning plant geography in the Hautes Alpes Mr. Ramond imparted similar material on the flora of the Pyrenees; I drew other material from the classical works of Mr. Wildenow. It was important to compare the phenomena of equinoctial vegetation with those presented on our European terrain, Mr. Delambre consented to enrich my description with several measures of elevation never before published. A large number of my barometric observations were calculated by Mr. Prony following the formula devised by Mr. Laplace, in each case with respect to the influence of the force of gravity. This respectable scholar had the kindness to calculate personally more than 400 of my measures of elevation.

I am currently organizing for publication the astronomic observations made in the course of my expedition, some of which were presented to the Bureau of Longitudes to determine their precision. It would be imprudent to publish first either those maps I drew of the continental interior or of my own voyage, since the position

of places and their altitude influence all phenomena in the regions through which I journeyed. I am especially tempted to flatter myself that the observations I made of longitude during our navigation of the Orinoco, the Cassiquiare, and the Rio Negro will be of interest to those who are concerned with the geography of South America. In spite of the exact description given by Father Caulin of the Cassiquiare, the most modern geographers have thrown new doubts on the existence of an association between the Orinoco and the Amazon Rivers. Working in that area, I should not have expected to be so bitterly reproached after finding the directions of rivers and mountains very different from those indicated on La Cruz' map; but it is the travellers' fate to displease when they observe facts contrary to admitted opinions.

After the publication of the volume on astronomy, that of my other works will follow rapidly; and it will only be after publishing the fruit of my last voyage that I will busy myself with a new enterprise I have contemplated which may throw light on meteorology and magnetic phenomena.

I can not publish this essay, first fruit of my researches, without offering the homage of my profound and respectful acknowledgement to that government which has honored me with its most generous protection throughout the course of my travels: enjoying a permission never before accorded, living for five years in the midst of a candid and loyal nation, I have known no other obstacles in the Spanish colonies than those presented by physical nature. The memory of such kindness on the part of the government will stay as perpetually graven in my soul as are the marks of affection and interest with which all classes of residents honored me during my sojourn in the two Americas.

Essay on plant georgraphy[2]:

Botanists generally focus their research on objects which comprise only a small part of their science. They are engaged almost exclusively in the discovery of new plant species, in the study of their external structure, of their distinguishing characteristics, and of the analogies which unite them in class and family.

This knowledge of the forms in which organisms are ordered is doubtless the principal foundation of descriptive natural history. One must consider such a foundation indispensable to the advance of those sciences which deal with the medical properties of plants, of their cultivation, or of their artistic merits; but if that foundation is worthy of employing large numbers of botanists, if likewise it lends itself to philosophic endeavors, it is then, no less important to establish a plant geography, a science still in name only, but one which, nevertheless is an essential part of natural philosophy.

It is such a science which examines plants with respect to their native distribution in various climates. As vast as the ob-

ject of its study, it paints with sweeping strokes the enormous realm of plants, from the land of perpetual snow to the bottom of the ocean, including the interior of our world, where in dark grottoes grow cryptogams as little known as the insects they support.

The upper limit of plants is variable, like that of the perpetual ice, depending upon their distance to the pole or the angle of the sun's rays. We don't know the lower limit of plants; but accurate observations of subterranean vegetation in the two hemispheres prove that our globe's interior is animated wherever organic germs have found the right environment to develop and the nourishment appropriate to their organization. Those rocky, icy summits that our eye barely discerns above the clouds are covered only by mosses and lichens. Analogous cryptogams, now withered, now colorful, branch out on the vaults of mines and underground grottoes. Thus at the two opposite limits to vegetation organisms of similar structure and equally unknown physiology are produced.

Plant geography does not just array plants according to the zones and various altitudes in which they are found; it is not sufficient to consider plants in relation to the conditions of atmospheric pressures, temperature, humidity and electric tension within which they live; one discerns among plants, as among animals, two classes which have a different way of life and, if one dares say it, habits.

Some are isolated and sparsely distributed: in Europe, such are the Solanum dulcamara, Lychnis dioica, Polygonum bistorta, Anthericum liliago, Cratoegus aria[3], Weissia paludosa, Polytrichum piliferum, Fucus saccharinus, Clavaria pistillaris, Agaricus procerus; in the tropics, Theophrasta americana, Lysianthus longifolius[4], cinchona, Hevea. Other plants gathered in communities like ants and bees, cover immense areas from which heterogenous species are excluded: such are the strawberry (Fragaria vesca), whortleberry (Vaccinium myrtillus), Polygonum aviculare, Cyperus fuscus, Aira canescens[5], Pinus sylvestris, Sesuvium portulacastrum, Rhizophora mangle, Croton argenteum[6], Convolvulus brasiliensis[7] Brathys juniperina[8], Escallonia myrtilloides, Bromelia karatas[9], Sphagnum palustre, Polytrichum commune, Fucus natans, Sphaeria digitata, Lichen haematomma, Cladonia pashalis, and Thelephora hirsuta.

Those social plants are more common in temperate rather than in tropical zones, where less uniform vegetation is no less picturesque. From the banks of the Orinoco as far as those of the Amazon and the Ucayali over an expanse of more than 500 leagues, the entire soil surface is covered by thick forests, and if the rivers did not interrupt its continuity, monkeys, the nearly solitary inhabitants of those widernesses, could, by springing from branch to branch, travel from the boreal hemisphere to the austral hemisphere. But those immense forests do not present the uniform

picture of social plants; each sector of forest produces different forms of plants, Here one finds mimosas, Psychotria or Melastoma, there laurels, Cesalpinia, Ficus, Carolinea[10], and Hevea, which entwine their boughs; not one plant has dominion over the others. It is not the same in that tropical region which borders New Mexico[11] and Canada. From the 17th to the 22nd degree of latitude, all of Anahuac[12], the entire plateau from 1500 to 3000 meters above sea level, is covered with oaks and a species of evergreen resembling Pinus strobus. On the eastern slope of the Andes in the Jalapa valleys, one finds a vast liquidamber forest; soil, vegetation and climate there assume the character of temperate regions. This circumstance is observed nowhere else at an equal altitude in South America.

The cause of this phenomenon seems to depend on the structure of the American continent. This continent widens towards the north pole and protracts more in this direction than Europe, which renders the Mexican climate colder than it should be due to its latitude and its elevation above sea level. The vegetation of Canada and the more northern regions spreads toward the south, and the Mexican volcanoes are covered by the same evergreens which seemed to belong only to the sources of the Gila and the Missouri Rivers.

In Europe, on the contrary, the great cataclysm which opened the straits of Gibraltar and dug the Mediterranean's bed prevented the spread of any more African plant species to southern Europe, and so one finds few African plant species north of the Pyrenees. But the oaks which crown the heights of the Tenochtitlan valley are of the same species as those of the 45th degree latitude, and the painter travelling through that part of those countries situated in the tropics in order to study the aspect of the vegetation, would not be struck by the beauty and the variety of form characteristic of equinoctial plants. He would find at the Jamaican parallel, forests of oak, of fir, of Cupressus disticha[13] and Arbutus madronno[14], forests which present all the character and monotony of the social plants of Canada, Europe, and northern Asia.

It would be interesting to designate on botanic maps the lands where assemblages of plants of the same species are found. They would appear as long belts, of which the irresistible extension lessens national populations, separates neighboring states, and places obstacles to their communication and commerce stronger than mountains and oceans. Heather, those associations of Erica vulgaris[15], Erica tetralix, Lichen icmadophila[16], and Haematomma, spreads from the extreme northern tip of Jutland, by Holstein and Lunebourg, to the 52nd degree latitude. From there, they extend to the west, over the granitic gravels of Munster and Breda, to the shores of the ocean.

Those plants, after many centuries, spread soil sterility and

reign absolutely over these regions; man, in spite of his efforts, struggles against indomitable nature, and has removed but little land for cultivation. Those ploughed fields, those industrial conquests, the solitary blessings for humanity, form, so to speak, small islands in the middle of the heath lands. They recall to the voyager's imagination those oases of Libya, where the ever fresh foliage contrasts with the desert sands.

A moss common to tropical and European marshes, Sphagnum palustre, formerly covered a large part of Germany. It is that moss which rendered vast terrains uninhabitable to the nomadic peoples whose morals Tacitus described. One geologic fact supports this phenomenon. The oldest turf-pits, where sea salt and sea shells are mingled, owe their origin to ulvas and Fucus; the newest, on the contrary, and the most widespread, spring from Sphagnum and from Mnium serpillifolium, and their existence proves how much those cryptogams teemed over the globe of old. By felling the forests, rural peoples diminished the humidity of the climates; the marshes dried up, and by degrees, useful plants gained the plains occupied exclusively by those cryptogams adverse to cultivation.

Although the phenomenon of social plants seems to belong principally to the temperate zones, the tropics offer several such examples. On the back of the long range of the Andes, at 3000 meters elevations, extend Brathis juniperina[8], Jarava[17] (a genus related to Papporophorum), Escallonia myrtilloides, several species of Molina[18], and especially Tourrettia[19], the nourishing marrow over which native Indians occasionally dispute with bears. In the plains separating the Amazon and the Chinchipe Rivers, one finds together Croton argenteum[6], Bougainvillea and Godoya, as in the Orinoco savannahs, the Mauritia palm, some sensitive herbs and some Kyllingia. In the realm of Colombia, Bambusa and Heliconia offer uniform belts uninterrupted by other species; but those plant associations of the same species are consistently less extensive and less numerous in the tropics than in temperate climates.

To decide as to the existence historically of a connection between neighboring continents, geology bases itself on the analogous structures of coastlines, of ocean shallows, and on the similarity of animals living there. Plant geography furnishes most important materials for this kind of research. It can, up to a certain point, determine the islands which, formerly united, have become separated from one another; it declares that the separation of Africa and South America occurred before the development of living organisms. It is again this science that shows which plants are common to both eastern Asia and the coastlands of Mexico and California, and whether there are some which grow in all zones and at all altitudes. By the aid of plant geography we can go back with some certainty to the initial physical state of the globe. It is this science which can decide whether, after the recession

of those waters to whose abundance and movements the calcareous rocks attest, the entire surface of the earth was covered simultaneously with diverse vegetation, or whether, according to traditions of various peoples, the globe, having regained its repose, first produced plants only in a single region, from which ocean currents carried them progressively, during the course of centuries, into the most distant zones.

It is this science which examines whether, across the immense variety of plant forms, we can recognize some primitive forms, and whether species diversity should be considered the effect of a constant degeneration of those varieties originally accidental.

If I could venture some general conclusions from what I have observed in the two hemispheres, I would remark that only the germs of cryptogams seem to have developed spontaneously and naturally in all climates. Dicranum scoparium, Polytrichum commune, Verrucaria sanguinea[20], Verrucaria limitata[21] of Scopoli, appear at all latitudes, in Europe as at the equator, not just on the highest mountain ranges, but even at sea level, wherever one finds shade and humidity.

On the banks of the Magdalena between Honda and Egyptiaca in a plain where the thermometer maintains an almost constant temperature of 28 to 30 degrees C., just below the Macrocnemum and Ochroma, the mosses form a lawn as beautiful and as green as any in Norway. Other travellers have asserted that tropical cryptogams are very rare; there is little doubt those travellers visited only arid shores or cultivated islands without adequately penetrating the continental interior. Lichens of the same species are found at all latitudes; their form seems to be as independent of climatic influence as it is of the rocks on which they live.

We do not yet know of any phanerogram whose organs are flexible enough to accomodate all zones and altitudes. It was futile to claim such an advantage for Alsine media[22], Fragaria vesca, and Solanum nigrum, which advantage seems to be reserved to man and certain mammals in his entourage. The American and Canadian strawberry differs from the European strawberry. Monsieur Bonpland and myself believed to have discovered several roots of the latter species in the Andes by way of the Magdalena and Cauca valleys through the snows of Quindiu. The seclusion of those forests, composed of styrax, of tree-like Passiflora and of wax palms, the lack of cultivation in the environs and other circumstances, seem to exclude the suspicion that those strawberries were disseminated either by man or birds; though perhaps, if we had seen that plant in flower we would have found it specifically different from Fragaria vesca, as Fragaria elatior differs from Fragaria Virginiana by very subtle nuances. At any rate, during the five years spent herborising in the two hemispheres, we collected not one European plant spontaneously produced by the soil of South America. One is forced to believe that Alsine media, Solanum nigrum, Sonchus

oleraceus, Apium graveolens, and Portulaca oleracea, are plants which, like the poeple of the Caucasian races, are well distributed in the northern part of the old continent. We still know so little of the productions of the earth's interior that we should refrain from all general conclusions, otherwise we risk falling into the geologists' error of constructing the entire world after the model of the nearest surrounding hills.

To settle the question of plant migration, plant geography descends to the interior of the globe; there it consults ancient monuments that nature has left in the form of petrifactions in the fossil wood and coal beds, which are the graves of our planet's first vegetation. The science of plant geography discovers pertrified fruits from the Indies, palm trees, tree ferns, members of the banana family, and tropical bamboos buried in the frozen earth of the North. Plant geography considers whether that equatorial yield, like the bones of elephants, tapirs, crocodiles and marsupials recently found in Europe, could have been carried by currents in a submerged world to temperate climates, or whether those same climates formerly sustained palm trees and tapirs, crocodiles and bamboo. The latter appears more reasonable if one considers local conditions associated with petrifactions in the Indies. But can we grant such great changes in atmospheric temperature without resorting to a displacement of the stars or a change in the earth's axis, which the current state of our learning in astronomy indicates is unlikely? If the most striking geologic phenomena bear witness that out planet's crust was formerly liquid, if stratification and the differences in rocks indicate that mountain formation and crystallization of great masses around a common nucleus were not effected simultaneously over the earth, it is possible that the change from a liquid to a solid state released large quantities of heat, thus temporarily increasing regional temperature independently of the sun. But could that local increase have lasted long enough to account for the observed phenomena?

Observed changes in starlight have led to the surmise that the central star of our system undergoes analogous variations. Could an increase in the intensity of sunbeams in certain eras cause tropical heat to spread to zones adjoining the pole? Are the variations which make Lapland habitable to equatorial plants, elephants and tapirs periodic, or are they the effect of some transitory disturbances in our planetary system?

Such are the discussions which unite plant geography and geology. By shedding light on the ancient history of our globe plant geography offers to man's imagination a field as rich as it is interesting to cultivate.

Plants, although quite analogous to animals in their response to stimuli and in the irritability of their fibers, differ essentially with regard to their mobility. Most animals leave their mothers only as adults. Plants, however, are fixed to the soil

after their development, and can migrate only as eggs, the structure of which favors mobility. But it is not just the winds, currents, and birds which assist plant migrations; it is above all, man.

As soon as man gives up the wandering life, he surrounds himself with useful plants and animals capable of clothing and feeding him. This transition from a nomadic life to agriculture occurs slowly with the Northern peoples. In the equatorial regions between the Orinoco and the Amazon Rivers, the thickness of the woods prevents the savage from being a hunter: he is forced to care for certain plants, a few roots, including jatropha, bananas and Solanum, which sustain him. South American Indians are sustained principally by fishing, the friut of the palm trees, and those small cultivated fields (if I may be allowed to speak of cultivation where there is such a small variety of crops). Everywhere the savage's life is subdued by the nature of the climate and the soil where he lives. Those modifications alone distinguish the first Greeks from the Bedouin shepherds, and them from the Canadian Indians.

Some plants, subjected to cultivation and gardening from the earliest days, have followed man from one end of the globe to the other. Thus, in Europe, has the vine followed the Greeks, wheat the Romans, and cotton the Arabs. In America, the Toltecs carried corn with them; potatoes and green quinoa are found wherever the inhabitants of ancient Condinamarca[23] passed. Migration of those plants is evident, but their native home is as little known as that of the different races of man, which we find already spread over the entire globe in the remotest past. To the southeast of the Caspian Sea, on the banks of the Amu-Darya, in ancient Colchis, and especially in the province of Kurdistan, where the highest mountains are perpetually covered with snow and are consequently higher than 3000 meters, the earth is covered with lemon trees, pomegranate trees, cherry trees, pear trees, and all other fruit trees gathered in our gardens. We do not know if that is their native locality or if, cultivated formerly, they became wild, and attest by their presence to the historic cultivation of these regions. The fertile lands between the Euphrates and the Indus Rivers, between the Caspian Sea, the Black Sea and the Persian Gulf, furnished a most precious yield to Europe. Persia gave us the walnut and peach trees; Armenia, the apricot tree; Asia minor, the cherry and chestnut trees; Syria, the fig, pear, pomegranate, olive, plum, and mulberry trees. While Cato ruled, Rome still was not acquainted with cherries, peaches, or mulberries.

Even Hesiod and Homer mention olive cultivation in Greece and the islands of the archipelago. Under the reign of Tarquin, that tree was still unknown in Italy, Spain, and Africa. Under the consul Appius Claudius, olive oil was still quite rare in Rome; but by the time of Pliny, the olive tree had already spread to

France and Spain. The grape vine that we cultivate today is not native to Europe; it grows wild on the coasts of the Caspian Sea, in Armenia and Caramania[24]. From Asia it passed to Greece, and from there to Sicily. The Phocaeans brought it to southern France; Romans planted it on the banks of the Rhine. The species of Vites growing wild in North America, and which gave the name Wineland to the first part of the continent discovered by Europeans, are quite different from out Vitis.

A cherry tree loaded with fruits adorned the triumph of Lucullus; it was the first tree of its species to be found in Italy. The dictator had removed it from the province of Pont following his victory over Mithridates. In less than one century the cherry tree was already common in France, Germany, and England. Thus does man change the surface of the globe to suit his pleasure, and assembles around himself plants native to climates far removed. European colonies in the two Indias exhibit small cultivated plots of Arabian coffee, Chinese sugar cane, African indigo, and a multitude of other plants from both hemispheres. Such a variety of cultivated plants is even more interesting when one considers the course of events which spread the human race over the entire surface of the globe, from which our race has adapted our entire agricultural harvest.

In this manner, an industrious and restless race, roaming over the diverse parts of the world, forced a certain number of plants to inhabit all climates and elevations. However, this control exercised over organized beings has not altered their primitive structure. The potato, cultivated in Chile at an elevation of 600 meters, bears the same flower as the one introduced on the Siberian plains. The barley which nourished Achilles' horses was doubtless the same that we see today. The characteristic forms of plants and animals currently present on the surface of our globe do not seem to have undergone any change since the most remote times. The ibis hidden undergrown in the Egyptian catacombs, that bird whose antiquity dates nearly to the Pyramids, is identical with the bird that fishes today on the banks of the Nile. This identity evidently proves that the enormous deposits of animal fossils enclosed in the heart of the earth do not come from present species, but from an order of the physical world far different from our own, and too ancient for our traditions to enlighten.

Man, favoring by cultivation those plants recently introduced, has helped subjugate native species; but this preponderance, which renders the vista of the European horizon so monotonous, and which so discourages touring botanists, only belongs to that tiny part of the globe where civilization has become more perfect, and where, as a result, the population has most increased. In countries bordering the equator, man is too weak to subdue a vegetation which hides the soil from view and leaves no gap from the ocean to the rivers. Nature wears a savage and majestic visage which dissolves any immediate cultural efforts.

The origin, the native land, of those plants which are useful to man and which have followed him since the remotest past, is as much an unfathomable secret as is the first home of all our domesticated animals. We are ignorant of the native land of those grasses which form the principal nourishment for the Mongol and Caucasian races; we do not know which region spontaneously produced the cereals: wheat, barley, oats, and rye. This last grass seems not to have been cultivated even by the Romans. Claims to have discovered barley on the banks of the Samara in Tartary, Triticum spelta in Armenia, rye in Crete, wheat at Baschiros in Asia, all growing wild, have not been substantiated, since it is quite easy to mistake those plants escaped from man's dominion and returned to their former liberty for plants spontaneously produced by nature. Birds can easily disseminate cereals in the woods by devouring the seeds. Those plants which comprise the natural wealth of all tropical habitats--the banana, Carica papaya, Jatropha manihot[25], and corn have never been found growing wild. I found several roots of them on the banks of the Cassiquiare and the Rio Negro. However, the savage of those areas, as gloomy as he is suspicious, cultivates small plots in solitary locations; he then abandons them shortly afterwards, and those plants remaining rapidly appear natural to the soil which supports them. The potato, an amiable plant largely responsible for sustaining the populations of the most sterile European nations, offers the same phenomenon as does the banana, corn, and wheat. Regardless of the field investigations I was able to conduct, I never found any traveller who had discovered the potato growing wild, either on the summit of the Peruvian Cordilleras or in the realm of New Spain[26], where it is cultivated with Chenopodium quinoa.

Such relationships doubtless demonstrate the breadth of inquiry which I have tried to delineate within this science. However, any man sensitive to nature's bounty will find yet more: the explanation of the influence that the appearance of vegetation exerts on peoples' taste and imagination. Such a man would take pleasure in examining what is commonly called the character of the vegetation, and the variety of sensations it produces in the soul of the beholder. These considerations are that much more important as they treat intimately of the means by which the imitative arts and descriptive poetry are able to inspire us. The simple aspect of nature, the view of fields and woods, delights in a way fundamentally different from that delight acheived through the particular study of the structure of organisms. In the latter, detail interests and excites our curiosity; in the former, the aggregate stirs our imagination. What are the different impressions caused by the appearance of a vast prairie bordered by a few groves of trees and the vista of a thick and dark mixed forest of oaks and evergreens? What a striking contrast exists between the temperate zone forests, and those of the equatorial zone, where the naked, slender palm trunks rise above flowering mahogany trees and form majestic porticos in the sky. What is the moral cause of such

sensations? Are they produced by nature, by massive grandeur, the contour of forms, or the habit of plant life? How does this habit, this view of nature more or less rich, more or less laughing, influence the morals, and especially the sensitivity of peoples? In what does the character of tropical vegetation consist? What physiognomic differences distinguish African plants from those of the New World? What analogy of form unites Andean alpine plant species and those of the higher summits of the Pyreness? Such are the questions, scarcely discussed to date, which doubtless deserve the attention of doctors.

Among the diverse types of plants which blanket the skin of our planet, we can easily distinguish a few general forms to which most species can be reduced, and which contain between them as many families or groups more or less analogous. I shall confine my list to fifteen of those groups, the physiognomies of which offer an important study to the landscape painter:

1. Scitaminales (genera: Musca, Heliconia, and Strelitzia),
2. palm trees,
3. tree ferns,
4. the form shown by the genera Arum, Pothos, and Dracontium,
5. the evergreens (genera: Taxus, Pinus),
6. all maple leaves,
7. the genus Tamarindus (also the genera Mimosa, Gleditschia, and Porlieria),
8. Malvaceae (genera: Sterculia, Hibiscus, Ochroma, and Cavanillesia),
9. tropical creepers (genera: Vitis, Paullinia),
10. orchids (genera: Epidendrum, Serapias),
11. cacti,
12. the genera Casuarina, Equisetum,
13. Gramineae,
14. the mosses, and
15. finally, the lichens.

Those physiognomic divisions have nearly nothing in common with divisions made to date by botanists following quite different principles. In the former we are concerned only with the large contours which determine the physiognomy of vegetation and with the analogous impression granted to those who contemplate nature, while descriptive botany associates plants according to the tiniest, but most essential, parts of fructification. To study the physiognomy of the groups of plants that I have enumerated, not in conservatories and botanical treatises, but in nature itself, would be the worthy endeavor of a distinguished artist. What more interesting subject for a painting than the ancient trunk of a palm tree balancing its varicolored leaves above a group of Heliconia and banana trees? What more picturesque contrast could there be than a tree fern surrounded by Mexican oaks?

Within the absolute beauty of form, with the harmony and the

contrast which is born from their union, is to be found that which is called the natural character of this or that region. Some of the most beautiful forms (that of the Scitaminales, palm trees and bamboos) are entirely absent in temperate zones; others, for example the trees with needle shaped leaves, are quite rare and less elegant in temperate zones. Arborescent species are much less elegant in temperate zones. Arborescent species are much less abundant, smaller, and bear fewer of those flowers which delight the eye. Additionally, the frequency of those social plants spoken of earlier and of the practices of cultivation, confer a more monotonous appearance to the terrain of temperate zones. However, in the tropics nature is delighted to bring together all forms. The pines seem to lack at first glance; but in the Andes of Quindiu, in the temperate forests of Oxa and Mexico, there are cypress, firs, and junipers.

In general, plant forms near the equator are more majestic and more imposing; the gloss of the leaves is more brilliant, the parenchyma tissue is more lax, more succulent. The tallest trees are constantly adorned with the most beautiful flowers, larger and more fragrant than those herbaceous plants of the temperate zones. The burnt bark of their ancient trunks forms a most pleasant contrast to the younger foliage composed of tropical creepers, Pothos, and especially orchids, the flowers of which imitate the form and plumage of the birds that suck their nectar. However, the tropics never present the visual expanse of green prairies which border the rivers of northern countries; equatorial inhabitants are almost completely unacquainted with that sweet feeling of vegetation awakened by spring. Nature, charitable to all beings, set aside particular gifts for each region. Fibrous tissue more or less lax, plant colors more or less bright, according to the chemical mix of elements and the stimulating force of the sun's rays: such are a few of the causes which impart a particular character to the vegetation of each global zone. The great elevation of lands near the equator presents a curious phenomenon to tropical residents: their plants have forms identical to European plants.

The Andean valleys are adorned with banana and palm trees; that charitable tree whose bark is the quickest and most wholesome cure for fever is found at higher elevations. Oaks, firs, Berberis, Alnus, Rubus, and a multitude of other genera commonly believed to belong strictly to northern lands are found in the temperate region occupied by the genus Quinquinas and higher in the region occupied by the genus Escallonia. In addition, equatorial inhabitants are familiar with all the vegetative forms which nature disposed around them: the earth unfolds a visual display as varied as the sky's azure vault, which can hide none of its constellations there.

The European peoples do not enjoy the same advantage. The love of sciences or a refined luxury encourages the cultivation of

languishing plants in hot-house conservatories where they display a shadow of the majesty of equatorial species. Many forms will stay forever unknown, but the wealth and perfection of language, the imagination and the sensitivity of poets and painters may provide some compensation. The imitative arts allow us to depict the variable pageant of equatorial life. In Europe, an isolated man on an arid shore can derive mental satisfaction from the vista of remote regions; if his soul is sensitive to works of art, if his cultured mind is broad enough to embrace the more diffuse and general considerations of natural sciences, then from the depths of his solitude and without leaving his study, he may abstract all that dauntless naturalists have discovered from the atmosphere to the oceans, penetrating subterranean grottoes or climbing icy summits. It is thus, doubtless, that the light of civilization is most influential upon our individual happiness: we are enabled to live simultaneously in the present and the past, while around us are assembled all that nature can produce in each of the diverse climates; we can communicate with all the peoples of the earth. Supported by discoveries already made, we may leap into the future, and, able to predict consequences of individual phenomena, so to settle forever those laws to which nature is subject. In the midst of such research we have prepared for ourselves an intellectual delight and a moral liberty which will fortify us against the winds of fate; no outside power may hinder our quest.

Humboldt's additions:

I. While using several measures made by Spanish geometers in this work, the author made use of a reduction in the Castillean vara[27] in meters and in fathoms[28] which is not regorous enough. The vara is to the toise[29] :: 0.513074:1.196307, and instead of reducing by 2.3, we must suppose a fathom = 2.3316 varas. Don Jorge Juan only allowed 2.32. However, consider the excellent work by Gabriel Ciscar, Sobra los neuvos pesos y medidas decimales, 1800. The beautiful maps Deposito hydrografico of Madrid designate Chimborazo as 7496 varas, which figure should be only 3217 fathoms, or the same number published by Bouguer in La figure de la terre. The peak S. Elie is 6507 varas, or 2792 fathoms (5441 meters). The peak Beau-Temps is 5368 varas, or 2304 fathoms (4489 meters). See Viaje al Estrecho de Fuca Hecho por las Goletas Sutil y Mexicana, 1792; p. CXX, CXV.

II. At the Philadelphia Society in 1800, Mr. Barton read an essay on plant geography of the United States which has not yet been printed, but which contains some most interesting ideas. He has observed that Mitchella repens is the most widespread plant in North America. It occupies all the land surface from 28 to 69 1/2 degrees north latitude. Likewise Arbutus uva ursi[30] extends from New Jersey to 72 degrees north latitude where it was observed by Mr. Hearne. However, Gordonia Francklini[31] and Kionaea muscipula are found isolated in small plots. Mr. Barton remarks that in general the same plant species advance farther northward in provinces to the

west of the Alleghenies than in provinces to the east, where the climate is colder. Cotton is cultivated in Tennessee at a latitude where it may not be found in North Carolina. The eastern shores of the Hudson Bay are destitute of vegetation, while the western shores are covered. Mr. Barton observes that:

	Western side of the Alleghenies	Eastern side of the Alleghenies
Aesculus flava is found from 36 degrees latitude to 42 degrees latitude		
Juglans nigra	41	41
Aristolochia sypho	38	41
Nelumbium luteum	40	44
Gleditsia triacanthos	38	41
Gleditsia monosperma[32]	36	39
Glycine frutescens[33]	36	40

Even the genus Crotalus (rattlesnake) is found up to 44 degrees north latitude east of the Alleghenies, while it advances northward west of the Alleghenies to 47 degrees north latitude. Compare also the excellent work by Mr. Volney on the soil and climate of the United States.

Notes:

1. Augustin Pyramus de Candolle. Both Augustin (in 1820) and his son Alphonse (in 1855), contributed important works to the study of plant georgraphy.
2. Humboldt's note: "Read to the class of physical sciences and mathematics of the National Institute, the 17th Nivose, 13th year." (Translator: January 7, 1805.)
3. Pyrus aria.
4. Leianthus longifolius.
5. Corynephorous canesens.
6. Julocroton argenteus.
7. Ipomoea Pes-caprae.
8. Hypericum Brathys.
9. Karatas Plumieri.
10. Pachira.
11. Until 1850, New Mexico was a Spanish province roughly comprising Arizona, New Mexico, Utah, Colorado, and Nevada.
12. Mexico.
13. Taxodium distichum.
14. Arbutus menziesii.
15. Calluna vulgaris.
16. probably Icmadophila ericetorum.
17. Stipa.
18. Baccharis.
19. Dombeya.
20. probably Mycoblastus sanguinarius.
21. probably Lecidea limitata.

22. Stellaria media.
23. Cundinamarca.
24. Karaman.
25. Manihot utilissima.
26. Colombia.
27. Any of various Spanish and Portuguese units of length equal to between 31 and 34 inches.
28. Usually accepted as six feet; also variable between 5 and 5½ feet.
29. French unit of length equal to 6.396 feet.
30. Arctostaphylos uva-ursi.
31. Gordonia pubescens.
32. Gleditsia aquatica.
33. Wistaria frutescens.

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NOTES ON NEW AND NOTEWORTHY PLANTS. CLXV

Harold N. Moldenke

AEGIPHILA NOVOGRANATENSIS f. GRANDIFOLIA Mold., f. nov.

Haec forma a forma typica speciei laminis foliorum in statu florifero usque ad ultrave 40 cm. longis 12 cm. latis et petiolis brevissimis recedit.

This form differs from the typical form of the species in having its petioles very short and the leaf-blades, at time of anthesis, up to 40 or more cm. in length and 12 cm. in width or even larger.

The type of the form was collected by Brian M. Boom (no. 1380) in a moist tropical forest at San José, at km. 321 along the railroad from Ibarra ro San Lorenzo, at an altitude of 350 m., Esmeraldas, Ecuador, 1°N, 78° W, collected on May 6, 1982, and deposited in the Britton Herbarium at the New York Botanical Garden. The collector notes that the plant was a tree, 8 m. tall, and that the corollas were white, spreading, with exserted stamens.

VITEX MOLLIS f. ILTISII Mold., f. nov.

Haec forma a forma typica speciei foliis 1--3-foliolatis laminis membranaceis vel tenuissime chartaceis pilis sparsioribus brevioribusque foliolis lateralibus multo parvioribus recedit.

This form differs from the typical form of the species in having its leaves mostly only 1- or 2-foliolate, sometimes 3-foliolate, the lateral ones (if any) very much smaller than the central one, the blades of all the leaflets only membranous or subchartaceous in texture and the pubescence very much more sparse and short, cinereous.

The type of the form was collected by Hugh H. Iltis and M. Nee (no. 1419) along the "highway" to Manantlán, in a valley bottom forest along an at the time dry gravelly arroyo dominated by 8--13 m. tall trees of this taxon and of Ficus, with many epiphytes, at the north end of the Tecopatlan valley 5 km. south-southeast of El Chante, 19°41' N., 104°10'30" W., Jalisco, Mexico, on January 10, 1979, and deposited in the Lundell Herbarium at the University of Texas, Austin.

It is with great pleasure that this taxon is named in honor of my esteemed and valued friend and colleague of long standing, Dr. Hugh H. Iltis (1925--), professor and herbarium curator at the University of Wisconsin, botanical collector and expert on the flora of the central U.S.A., especially of Wisconsin and Arkansas, collector also in Canada, Costa Rica, Peru, Italy, Mexico, and elsewhere, and recognized specialist on the Capparidaceae, especially the Cleomoideae, of the world.

CERTAMEN MELASTOMATACEIS XXXVI.

John J. Wurdack
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This installment concludes the bulk of recent melastome novelties from Bahia, Brazil. Some problems remain unresolved, especially in Tibouchina and Microlicia; also a small assemblage of descriptions pend receipt of material from Brazil for holotype designation.

The coastal rain forest of Bahia is a mixture of lower Amazonian-Guianan and infra-Organ Mountain melastomes. In the interior mountains, Marcetia has proliferated in a morphologic set rather dissimilar to the genus elsewhere. Tibouchinopsis is still known only from Bahia. Merianthera, described from Espirito Santo originally, has recently been found in southern Bahia (5 km NW of Itamaraju, Mori, Silva, & dos Santos 10723). No Bahia collections of the following geographically restricted genera have been seen yet, but possibly may be expected: Lithobium (Minas Gerais), Svitramia (Minas Gerais), Pleiochiton (Rio de Janeiro to Santa Catarina), Behuria (Minas Gerais, Rio de Janeiro, São Paulo), Benevidesia (Rio de Janeiro), Dolichoura (Espirito Santo), Bisglaziovia (Rio de Janeiro), and Eriocnema (Minas Gerais). For the four last-named genera, no modern collections have been seen, but Brade described a second species of Benevidesia in 1935. From a provincial (Washington, D.C.) viewpoint, more field activity in the Organ Mountains and peripheral regions certainly is much to be desired.

The following covers the species totals for each melastome genus currently ascribed to Bahia, the data assembled from Cogniaux' monograph, publications by Ule, Hoehne, Markgraf, and Brade, and the recent specimen accumulation; the numbers in parentheses are species restricted to Bahia: Meriania 2 (1); Merianthera 1 (0); Huberia 2 (0); Bertolonia 4 (2); Trembleya 2 (0); Lavoisiera 7, including 1 unpublished (5); Microlicia 40, including 3 unpublished (32); Chaetostoma 3 (3); Rhynchanthera 5 (0); Cambessedesia 10, including 1 unpublished (6); Pyramia 1 (1); Marcetia 31, including 1 unpublished (23); Macairea 3 (2); Comolia 1 (0); Fritzschia 1 (1); Nepsera 1 (0); Acisanthera 5 (0); Aciotis 8 (3); Tibouchinopsis 2 (2); Tibouchina 31, including 1 unpublished (18); Pterolepis 16 (7); Desmoscelis 1 (0); Conostegia 1 (0); Miconia 54, including 1 unpublished (6); Tococa 1 (0); Clidemia 8 (0); Bellucia 1 (0); Henriettea 1 (0); Leandra 16 (2); Platycentrum 1 (0); Ossaea 4 (1); Mouriri 6 (2). The total of 270 species (117 endemic) is a respectable one, considering the large area of unhospitable caatinga in Bahia, and will probably be augmented with future collecting.

MICROLICIA PINHEIROI Wurdack, sp. nov.

M. taxifoliae Naud. et M. schreineri Schwacke & Cogn. affinis, foliis brevioribus calycis lobis latioribus differt.

Ramuli primum quadrangulares mox teretes sicut folia hypanthiaque dense vel densiuscule resinoso-granulosi, ramulorum glandulis p. p. minore brevistipitatis. Folia ascendentia conferta esetulosa; petioli 0.6-1 mm longi; lamina 4-6 X 1-1.8 mm lanceato-oblonga vel elliptico-oblonga apice hebeti basi acuta, rigida et integra, supra obscure et subtus dense punctata, uninervata. Flores in ramulis foliosis terminales 1-2-aggregati; pedicelli 0.4-0.8 mm longi. Hypanthium (ad torum) 2.6-3 mm longum teres esetulosum ad basim truncatum; calycis tubus 0.5 mm longus, lobis hypanthio paullulo brevioribus 2.4-2.7 X 0.8-1 mm oblongo-lanceatis apice acuto et esetuloso vel setula 0.1-0.2 mm longa terminato. Petala glabra 9.3-10.3 X 4.5-5.4 mm oblongo-obovata apice late acuto vel obtuso. Stamina dimorphica, filamentis 4-4.2 mm vel 3.9-4 mm longis, antheris oblongis, rostro 0.25-0.35 mm longo, connectivi appendice ventrali ad apicem rotundato-truncata vel paullulo emarginata. Stamina maiora: thecae (rostris exclusis) 2-2.3 X 0.4-0.5 X 0.6-0.8 mm; connectivum 5.5-6 mm prolongatum, appendice ventrali 1.1-1.2 X 0.3 X 0.5-0.6 mm. Stamina minora: thecae (rostris exclusis) 1.9-2 X 0.35-0.5 X 0.5-0.7 mm; connectivum 1.7-1.8 mm prolongatum, appendice ventrali 0.5-0.8 X 0.2-0.25 X 0.3-0.35 mm. Stylus 8.8-9.1 X 0.25-0.3 mm in ovarii apicem ca 0.4 mm immersus; ovarium 3-loculare glabrum apice rotundato.

Type Collection: R. M. Harley, S. A. Renvoize, C. M. Erskine, C. A. Brighton, & R. Pinheiro 16120 (holotype CEPEC; isotypes K, US), collected ca 10 km north of Mucugé on road to Andaraí, 41° 20' W, 12° 56' S, Bahia, Brazil, elev. 1050 m, 8 Feb. 1974. "Tree-like shrub to ca 1.5 m, with single thick main trunk base beneath and with bushy crown of leaves above, massed with flowers. Petals pink, anthers yellow."

Paratypes (both Bahia, Brazil): Harley et al 18772 (CEPEC, K, US), from 10 km south of Andaraí on road to Mucugé, 41° 19' W, 12° 52' S, elev. 500-700 m, 16 Feb. 1977 ("Bushy shrub to 1.5 m. Petals pink."); Harley et al 20651 (K), 5 km along Andaraí road from Mucugé, elev. ca 900 m, 25 Jan. 1980 ("Shrub ca 1.75 m high. Flowers pink. Anthers yellow").

Both suggested relatives have leaves 8-14 mm long and shorter calyx lobes only about 0.4 mm wide; M. schreineri has connective appendages of the large stamens 2 X 0.7 mm. The other species placed in this alliance by Cogniaux, M. minutiflora Cogn., differs at least in the very sparsely resinous-granulose branchlets, leaves, and hypanthia, shorter calyx lobes, and (fide Cogniaux) yellowish petals 3-4 mm long.

MICROLICIA ISOSTEMON Wurdack, sp. nov.

M. minimae Markgraf affinis, foliis maioribus breviter petiolatis, staminum connectivis ad basim non porrectis differt.

Ramuli primum obtuse quadrangulati demum teretes sicut hypanthia dense resinoso-granulosi. Folia dense conferta ascendentia; petioli 0.5-0.7 mm longi crassi; lamina 2.5-3.5 X 0.7-1.2

mm oblongo-elliptica vel oblongo-lanceata apice hebeti-acuto basi acuta, rigida et obscure crenulata, ubique densiuscule impresso-punctata esetulosa, 1-nervata. Flores in ramulis foliosis terminales vel subterminales; pedicelli 0.7-0.8 mm longi. Hypanthium (ad torum) 2.4-2.5 mm longum teres esetulosum; calycis tubus 0.3 mm longus, lobis 1.5-2.1 X 0.8-1 mm lanceatis acutis et setula 0.1-0.25 mm longa terminatis ad basim remotis. Petala glabra 4.5-6 X 3.6-4 mm asymmetrice obovata apice late acuto vel obtuso. Stamina essentialiter isomorphica; filamenta 2-2.6 mm longa; thecae (rostro 0.15-0.25 mm longo incluso) 1.7-2 X 0.5 X 0.6-0.7 mm oblongae; connectivum 0.6-0.9 mm prolongatum non expansum nec porrectum; stylus 6 X 0.25-0.3 mm; ovarium 3-loculare glabrum.

Type Collection: R. M. Harley, S. J. Mayo, R. M. Storr, T. S. Santos, & R. S. Pinheiro 19689 (holotype CEPEC 19693; isotypes K, US), collected at base of summit ridge, Pico das Almas ca 25 km WNW of Vila do Rio de Contas, 41° 57' W, 13° 33' S, Bahia, Brazil, elev. 1600-1850 m, 19 March 1977. "Bushy shrub with stem bare below, to 1 m high. Leaves rather dull green. Petals deep pinkish magenta."

Paratype (topotypical): Harley et al 19712 (CEPEC, K, US).

Microlicia minima has similar resinous-granulose indument and leaf punctation, but sessile leaves 1.2-2 X 0.5-0.7 mm as well as somewhat larger and more dimorphic anthers with the connective prolonged 1-1.5 mm and with a distinct ventral appendage 0.3-0.4 mm long; recent collections of the typical variety are Harley et al 19992 (1 km south of Mato Grosso on road to Vila do Rio de Contas, elev. 1200 m) and 20100 (2.5-5 km south of Vila do Rio de Contas). No recent collections of M. minima var. aristifera Markgraf have been seen. More distantly related are M. ericoides D. Don, M. martiana Berg ex Triana, and perhaps M. myrtoidea Cham. and M. benthamiana Triana ex Cogn., all having the anther connectives in at least the large stamens with a large ventral appendage. Microlicia subalata Wurdack (vide infra) has stamens similar to those of M. isostemon, but differs in the alate branchlets, 3-nerved leaves, only sparsely resinous-granulose hypanthia, and somewhat larger petals.

MICROLICIA MONTICOLA Wurdack, sp. nov.

M. luteae Markgraf affinis, foliis angustioribus floribus maioribus staminibus valde dimorphicis differt.

Ramuli obtuse quadrangulati sicut hypanthia sparse decidueque resinoso-glandulosi interdum sparsissime caduceque setulosi. Folia laxe conferta ascendentia essentialiter sessilia; lamina 3.5-5 X 0.7-1.2 mm lanceata vel elliptico-lanceata apice acuto et caduce 0.2-0.3 mm aristato basi acuta, rigida et integra eciliata, ubique in superficie sparse impresso-punctata esetosa, 1-nervata. Flores in ramulis solitarii vel pauci; pedicelli 0.7-0.8 mm longi. Hypanthium (ad torum) 1.8-2.1 mm longum glandulis exceptis glabrum; calycis tubus 0.2 mm longus, lobis 0.9-1.8 mm longis lanceato-subulatis ad basim remotis eciliatis subaristatis (0.1 mm). Petala 6-7.2 X 3-3.6 mm elliptica glabra apice subgradatim acuminato. Stamina dimorphica glabra, filamentis 3.7-3.8 mm

vel 3-3.5 mm longis, thecis oblongis 0.3 mm rostratis. Stamina maiora: thecae (rostris inclusis) 1.8-2.1 X 0.5 X 0.7-0.8 mm; connectivum 3.2-3.7 mm prolongatum, appendice ventrali 1.5-1.8 X 0.5-0.7 X 0.7-0.8 mm truncata. Stamina minora: thecae (rostris inclusis) 1.4-1.6 X 0.4 X 0.5 mm; connectivum 1.3-1.5 mm prolongatum, appendice ventrali 0.5-0.8 X 0.25-0.3 X 0.25 mm hebeti. Stylus 4.3-6.6 X 0.25-0.1 mm glaber; ovarium 3-loculare glabrum.

Type Collection: R. M. Harley, S. A. Renvoize, C. M. Erskine, C. A. Brighton & R. Pinheiro 15609 (holotype CEPEC; isotypes K, US), collected near Junco ca 15 km WNW of town of Rio de Contas, Bahia, Brazil, 41° 55' W, 13° 32' S, elev. ca 1200 m, 22 Jan. 1974. "Erect, 30 cm. Flowers bright yellow. Differing in both habit and micro-characters from 15615."

Paratypes (both Bahia, Brazil): Harley et al 19716 (CEPEC, K, US), from open stony grasslands on lower slopes of Pico das Almas ca 25 km WNW of Vila do Rio de Contas, elev. 1600-1850 m, 19 March 1977 ("Bushy shrub to 60 cm with bare stems below. Leaves pale green, rigid. Petals and stamens yellow"); Mori & Benton 13541 (CEPEC, NY, US), from Serra das Almas ca 5 km NW of Rio de Contas, elev. 1000-1200 m, 21 March 1980 ("Subarbusto, até 1 m de altura. Flores amarelas. Cada exsicata de uma planta differente").

Microlicia lutea has leaf blades 4 X 1.8-2 mm, petals 5 X 2 mm, and large and small stamens qualitatively similar; Markgraf described the leaves of M. lutea as sometimes shortly aristate, but there is no such indication to be seen in Luetzelburg 89 (NY), nor in Harley 15615 (an excellent match for the NY syntype). Certainly Chaetostoma luetzelburgii Markgraf is closely related to M. lutea, perhaps infraspecifically distinct, with only leaf length/width ratio and base shape, petal size, and connective appendage development to separate the types and recent collections blurring these distinctions.

MICROLICIA AUREA Wurdack, sp. nov.

M. sulfureae Hoehne, M. luteae Markgraf, M. macedoi Smith & Wurdack, et M. monticolae Wurdack affinis, floribus maioribus calycis lobis triangularibus ad basim contiguis differt.

Ramuli novelli quadrangulati demum teretes sicut folia hypanthiaque primum modice vel sparse resinoso-granulosi glabrati. Folia conferta laxe ascendentia; petioli lati vix distincti ca 0.5 mm longi; lamina (4.5-)6.5-7.5 X 2.5-3 mm lanceato-elliptica apice hebeti-acuto basi acuta, rigida et subintegra, ubique modice punctulata esetulosa, 1-nervata. Flores sessiles in ramulis terminales solitarii. Hypanthium (ad torum) ca 4.2 mm longum teres; calycis tubus 1 mm longus, lobis 1.4 X 2.7 mm late deltoideis hebeti-acutis. Petala glabra 13.2-14 X 7.5-8 mm oblongo-obovata apice late acuto vel obtuso. Stamina paulo anisomorphica glabra; filamenta 4.5-4.6 mm vel 4.3 mm longa; antherarum thecae 3.9-4.1 X 0.6 X 0.9 mm (rostro ca 0.5 mm longo incluso) oblongae, poro 0.25 mm diam. ventraliter inclinato; connectivum 2 mm vel 1.4-1.5 mm prolongatum, appendice ventrali 1 X 1 mm hebeti-acuta vel 0.5 X 0.4 mm hebeti. Stylus 14 X 0.6 mm

glaber in ovarii apicem ca 0.8 mm immersus; ovarium 3-loculare glabrum apice hebeti-lobato.

Type Collection: R. M. Harley, S. A. Renvoize, C. M. Erskine, C. A. Brighton, & R. Pinheiro 15106 (holotype CEPEC; isotypes K, US), collected ca 6 km north of town of Rio de Contas on road to Abaira, 41° 47' W, 13° 33' S, Bahia, Brazil, elev. ca 1000 m, 16 Jan. 1974. "Very bushy shrub to ca 1 m with many slender wiry branches. Flowers bright yellow."

All the suggested relatives have oblong, lanceate, or linear calyx lobes remote at the base and considerably smaller flowers (petals 4-8 mm long), as well as somewhat smaller leaves. Vegetatively M. aurea is rather like M. sincorensis DC., which has longer calyx lobes, larger pink petals, and longer anther rostra.

MICROLICIA SUBALATA Wurdack, sp. nov.

In systemate Cogniauxii M. sincorensi (DC.) Mart. affinis, foliis parvioribus 3-nervatis floribus minoribus staminum connectivis ventraliter non porrectis differt.

Ramuli primum acute tetragoni et subalati (0.2 mm) sicut folia hypanthiaque sparse caduceque resinoso-granulosi et glutinosi et sicut folia densiuscule impresso-punctati. Petioli 0.6-1 mm longi distincti; lamina 6-8 X 1.7-2.5 mm oblongo-elliptica vel lanceato-elliptica apice hebeti-acuto basi acuta, rigida et integra vel obscure crenulata, esetosa, subtus evidenter trinervata. Flores in ramulis foliosis plerumque solitarii et terminales; pedicelli 0.5-1 mm longi crassi. Hypanthium (ad torum) 2.5 mm longum teres esetulosum; calycis tubus 0.6 mm longus, lobis 1.8-2 X ca 1 mm lanceatis ad basim remotis setula unica 0.3 mm longa terminatis. Petala 6.7-7.4 X 5.1-5.3 mm obovata asymmetrica apice late acuto esetuloso. Stamina essentialiter isomorphica; filamenta 2.1-2.3 mm longa; thecae (rostro excluso) 1.8-1.9 X 0.5 X 0.7-0.8 mm oblongae, rostro 0.2 mm longo; connectivum 0.5-0.6 mm prolongatum non vel vix expansum, appendice ventrali non evoluto. Stylus 5.6 X 0.35 mm glaber in ovarii apicem leviter (0.2 mm) intrusus; ovarium 3-loculare glabrum.

Type Collection: S. Mori & F. Benton 13588 (holotype CEPEC 20745; isotype US), collected on Pico das Almas 17 km NW of Rio de Contas, Bahia, Brazil, elev. 1400-1600 m, 25 March 1980 "Subarbusto, 1 m de altura. Cálice avermelhado, corola roxa, anteras amarelas".

Paratype: Harley et al 15456 (K), topotypical, elev. 1600 m, 23 Jan. 1974 ("Wiry shrub to ca 20 cm, with dull green leaves. Petals magenta").

Microlicia sincorensis has 1-nerved leaf blades 7-10 X 1.5-4 mm, hypanthium ca 4.5 mm long, petals 13-15 mm long, anthers long-rostrate (1.5-2 mm), and definite (albeit short, 0.5-1 mm) ventral prolongation of the connectives; an exact match for the Martius type (M) is Harley et al 20049 (5 km east of Vila do Rio Contas, elev. 1000 m). The general vegetative aspect of M. subalata is rather like that of M. avicularis Mart. ex Naud. var.

subspathulata Cogn. and M. myrtoidea Cham., both of which have quite dimorphic stamens with well-developed ventral connective appendages in the large ones; M. myrtoidea has similar subalate branchlets.

MICROLICIA PETASENSIS Wurdack, sp. nov.

In systemate Cogniauxii M. cinereae Cogn. affinis, foliis sparse setulosis calycis lobis subulatis ad basim remotis staminum minorum connectivis ventraliter protractis differt.

Ramuli primum quadrangulati demum teretes sicut folia novella hypanthiaque sparse resinoso-glandulosi. Folia conferta ascendentia; petioli 0.4-0.5 mm longi crassi; lamina 3-4 X 1-1.5(-2) mm lanceato-elliptica apice hebeti-acuto basi acuta, rigida et subintegra ciliolata, ubique sparse punctulata et sparse setulosa (pilis eglandulosis 0.3-0.5 mm longis), uninervata. Flores in ramulis foliosis terminales solitarii vel 3-aggregati; pedicelli 0.5-0.8 mm longi. Hypanthium (ad torum) 2.8-3 mm longum esetulosum vel sparsissime setulosum (0.3-0.5 mm); calycis tubus 0.4-0.5 mm longus extus sparse setulosus (pilis 1-1.4 mm longis), lobis 1.3-1.5 X 0.3-0.35 mm subulatis ad basim remotis extus sparse setulosis et setula ca 0.5 mm longa terminatis. Petala 7.9-8.3 X 4-4.3 mm obovata apice late acuto et interdum setula 0.1-0.2 mm longa terminato alioqui glabra. Stamina dimorphica, filamentis 4.6-5 mm vel 3.8-4 mm longis, thecis oblongis 2.9-3.1 (rostris 0.3 mm longis inclusis) X 0.4-0.5 X 0.6 mm vel 2.7-3 X 0.5 X 0.6 mm, poro 0.15 mm diam. ventraliter inclinato. Stamina maiora: connectivum 5-6 mm prolongatum, appendice ventrali 0.8-1.4 X 0.4-0.5 X 0.5-0.6 mm paulo expansa ad apicem hebeti vel acutiuscula. Stamina minora: connectivum 2-2.2 mm prolongatum, appendice ventrali 0.6-1 X 0.3-0.35 X 0.3-0.4 mm hebeti. Stylus 9-11 X 0.4 mm in ovarii apicem vix (0.1-0.2 mm) immersus; ovarium 3-loculare glabrum.

Type Collection: S. A. Mori & B. M. Boom 14511 (holotype CEPEC 27326; isotype US), collected near bridge over Rio Ferro Doido ca 18 km east of Morro do Chapéu, Mun. Morro do Chapéu, Bahia, Brazil, elev. 1000 m, 17 June 1981. "Shrub 1 m tall. Petals purple, stamens entirely yellow."

Paratypes (all Morro do Chapéu, Bahia): Harley et al 19372 (CEPEC, K, US), near Rio Ferro Doido 19.5 km SE of Morro do Chapéu, elev. 900 m, 4 March 1977 ("Bushy ericoid shrub to ca 50 cm. Leaves rather pale green. Petals pinkish carmine. Stamens golden-yellow"); Irwin, Harley, & Smith 32432 (NY, US), margin of Rio Ferro Doido 18 km east of Morro do Chapéu, Serra da Tombador, elev. 1100 m, 17 Feb. 1971 ("Ramose subshrub to ca 50 cm tall. Corolla lavender-purple"); Hatschbach 39612 (MBM, US), near Morro do Chapéu, 15 Jan. 1977 ("Ramosa 50 cm, flor rosada, estames e anteras amarelas"); E. Pereira 2013 (HB, RB, US), elev. 1000 m ("Arbusto de flores violaceas").

The suggested relative has much denser and shorter (0.1-0.2 mm long) foliar pubescence, the toral zone of the calyx lacking a prominent ring of hairs, triangular to oblong-triangular calyx lobes 1.5 X 1 mm, and (ex char.) the small stamen connectives

simply articulate with the filaments; to M. cinerea, I have referred Harley et al 22796 (summit of Morro do Chapéu ca 8 km SW of town of Morro do Chapéu, elev. 1000 m), although the small anther connectives have minute ventral appendages. The obscure leaf crenulation might dictate attention to species 64-66 of Cogniaux' monograph, but all these differ greatly vegetatively from M. petasensis; although the type of M. vestita DC. (a good match being Macedo 3432, Serra Dourado, Goiás) purportedly was collected "prope de Caitete Rio das Contas et Sincora," I have seen no modern collections from Bahia.

MICROLICIA LEUCOPETALA Wurdack, sp. nov.

M. amblysepalae Ule affinis, foliorum petiolis longioribus laminis ad basim acutis densius pubescentibus sepalis longioribus petalis plerumque albis differt.

Ramuli paulo quadrangulati sicut petioli dense pilis eglandulosis incurvis 0.5-1 mm longis setulosi. Petioli 0.2-0.3 cm longi; lamina (0.7-)1-1.5 X (0.4-)0.6-0.8 cm elliptica vel paulo obovato-elliptica apice hebeti-obtuso vel rotundato basi acuta, subrigida et integra, ubique densiuscule resinoso-glandulosa et modice setulosa (pilis ca 0.5 mm longis gracilibus eglandulosis), trinervata. Pedicelli ca 2 mm longi sicut hypanthia calycesque densiuscule resinoso-glandulosi et modice setulosi (pilis ca 0.7 mm longis). Hypanthium 3.4-4 mm longum; calycis tubus 0.3 mm longus, lobis 3.7-4.8 mm longis subulatis acuminatis ad basim remotis hypanthio longioribus. Petala 8.5-10 X 4.5-5.5 mm anguste obovata apice obtuso vel acuto apicem versus obscure glanduloso-ciliolata alioqui glabra. Stamina dimorphica glabra, antheris 0.3 mm rostratis, poro 0.1-0.15 mm diam. ventraliter inclinato. Stamina maiora: filamenta 4.7-5.5 mm longa; thecae (rostris inclusis) 2.6-3.3 X 0.4-0.5 X 0.8 mm; connectivum 3.3-4.5 mm prolongatum, appendice ventrali 2-2.5 X 0.3 X 0.7-1 mm truncata vel rotundata. Stamina minora: filamenta 4-5 mm longa; thecae (rostris inclusis) 2.3-2.8 X 0.4-0.6 X 0.6-0.8 mm; connectivum 1.3-1.8 mm prolongatum, appendice ventrali 1-1.4 X 0.2-0.3 X 0.35-0.5 mm paulo emarginata. Stigma non expansum; stylus 7.5-9.5 X 0.4-0.2 mm glaber in ovarii apicem ca 0.3 mm immersus; ovarium 3-loculare glabrum.

Type Collection: R. M. Harley, S. A. Renvoize, C. M. Erskine, C. A. Brighton & R. Pinheiro 16094 (holotype CEPEC; isotypes, K, US), collected in marshy ground at Mucugé, Serra do Sincorá, Bahia, Brazil, elev. 850 m, 7 Feb. 1974. "Shrub to 1 m; leaves blue-green. Petals white, stamens yellow. Filaments turning red with age."

Paratypes (all Bahia, Brazil): Harley et al 18833 (CEPEC, K, US), from 2-3 km SW of Mucugé on road to Cascavel, elev. 950 m, 17 Feb. 1977 ("Shrub to 1.5 m; leaves dull green, often red-tinged. Stems red-tinged. Petals white, anthers yellow, filaments pale yellow."); Giulietti et al CFCR 1374 (SPF 18286) (K), topotypical, 20 July 1981 ("Subarbusto ca 30 cm. Flores alvas até róseas."); Mori & Benton 13101 (CEPEC, NY, US), from 3 km south of Andaraí, Mun. Andaraí, elev. 1000 m, 21 Dec. 1979

("Arbusto, 1,5 m de altura. Cálice verde, corola branca, estames novas totalmente amareladelos, os velhos vermelhas.").

The suggested relative has petioles 0.5-1 mm long, leaf blades sparsely puberulous and broadly rounded-obtuse at the base, broader blunter sepals ca 3 mm long, and "lilac" or pink petals; a recent collection matching well Ule 7331 (HBG) is Harley et al 15728 (16 km north of Barra da Estiva, Serra Sincorá, elev. 1150 m). In Cogniaux' monograph, M. decussata DC. would be a relative, differing however in the smaller subsessile leaves and somewhat smaller flowers (with pink petals) with obtuse and shorter calyx lobes. I have not studied the Bahia collection (Blanchet 2781) attributed to M. decussata by Cogniaux. Microlicia agrestis (DC.) Cogn. differs at least in the sessile esetulose (but densely resinous-glandular) leaves and pink petals.

MICROLICIA SUBAEQUALIS Wurdack, sp. nov.

M. subsetosae DC. affinis, staminibus subconformibus differt.

Ramuli densiuscule setulosi (0.4-0.7 mm) et sicut folia novella hypanthiaque modice resinoso-glandulosi. Folia conferta; petioli crassi 0.3-0.5 mm longi; lamina 3.5-4 X 1-1.5 mm lanceato-oblonga apice hebeti-acuto basi acuta, rigida et subintegra ciliolata, ubique sparse setulosa (0.3-0.6 mm) et modice punctata, 1-nervata vel obscure 3-nervata. Flores ad ramulorum apices solitarii vel 2-3-aggregati, pedicellis 0.5 mm longis. Hypanthium (ad torum) ca 2.7 mm longum extus sicut sepala densiuscule setulosum pilis ca 1-1.4 mm longis; calycis tubus 0.6 mm longus, lobis 3-3.2 X 1.7 mm lanceato-oblongis acutiusculis. Petala 7.5-8 X 4.2-4.8 mm oblongo-obovata apice late acuto vel obtuso et interdum setula 0.1 mm longa terminato alioqui glabra. Stamina subisomorphica, filamentis 3.6-3.7 mm vel 3.2-3.4 mm longis, thecis oblongis 2.4-2.6 mm vel 2-2.1 mm (rostro 0.2-0.25 mm longo incluso) X 0.5 mm X 0.6-0.7 mm; connectivum 1.6-1.7 mm vel 1 mm prolongatum, appendice ventrali 0.3 mm longa et profunde bilobata vel 0.25 mm longa et 1/3-1/2 bilobata. Stylus 7 X 0.4 mm in ovarii apicem 0.3 mm immersus; ovarium 3-loculare glabrum.

Type Collection: R. M. Harley, S. A. Renvoize, C. M. Erskine, C. A. Brighton, & R. Pinheiro 15455 (holotype CEPEC; isotypes K, US), collected in the upper caldera on slopes of Pico das Almas ca 25 km WNW of town of Rio de Contas, 41° 55' W, 13° 32' S, Bahia, Brazil, elev. 1600 m, 23 Jan. 1974. "Wiry subshrub to ca 30 cm with greyish leaves, in damp grassland. Petals pale magenta, anthers yellow."

Microlicia subsetosa has quite anisomorphic stamens, the larger ones with connective prolonged about 5 mm and with a well-developed expanded ventral appendage 1.7 X 0.5 X 0.7 mm; a good match for the Martius type (M) is Harley et al 15519 (6 km north of Barra da Estiva, Serra do Sincorá, elev. 1100 m), the leaves (as in the type) mostly 1-nerved. To M. subsetosa (but with smaller anisomorphic stamens, the connective with prolongation 2-3.5 mm, but well-developed ventral appendage) have also been referred Harley et al 15573 and 15701, both from Serra do Sincorá.

Another Bahia relative (or variant) of M. subsetosa with upper leaf surface pubescence somewhat more persistent and petal apices acute (rather than obtuse) is represented by King & Bishop 8611, Irwin et al 31129, Harley et al 15124, and Harley et al 15174, all except the last-cited (with yellow petals) having white corollas; my current perceptions are too hazy for any formal disposition. I had earlier referred a series of collections from eastern Bahia (Belém et al 757, 1675, 2430; Harley et al 18075; da Vinha 135; Hage & dos Santos 907; dos Santos et al 3349) with rather distinctly 3-nerved leaves to M. subsetosa, but now believe that this population is best regarded as a pubescent variant of M. setosa (Spreng.) DC., the species with connectives of the small stamens simply articulated with the filaments; collections matching the Sellow collection (US) from Vittoria are Harley et al 17339 and Carvalho & Gatti 478 (from 24-30 km SW of Belmonte).

MICROLICIA LONGISEPALA Wurdack, sp. nov.

In systemate Cogniauxii M. subsetosae DC. affinis, foliis floribusque maioribus differt.

Ramuli primum quadrangulati mox teretes sicut folia novella hypanthiaque sparse decidueque resinoso-granulosi esetulosi vel sparsissime eglanduloso-setulosi. Petioli ca 1 mm longi; lamina (8-)10-14 X (4-)5-8 mm late lanceata apice acuto et setula 0.3-0.5 mm longa terminato basi late acuta, subrigida et obscure crenulata, modice ciliolata pilis 0.3-0.5 mm longis eglandulosis, ubique sparse vel sparsissime setulosa (0.1-0.3 mm) et densiuscule punctata, usque ad 1 mm 3(-5)-pseudoplinervata. Flores in ramulis foliosis terminales plerumque solitarii, pedicellis 1-1.5 mm longis. Hypanthium (ad torum) 4 mm longum sparse vel sparsissime setulosum; calycis tubus 1 mm longus extus sparse setulosus, lobis 6 X 1.4 mm lanceatis plerumque sparse vel sparsissime ciliolatis (1-1.5 mm). Petala 15.5-16 X 8.5-10 mm obovato-elliptica apice late acuto et setula unica eglandulosa 0.3-0.4 mm longa terminato alioqui glabra. Stamina dimorphica, filamentis 6.2-6.3 mm vel 5.4-5.6 mm longis, thecis oblongis, poro 0.3 mm diam. ventraliter inclinato. Stamina maiora: thecae (rostro 0.4 mm longo incluso) 4 X 0.6 X 0.7-0.8 mm; connectivum 8 mm prolongatum, appendice ventrali 1.6 X 0.5 X 1 mm apice late acuto. Stamina minora: thecae (rostro 0.5-0.7 mm longo incluso) 3.3-3.7 X 0.6 X 0.7 mm; connectivum 2.5 mm prolongatum, appendice ventrali 1.3 X 0.4 X 0.7 mm apice rotundato vel paullulo emarginato. Stylus 12 X 0.4-0.5 mm glaber in ovarii apicem 0.7 mm immersus; ovarium 3-loculare glabrum apice hebeti-trilobato.

Type Collection: R. M. Harley, S. A. Renvoize, C. M. Erskine, C. A. Brighton, & R. Pinheiro 16877 (holotype CEPEC; isotypes K, US), collected 22 km NW of Lagoinha (which is 5.5 km SW of Delfino) on side road to Minas do Mimoso, 41° 20' W, 10° 20' S, Bahia, Brazil, elev. 980 m, 6 March 1974. "Bushy shrub to ca 30 cm. Leaves and stems viscid. Leaves mid-green, soft. Sepals green. Petals bright pink. Stamens deep pink, with fertile anther-locules dark brown, sterile locules bright yellow.

Style pink."

Paratype: King & Bishop 8760 (CEPEC, US), from road 8 km along road S of Mucugê, 2-5 km E along base of mountain, Bahia, Brazil, elev. 850-910 m, 1 Feb. 1981. "Shrub 3 dm tall, flowers pink."

Microlicia subsetosa (see discussion under M. subaequalis Wurdack) has leaf blades 6-9 X 2-4 mm, petals 9-10 X 4-6 mm, and large anther connectives prolonged about 5 mm. The other species placed by Cogniaux in this alliance all have different pubescence and foliage. Microlicia bradeana Hoehne (ex descr.) may be related, but differs at least in the sessile epunctate leaves and petals only 10 X 7 mm. The general aspect of M. longisepala is rather like that of the glandular-pubescent species described by Markgraf (M. bahiensis, M. carrasci, M. luetzelburgii). Of these, M. bahiensis, known to me only by the original collection (M), has smaller leaves and flowers, while the others have sessile cordate leaves and yellow petals. These two yellow-to white-flowered taxa are perhaps only subspecifically distinct, M. carrasci having been once recently collected (Mori & Benton 13524, Serra das Almas, Bahia, 1000-1200 m) and M. luetzelburgii five times near Rio de Contas, Bahia (Harley et al 20090 and 20097; Mori et al 12389, 13510, 13511).

MICROLICIA OLIGOCHAETA Wurdack, sp. nov.

M. confertiflorae Naud. affinis, antherarum minorum connectivis ventraliter distinctius appendiculatis differt.

Ramuli subquadrangulati modice vel sparsiuscule setulosi pilis gracilibus eglandulosis 1-1.5(-2) mm longis et sicut folia hypanthiaque modice plus minusve deciduque resinoso-granulosi. Petioli crassi 0.5-1 mm longi; lamina (4-)5-7 X 3-5 mm elliptica vel paulo oblongo-elliptica apice rotundato basi late acuta vel obtusa, subrigida et integra sparse ciliolata, supra sparsissime et subtus evidenter modiceque punctata, manifeste 3-nervata. Flores 5-meri ad ramorum apices pauciglomerati, pedicellis 0.5-0.7 mm longis. Hypanthium (ad torum) 3.5-3.6 mm longum esetulosum; calycis tubus 0.4 mm longus (pilis intercalycinis interdum evolutis), lobis 2.7-3.2 X 1-1.2 mm lanceatis subacuminatis setula 0.5-1 mm longa terminatis. Petala glabra 9-11.8 X 5-6.7 mm obovata apice hebeti-acuto. Stamina dimorphica glabra; filamenta 4-4.2 mm vel 3-3.7 mm longa; antherarum thecae (rostro 0.5-0.6 mm longo incluso) 2-2.9 X 0.5 X 0.7 mm vel 1.9-2 X 0.4-0.5 X 0.6-0.7 mm oblongae, poro 0.15 mm diam. ventraliter inclinato; connectivum 3-3.5 mm vel 1.4-1.5 mm prolongatum, appendice ventrali 1.6-1.7 X 0.25-0.35 X 0.5-0.8 mm ad apicem obscure acuta vel 0.9-1.1 X 0.2-0.25 X 0.3-0.5 mm ad apicem rotundata. Stylus 8-9.5 X 0.25-0.15 mm glaber; ovarium 3-loculare glabrum.

Type Collection: Scott Mori 12947 (holotype CEPEC 18178; isotypes NY, US), collected on trail to Barro Branco near Lençóis, Município de Lençóis, Bahia, Brazil, elev. ca 400 m, 1 Nov. 1979. "Arbusto 1 m de altura."

Paratype: Mori & Boom 14398 (CEPEC, NY, US), near-topotypical (5 km north of Lençóis). "Shrub 1.5 m tall. Petals pink."

Microlicia confertiflora generally has smaller ovate to elliptic-ovate leaf blades nearly or quite esetulose beneath, shorter sepals (1.2-1.6 mm from the sinus), generally smaller anther thecae (body exclusive of rostrum 1.1-1.5 mm long), and ventral connective appendage of the small stamens only 0.1-0.25 mm long; among the recent Bahia collections, Belém & Magalhaes 802 (Camacan-Canavieira) and (as a nearly glabrous variant) Harley et al 21322 (Serra Geral de Caitité) have been referred to M. confertiflora. Probably also related is M. maximowicziana Cogn., which has distinctly serrulate leaf blades, calyx lobes 2 mm or less long, and (ex char.) ventral connective appendage in the small stamens only 0.25-0.5 mm long. Most of the visible flowers in Mori 12947 had intercalycine setae, but no such hairs were noted in Mori & Boom 14398.

MARCETIA MUCUGENSIS Wurdack, sp. nov.

M. bracteolari (DC.) Cogn. affinis, foliis minoribus 3-nervatis differt.

Ramuli quadrangulati sicut folia hypanthiaque densiuscule glanduloso-setulosi pilis 0.3-0.5(-1) mm longis gracillimis. Petioli 0.1-0.2 cm longi; lamina 0.7-1.4(-2) X 0.4-0.8(-1) cm elliptica vel ovato-elliptica apice acuto basi late acuta vel obtusa, rigidiuscula et apicem versus obscure serrulata, 3-nervata nervis secundariis ca 1 mm inter se distantibus subtus paulo elevatis. Flores in ramulis foliosis lateralibus 0.2-0.4 cm longis solitarii-terni terminales; pedicelli 1-1.5 mm longi. Hypanthium (ad torum) 3-3.5 mm longum; calycis tubus 0.2 mm longus, lobis 2.3-4.2 X 0.6-0.7 mm anguste oblongis extus et intus glanduloso-setulosis. Petala 6.2-7.5 X 3.4-4.6 mm oblonga apice hebeti-acuto setula solitaria subterminali glandulifera 0.3-0.4 mm longa excepta glabra. Filamenta 4.3-5 mm longa; antherarum thecae (3-)3.8-4.7 X 0.6-0.7 X 0.5-0.7 mm lanceato-oblongae, poro 0.1 mm diam. paullulo ventraliter inclinato, connectivo ad basim dorsaliter vix elevato ventraliter bilobulato. Stigma vix expansum; stylus 12.5-13 X 0.25-0.1 mm glaber; ovarium 3-4-loculare glabrum.

Type Collection: R. M. Harley, S. J. Mayo, R. M. Storr, T. S. Santos, & R. S. Pinheiro 18611 (holotype CEPEC 21845; isotypes K, US), collected 8 km south of Andaraí on road to Mucugé, Bahia, Brazil, elev. 400 m, 13 Feb. 1977. "Spindly subshrub to 80 cm. Leaves dull green, paler below. Calyx tube tinged red. Petals white, red at base. Anthers yellow, filaments white."

Paratypes (all Bahia): Harley et al 16003 (CEPEC, K, US), Rio Cumbuca 3 km north of Mucugé on Andaraí road ("Erect viscid perennial herb 50 cm. Petals white, filaments pink, anthers yellow"); Mori & Boom 14405 (CEPEC, NY, US), trail to Barro Branco 5 km north of Lençois ("Low shrub 50 cm tall in rock cracks. Petals and filaments white, anthers yellow"); King & Bishop 8735 (CEPEC, US), 3-8 km north of Mucugé, elev. 800-900 m ("Shrub 1 m tall; petals and filaments white"); Pirani et al CFCR 1621 (SPF 18493) (K), Pio Paraguaçu, Mucugé, Andaraí-Mucugé road ("Subarbusto 90-100 cm. Flores alvas com base rosa, filetes

rosa"); Pirani et al CFCR 2097 (SPF 18892) (K), near Igatu, Mucugé, old Andarai-Mucugé road ("Subarbusto 40 cm, entre rochas. Flores alvas"); Pirani et al CFCR 466 (SPF 18049) (K), Andaraí ("Subarbusto de 50 cm, flores alvas").

Marcetia bracteolaris has oblong 5-nerved leaves 4-6 X 1.5-2.5 cm and the ternate flowers on lateral branchlets 1.5-3 cm long; this species is still known only from the Martius type, with ambiguous geography. Marcetia canescens Naud. (isotype NY) differs in the leaf blades with plane venules beneath, calyx lobes only 2 mm long, and petals pink and glandular-ciliolate for much of the perimeter. Marcetia alba Ule has thinner cordate entire leaf blades, glandular-ciliolate petals, and smaller anthers; a recent collection is King & Bishop 8727, from 3-8 km north of Mucugé, elev. 800-900 m. Of the 14 ovaries and capsules examined in M. mucugensis, nine were 4-celled and five 3-celled.

MARCETIA BAHIENSIS (Brade & Markgraf) Wurdack, comb. nov.

Ossaea bahiensis Brade & Markgraf, Willdenowia 2: 774. 30 Mar. 1961; Arq. Jard. Bot. Rio 17: 47. 1959-61 (received at Smithsonian Institution 15 Apr. 1964).

MARCETIA SIMULANS Wurdack, sp. nov.

M. bahiensi (Brade & Markgraf) Wurdack affinis, foliorum laminis proportionaliter latioribus ovariis plerumque 4-locularibus differt.

Ramuli primum quadrangulati demum teretes glutinosi primum sicut foliorum lamina supra et venae primariae subtus hypanthiaque sparse vel modice glandulis ca 0.05 mm diam. obsiti glabrati. Petioli 0.3-0.7 cm longi adaxialiter apicem versus sicut nodi sparse glanduloso-setulosi; lamina (1-)1.5-2.5(-3.3) X (0.7-)1-2 cm elliptica vel paulo obovato-elliptica apice obtuso vel rotundato basi late acuta, rigidiuscula et apicem versus obscure serrulata, supra esetulosa et glutinosa, subtus in superficie dense glanduloso-setulosa pilis ca 0.2 mm longis gracillimis, 5-nervata (pari inframarginali incluso) nervis secundariis 1-2 mm inter se distantibus sicut nervulis supra invisis nervulis subtus elevato-reticulatis areolis 0.3-0.5 mm latis. Inflorescentiae in foliorum superiorum axillis oppositis laterales 1-1.5 cm longae 3-7-florae, pedunculo 0.5-1 cm longo; pedicelli ca 2 mm longi, bracteolis ca 0.5 mm longis angustis caducis. Hypanthium (ad torum) 1.9-2.1 mm longum esetulosum; calycis tubus 0.15-0.2 mm longus, lobis 1.6-1.8 X 0.5-0.7 mm oblongis. Petala obscure granulosa 4-5 X 2.2-2.7 mm elliptico-ovata apice hebeti-acuto. Stamina isomorphica glabra; filamenta 2.5-3 mm longa; antherarum thecae 1.9-2.2 X 0.4-0.5 X 0.45-0.6 mm oblongae poro 0.1-0.15 mm diam. terminali vel vix dorsaliter inclinato, connectivo ad basim paullulo incrassato. Stigma punctiforme; stylus 5-6.3 X 0.2-0.25-0.1 mm glaber; ovarium plerumque 4-loculare glabrum; capsula 4-locularis, seminibus 0.6-0.7 X 0.5 mm cochleatis muriculatis.

Type Collection: R. M. Harley, G. L. Bromley, A. M. de Carvalho, J. M. Soares Nunes, J. L. Hage, & E. B. dos Santos 22788 (holotype CEPEC 29658; isotypes K, US), collected on rocks

on summit of Morro do Chapéu ca 8 km SW of town of Morro do Chapéu, Bahia, Brazil, elev. ca 1000 m, 30 May 1980. "Spindly shrub to 1.5 m. Leaves coriaceous, dark glistening green above, pale green beneath. Calyx pale green, tinged red in fruit. Petals pure white, spreading; anthers golden yellow, filaments white."

Paratypes (all Bahia, Brazil): Morrão, Mun. Morro do Chapéu, Hatschbach 39647 (MBM, US) ("Arbusto 1 m; flor alva, anteras creme") and Hatschbach & Guimarães 42394 (MBM, US) ("Arbusto 1m50, ramoso, petalas alvas. Alt. 1200 m"); 22 km W of Morro do Chapéu, elev. 1000 m, Irwin, Harley, & Smith 30685 (NY, US); 7 km south of Morro do Chapéu, elev. 1150 m, Irwin, Harley, & Smith 32353 (NY, US) ("Viscous shrub ca 1.5 m. Fruit green"); 6 km south of Morro do Chapéu, elev. 1000 m, Mori & Boom 14439 (CEPEC, NY, US) ("Shrub 1 m. Corolla and filaments white; anthers yellow"); Rio do Ferro Doido 19.5 km SE of Morro do Chapéu on BA 052, elev. 900 m, Harley et al 22847 (CEPEC, K, US) ("Shrub to 70 cm. Sepals pale green, tinged red; petals white; anthers golden yellow"); Morro do Chapéu, Duarte 9215 (RB, US) ("Arb. 70 cm. fl. alva").

The leaf blade length/width ratio in M. bahiensis is 2.9-3.3 (rather than mostly 1.6-1.8) and the ovary (and capsule) is 3-celled; in recent collections from near Lençóis (Harley et al 22482, 22665; Mori et al 13360, 14254, 14377), 27 ovaries or capsules studied had 3 locules and only 2 were 4-celled. In M. simulans, 18 ovaries or fruit showed 4-locules and only 4 had 3 cells. Perhaps the closest (but rather distant) relative of this species-pair is M. bracteolaris (DC.) Cogn., which differs in the larger leaves densely glandular-puberulous above and larger flowers. From the ovary-cell number, M. bahiensis would not be placed in Sect. Marcetia but all other features indicate the close affinity with M. simulans; a similar ovary-locule anomaly was noted in M. harleyi Wurdack. Certainly the placement of M. bahiensis in Ossaea was erroneous.

TIBOUCHINA SUBGLABRA Wurdack, sp. nov.

T. salviaefoliae (Cham.) Cogn. affinis, foliorum laminis proportionaliter latioribus bracteis parvis filamentis stylisque glabris differt.

Trichomata laevia. Ramuli primum quadrangulati et in angulis nodisque sparsissime strigulosi demum teretes et glabrati sicut folia ut videtur glutinosi. Petioli 0.5-0.8 cm longi sparse strigulosi; lamina (2.5-)4.5-5.5 X (1.5-)2.5-3.5 cm ovata apice acuto basi paulo (usque ad 5 mm) cordata, subrigida et integra appresso-ciliolata, supra sparse vel sparsissime strigulosa pilis 0.2-0.4 mm longis, subtus in venis primariis secundariisque sparse appresso-setulosa in superficie glabra, 5-7-nervata nervulis laxe (ca 1 mm) reticulatis. Panicula 2-3 cm longa pauciflora; flores 5-meri, pedicellis 2-3 mm longis sicut hypanthiis sparse appresso-setulosis pilis plerumque 0.3-0.4 mm longis eglandulosis, bracteolis 2-2.5 mm longis lanceatis caducis. Hypanthium (ad torum) 7.5 mm longum; calycis tubus 0.3 mm longus,

lobis 4.8-5 X 2.3-2.5 mm lanceatis post anthesim caducis. Petala minute (0.1-0.15 mm) glanduloso-ciliolata ca 12-14 X 10-12 mm obovata apice rotundato-truncato. Stamina paulo dimorphica glabra; filamenta 11.1-11.6 mm vel 8.7-9 mm longa; antherarum thecae 10.1 X 0.6 mm vel 8.7-9 X 0.6 mm subulatae poro 0.4 mm diam. ventraliter inclinato; connectivum 1.4 mm vel 0.4 mm prolongatum, lobis ventralibus 0.4 X 0.3 mm vel 0.3 X 0.25 mm hebetibus. Stylus glaber 17.2 X 0.5-0.25 mm; ovarium setulis ca 10 eglandulosis 0.4 mm longis coronatum alioqui glabrum.

Type Collection: R. M. Harley, G. L. Bromley, A. M. de Carvalho, J. M. Soares Nunes, J. L. Hage, & E. B. dos Santos 22895 (holotype CEPEC 29661; isotypes K, US), collected at Rio do Ferro Doido 19.5 km SE of Morro do Chapéu on BA 052 highway to Mundo Novo, 41° 02' W, 11° 38' S, Bahia, Brazil, elev. ca 900 m, 31 May 1980. "Spindly shrub to 1.5 m. Leaves slightly convex above, pale green, rugose with slightly silvery sheen, pale green beneath. Calyx dark reddish. Petals bright purple, stamens purple."

Tibouchina salviaefolia has lance-oblong leaf blades with length/width ratio 3-3.7 (rather than 1.6-1.9), floral bracts ca 1.5 cm long, puberulous filaments and style, oblong rounded calyx lobes, eglandular petal cilia, and ovary densely sericeo-strigulose on the apical half; an excellent modern collection is Harley et al 18013 (12 km north of Alcobaca, coastal Bahia). The other species placed by Cogniaux in this alliance, T. maximiliana (DC.) Baill. and T. corymbosa (Raddi) Cogn., are much more pubescent taxa with generally shorter calyx lobes and glandular-puberulent filaments. While T. subglabra would actually key in Cogniaux' monograph to near T. virgata (Gardn.) Cogn. and T. asperior (Cham.) Cogn., these species seem more remotely related than T. salviaefolia. The vegetative aspect of T. subglabra is somewhat like that of the two species of Tibouchinopsis, both esetose shrubs with triangular calyx lobes only 2.5-3 mm long and glabrous ovaries.

TIBOUCHINA CARVALHOI Wurdack, sp. nov.

T. clidemioidi (Triana) Cogn. affinis, hypanthii pilis densioribus calycis lobis lanceato-oblongis differt.

Ramuli primum sulcato-quadrangulati demum teretes sicut folia dense setulosi pilis laevibus paulo retrorsis 0.2-0.5 mm longis pilis glanduliferis ca 1 mm longis sparse intermixtis; nodi inter petiolorum insertiones paulo elevati dense setosi pilis laevibus gracilibus ca 2 mm longis. Petioli (1-)1.5-3 cm longi; lamina (4-)7-12 X (3-)4-7 cm ovata vel oblongo-ovata apice acuto basi rotundata vel paulo (usque ad 0.5 cm) cordata, subrigida, 7-nervata nervis secundariis tertiariisque subtus elevatis. Inflorescentia 8-15 cm longa multiflora sicut hypanthia dense retrorso-setulosa (pilis 0.2-0.5 mm longis) et modice glanduloso-setosa (pilis 1-2 mm longis); flores 5-meri, pedicellis sub articulationem 0-5 mm longis supra 1-2 mm longis, bracteolis 2-5 X 0.7-2.5 mm lanceatis deciduis. Hypanthium (ad torum) (6-)6.5-9 mm longum; calycis tubus 0.6-1 mm longis, lobis

(4.3-)5.5-7 X 1.5 mm lanceato-oblongis in fructu persistentibus intus glabris. Petala (16.5-)18-22 X 12-13(-19) mm obovata apice late obtuso extus ad apicem sparse glanduloso-puberula (0.2 mm), ciliis 0.3-0.4 mm longis basaliter eglandulosis ad apicem pro parte glanduliferis. Stamina paulo dimorphica, filamentis ad basim sparse vel sparsissime glanduloso-setulosis (0.2 mm), thecis subulatis, poro 0.3 mm diam. ventraliter inclinato. Stamina maiora: filamenta 8-10 mm longa; thecae (9-)10-13 X 0.8 mm, connectivo 1.7-2 mm prolongato, lobis ventralibus 0.5 mm longis. Stamina minora: filamenta 5.5-6.5 mm longa; thecae 7-10.5 X 0.7 mm, connectivo 0.5-0.7 mm prolongato, lobis ventralibus 0.6-0.7 mm longis. Stylus 14-15 X 0.5 mm basim versus sparse setulosus pilis 0.1-0.2 mm longis eglandulosis; ovarii pili p. p. minore glanduliferi.

Type Collection: R. M. Harley, G. L. Bromley, A. M. de Carvalho, & G. Martinelli 20993 (holotype CEPEC 20558; isotypes K, US), collected on Serra do Sincorá ca 15 km NW of Mucugé on road to Guiné and Palmeiras, Bahia, Brazil, elev. 1300-1500 m, 26 March 1980. "Spindly shrub to ca 2.5 m, branched above, with dark green leaves grey-green beneath, with pink-tinged petioles. Pedicels and calyces red-tinged. Petals magenta. Stamens reddish with white anthers."

Paratypes (all Bahia, Brazil): Harley et al 22331 (CEPEC, K, US), Serra do Brejão 14 km NW of Lençóis, Mun. Lençóis, elev. 700-1000 m ("Shrub to 60 cm. Leaves mid-green above, grey-green beneath. Calyx red-tinged. Petals deep purple. Stamens pale purple"); Harley et al 22483 (CEPEC, K, US) ("Shrub to 2 m. Calyx tube and teeth red. Petals deep pinkish purple. Anthers pale pink") and Mori & Boom 14387 (CEPEC, NY, US) ("Shrub 1.5 m tall"), both from Pai Inaçio ca 15 km NW of Lençóis, Mun. Palmeiras, elev. 900-1000 m.

The suggested relative (isotype BM) has sparser foliar and hypanthial pubescence, 5-nerved leaf blades, and apically very narrow calyx lobes. Another relative, T. stipulacea da Vinha, has thinner leaf blades less densely pubescent beneath, much shorter (0.2-0.5 mm long) hypanthial pubescence, and lanceate calyx lobes only 2.5-3 mm long. Both T. pereirae Brade & Markgraf and T. riparia Markgraf, with eglandular appressed foliar hairs and eglandular cauline hairs, seem more distantly related, the former however with rather similar hypanthium and calyx.

PTEROLEPIS GRACILIS Wurdack, sp. nov.

P. hatschbachii Wurdack affinis, foliis angustioribus minus pubescentibus floribus tetrameris minoribus differt.

Herba non vel paullulo ramosa; ramuli quadrangulati modice setulosi internodis glabris vel sparsissime strigulosis. Petioli ca 1 mm longi; lamina (1-)1.5-2.5(-3.2) X (0.1-)0.2-0.3(-0.4) cm anguste oblongo-elliptica apice anguste acuto basi acuta, chartacea et integra sparse appresso-ciliolata, supra et in costa subtus sparse strigulosa pilis 0.2-0.3 mm longis gracilibus laevibus, subtus in superficie sparsissime strigulosa, 1(-3)-

nervata. Flores semper 4-meri solitarii vel pauci-aggregati, pedicellis 1-2 mm longis. Hypanthium (ad torum) 3 mm longum sparse strigulosum pilis 0.4-0.8 mm longis simplicibus plerumque eglandulosis; calycis tubus 0.1-0.2 mm longus, appendicum axibus 0.1-0.2 mm longis ramis paucis 0.4-1 mm longis, lobis 3.5-4 X 1.4 mm lanceatis eglanduloso-ciliolatis extus centraliter sparse strigulosis intus glabris. Petala 5.5 X 5 mm obovata apice rotundato apicem versus glanduloso-ciliolata. Stamina paulo dimorphica glabra; filamenta 3.6 mm vel 2.5 mm longa; antherae subulatae poro 0.15-0.2 mm diam. ventraliter inclinato, connectivo non prolongato. Stamina maiora: thecae 3.7-3.9 X 0.6 mm, lobis ventralibus ca 0.5 X 0.4 mm. Stamina minora: thecae 2.6-2.8 X 0.35 mm, lobis ventralibus 0.25 X 0.2 mm. Stigma punctiforme; stylus 5.6 X 0.5-0.15 mm glaber; ovarium apicaliter modice setulosum pilis 0.3-0.5 mm longis eglandulosis.

Type Collection: R. M. Harley, G. L. Bromley, A. M. de Carvalho, J. L. Hage, & H. S. Brito 21403 (holotype CEPEC 25776; isotypes K, US), collected in a marsh in the basin of the upper Rio São Francisco ca 28 km southeast of Bom Jesus da Lapa on the Caitité road, Bahia, Brazil, elev. ca 500 m, 16 April 1980. "Slender erect unbranched herb to 15 cm. Leaves pale green; calyx green, petals pink, anthers golden-yellow, filaments white, stigma tinged pink."

Paratype: Harley et al 21478 (K), Calderão ca 32 km NE of Bom Jesus da Lapa, Bahia, Brazil, elev. ca 500 m ("Slender annual. Leaves pale green. Calyx green. Petals pink, anthers golden yellow").

The suggested relative has lanceate leaves 0.4-0.8 cm wide and above with hairs 0.8-1.3 mm long, predominantly 3-merous flowers, hypanthium 4 mm long with hairs 1-2 mm long, and petals 10 X 10-11 mm. Pterolepis weddelliana (Naud.) Triana also has broader leaves with longer hairs, as well as much larger flowers; P. trianaei Cogn., known from the Serra do Acuruá in Bahia (Harley et al 19040 and 19067) has narrow leaves like those of P. gracilis, but abundant and patent glandular hairs on the stems, as well as larger flowers with part of the hypanthial hairs branched.

PTEROLEPIS ROTUNDIFOLIA Wurdack, sp. nov.

P. cataphractae (Cham.) Triana affinis, hypanthiorum pilis et calycis lobis longioribus differt.

Ramuli teretes sicut foliorum subtus venae primariae densiuscule strigulosi pilis plerumque 0.5-1 X 0.2-0.3 mm robustis paulo complanatis sublaevibus. Petioli 0.1-0.2 mm longi; lamina 0.5-0.7 X 0.4-0.6 cm rotundata vel ovato-rotundata apice basique late obtuso vel rotundato, rigida et integra appresso-ciliolata, supra ut videtur glutinosa et sparse strigulosa pilis sublaevibus 0.3-0.6 X 0.2 mm fere omnino adhaerentibus, subtus in superficie dense setulosa pilis crispulis ca 0.1 mm longis, trinervata venis primariis lateralibus et nervis secundariis supra invisis nervis secundariis subtus ca 0.5 mm inter se distantibus. Flores 5-meri terminales solitarii, pedicellis ca 1 mm longis, bracteis ovatis

ca 2.5 X 2.5 mm extus centraliter strigulosis plerumque evolutis. Hypanthium (ad torum) 4.5 mm longum dense pilis penicillatis (axibus 2-3 mm longis, ramis paucis eglandulosis 1-1.5 mm longis) setosum; calycis tubus 0.1 mm longus appendicum axibus ca 4-4.5 mm longis ramis 1-2(-2.5) mm longis eglandulosis, lobis 8 X 3.5 mm lanceatis ad basim ca 0.5 mm imbricatis ciliolatis alioqui glabris. Petala 12.3-12.7 X 8.2-8.5 mm obovata apice rotundato-truncato densiuscule glanduloso-ciliolata (0.1 mm) et pilis ca 3 glanduliferis 1-1.4 mm longis terminata. Stamina isomorphica glabra; filamenta 7.8-8 mm longa; antherarum thecae 5.4-5.6 X 0.5 X 0.6 mm subulatae, poro 0.15 mm diam. ventraliter inclinato; connectivum 0.5-0.7 mm prolongatum, lobis ventralibus 0.4 X 0.3 mm hebetibus. Stylus 15.5 X 0.5-0.3 mm glaber; ovarium apicaliter sparsiuscule glanduloso-strigulosum (0.3-0.7 mm) et setis numerosis glanduliferis 1-1.7 mm longis coronatum.

Type Collection: R. M. Harley, G. L. Bromley, A. M. de Carvalho, J. M. Soares Nunes, J. L. Hage, & E. B. dos Santos 22550 (holotype CEPEC 29657; isotypes K, US), collected on west-facing ridge of Serra da Larguinha ca 2 km NE of Caeté-Açu (Capae Grande), Serras dos Lençóis, 41° 29' W, 12° 36' S, Bahia, Brazil, elev. 1000-1400 m, 25 May 1980. "Bushy shrub to 1 m. Leaves thick, glossy dark green above, very pale below. Calyx dark reddish with yellowish-brown shaggy bristles. Spreading dull reddish calyx lobes. Corolla blue-purple, white at base. Anthers cream, filaments purple, style pink."

The flowers in P. cataphracta are usually 3 (or more)-aggregate at the branchlet ends; the hypanthial hairs have a "trunk" 1 mm or less long with usually gland-tipped branches (the intercalycine appendage stem longer, up to 2.5 mm); the calyx lobes are only (2-)3-4.5 mm long; and the stamens are somewhat dimorphic in size (but the ovary hairs are mostly gland-tipped). Santos et al 3344 (27 km SW of Alcobaça, Mun. Caravelas, Bahia) is the only collection seen of P. cataphracta with eglandular hypanthial hairs, but is otherwise consonant with numerous other gatherings of the species. Pterolepis parnassifolia (DC.) Triana is more distantly related, having fine spreading branchlet and lower leaf surface hairs, longer densely setulose-barbellate hypanthial hairs, and eglandular ovary pubescence; the only recent collection is Mori et al 12637, from 3 km south of Mucugé, Bahia. From SEM investigations (to be published in detail elsewhere), the large intersepalar hairs of P. rotundifolia and its two close relatives show stomata basally along the trunk. Other species with such stomata include P. alpestris (DC.) Triana, P. balansaei Cogn., P. glomerata (Rottb.) Miquel, P. maritima (St. Hil.) Cogn., P. paludosa Cogn., P. pauciflora (Naud.) Triana var. hirsutissima (Naud.) Cogn., P. pumila (Bonpl.) Cogn., P. riedeliana Cogn., and P. salzmannii (Naud.) Cogn.

CONTRIBUTION TO THE LICHEN FLORA OF BRAZIL XI. Lichens from Santa Maria, Rio Grande do Sul State.

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The Municipality of Santa Maria, located in the central part of Rio Grande do Sul State, is the westernmost region of the Central Lowlands (Depressao Central, Rambo 1956).

The present knowledge we possess of its lichen flora is due exclusively to the collections made by G. A. Malme during the First Regnell Expedition (Malme 1897). During the Second Regnell Expedition (Malme 1904) this Municipality was not visited by this author.

Apart from the works dealing with the collections made during the First Regnell Expedition the authors were unable to find any other information concerning the lichen flora of this Municipality.

The present paper is based on a collection made by the junior author in the place named "Parada Link" which is a small railway station located 25 km NW from Santa Maria City.

All the lichen species here enumerated were collected growing on Melia azedarach and are preserved at ICN. The collection numbers belong to the junior author numbering system.

Buellia callispora (Nyl.) Steiner.
703/28b. New to Rio Grande do Sul.

Caloplaca granularis (Müll. Arg.) C. Sambo.
703/3b, 703/26b. In Brazil this species is at present known only from Rio Grande do Sul State: two collections from the vicinity of Encruzhilada do Sul (Osorio & Homrich 1978) and two another collections from the Municipality of Montenegro (Osorio, Aguiar & Citadini 1980).

Dirinaria applanata (Fée) Awasthi.
703/3a.

Glyphis cicatricosa (Ach.) Vain. f. confluens (Zenk.) Zahlbr.
703/20.
Redinger (1934) reported three collections (including one of the forma intermedia) from the whole

State of Rio Grande do Sul. Field observations made by the authors in several localities proved that at present this species is widely distributed through the State. It was observed growing indistinctly on indigenous or introduced trees.

Graphina nylanderiana Zahlbr.
703/23.

Graphis lineola Ach.
703/22.

Haematomma similis Bagl.
703/16, 703/32. Malme (1940) who reported this species as Haematomma puniceum var. subinnatum do not quote any collection from Rio Grande do Sul. Rogers (1982) in the lectotypification of this variety mentions erroneously the locality of Colonia Risso from Uruguay instead of Paraguay.

Heterodermia diademata (Tayl.) Awasthi.
703/1, 703/9.

Lecidea russula Ach.
703/19.

Ochrolechia subpallescens Vers.
703/26a, 703/30. Formerly known in the State from only one collection made near Encruzilhada do Sul (Osorio & Homrich 1978).

Parmelina lindmanii (Lynge) Hale.
703/5, 703/6.

Parmotrema austrosinense (Zahlbr.) Hale.
703/8.

Parmotrema praesorediosum (Nyl.) Hale.
703/7.

Pertusaria flavens Nyl.
703/29a.

Pertusaria pulchella Malme.
703/18.

Phaeographina arechavaletae Müll. Arg.
703/24. Formerly known in Brazil from only one collection made near Encruzilhada do Sul in Rio Grande do Sul State (Osorio & Homrich 1978).

Phaeographina caesiopruinosa (Fée) Müll. Arg.
703/21.

Phaeographis lobata (Eschw.)Müll. Arg.
703/28a. Formerly known from two localities placed in the eastern region of the State (Osorio & Fleig 1982, Osorio, Homrich & Fleig 1982).

Phaeographis medusiformis(Kremplh.) Müll. Arg.
703/17.

Physcia aipolia (Ehrh.) Hampe.
703/15.

Physcia crispa Nyl.
703/2.

Pseudoparmelia carneopruinata (Zahlbr.) Hale.
703/13.

Pseudoparmelia exornata (Zahlbr.)Hale.
703/14.
Pseudoparmelia texana (Tuck.) Hale.
703/4.
Ramalina celastri (Spreng.)Krog & Swinsc.
703/11.
Sphinctrina depressa H. Magn.
703/29c. New to Brazil. Formerly known only from two localities in Uruguay (Magnusson 1950. Osorio 1979).

SUMMARY.
Twenty six lichen species collected in the Municipality of Santa Maria are listed. Buellia callispora and Haematomma similis are added to the known flora of Rio Grande do Sul State. Sphinctrina depressa is recorded for Brazil for first time.

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A NEW ILLINOIS VASCULAR PLANT AND OTHER DISTRIBUTIONAL RECORDS FOR WEST-CENTRAL ILLINOIS

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ABSTRACT: A new Illinois vascular plant, Sporobolus pyramidatus (Lam.) Hitchc. is reported along with 70 other county records for two west-central Illinois counties (Pike and Scott). Notable range extensions in the state are recorded for Corydalis aurea Willd., Eriochloa contracta Hitchc., and Leptochloa attenuata (Nutt.) Steud. Additionally, white color forms of Cirsium discolor (Muhl.) Spreng, Cirsium vulgare (Savi) Tenore and Delphinium tricorne Michx. are noted as well as an early flowering Aster novae-angliae L.

INTRODUCTION

The information on the vascular plants of Pike and Scott counties in Illinois reported in this paper was derived from a study entitled "Description of the Biota in the Areas of Proposed Illinois River Bridge Sites for the Central Illinois Expressway (FAP 408)" which was funded by the Illinois Department of Transportation and the Federal Highway Administration of the United States Department of Transportation. The plants were collected during walking surveys of the proposed highway corridors from March through September 1981. Distribution status of the species was determined from the work of Mohlenbrock and Ladd (1978) and Mohlenbrock (1978, 1980, 1981, 1982); nomenclature follows Mohlenbrock (1975). Voucher specimens are deposited in the R. M. Myers Herbarium of Western Illinois University (MWI). The plants were collected by the authors and in this report each plant is annotated as to county, habitat and collection number(s).

This paper reports 71 county records. One of these county records, Sporobolus pyramidatus (Lam.) Hitchc., is a state record and 3 others, Corydalis aurea Willd., Eriochloa contracta Hitchc. and Leptochloa attenuata Steud. are notable state range extensions. White color forms of Cirsium discolor (Muhl.) Spreng., Cirsium vulgare (Savi) Tenore and Delphinium tricorne Michx. as well as some June flowering Aster novae-angliae L. plants are also reported.

STATE RECORD

Sporobolus pyramidatus (Lam.) Hitchc.: Pike, roadside. 1734, 1758.

This alien plant, which is a native of southwestern United

States, was found in sandy soil along the highway west of Florence. Flowering specimens were collected from the rather large population in June and July, 1981. Steyermark (1963) reported an 1896 collection (and none since) from Jackson County, Missouri which is about 225 miles west of Florence, Illinois. Gleason (1963) reports it as adventive in Yonkers, New York.

NOTABLE RANGE EXTENSIONS

Corydalis aurea Willd. ssp. aurea: Pike, by railroad near edge of woods. 1862, 1690, 1691, 1764.

This plant was found in gravelly ballast about one mile west of Valley City. There were several small colonies each consisting of a small number of plants which were readily growing, flowering and seeding. According to Bowles, et al. (1981) this is an endangered species in Illinois and this would be the only county with an extant population. Bowles, et al. (1981) record it for only 4 northern counties whereas Mohlenbrock (1981) and Mohlenbrock and Ladd (1978) record it for 7 northern and central counties. Nevertheless, by either distribution, the Pike county location is the southernmost county of its occurrence in Illinois, being a 50 mile southwest extension from Mason county (Mohlenbrock, 1981) and a 150 mile southwest extension from LaSalle county (Bowles, et al., 1981). Although considered a native plant, it is theoretically possible that this population is "adventive" since G. B. Ownbey in his specimen determination letter to us states "C. aurea is frequently transported by means of its seeds in railroad ballast etc,....."

Eriochloa contracta Hitchc.: Pike, sandy soil by roadside. 1732.

This is the seventh and northernmost county for this plant, being about 70 miles northwest of its nearest location in Montgomery county. The other 6 counties are in the southern one-third of the state (Mohlenbrock and Ladd, 1978 and Shildneck, et al., 1981).

Leptochloa attenuata (Nutt.) Steud.: Scott, floodplain. 1778.

Presently known from 4 counties at the southern tip of the state (Mohlenbrock and Ladd, 1978), this fifth location extends the range north about 150 miles.

ADDITIONAL COUNTY RECORDS

Acorus calamus L.: Pike, wet ground. 1632.
Amaranthus spinosus L.: Scott, dike. 1610.
Amaranthus tamariscinus Nutt.: Scott, floodplain. 1779.
Berberis thunbergii DC.: Pike, wooded slope. 1626, 1745.
Betula nigra L.: Scott, floodplain. 1596.
Bidens comosa (Gray) Wieg.: Scott, floodplain. 1787-1788.
Bidens connata Muhl.: Scott, floodplain. 1785-1786.
Botrychium dissectum Spreng.: Pike, woods. 1746.

Botrychium dissectum Spreng. var. obliquum (Muhl.) Clute: Pike, woods. 1747.
Cardaria draba (L.) Desv.: Pike, roadside. 1631.
Carex conjuncta Boott.: Pike, moist woods. 1661.
Cassia marilandica L.: Pike, Prairie opening. 1748.
Circaea quadrisulcata (Maxim.) Franch. & Sav. var. canadensis (L.) Hara.: Pike, damp woods. 1767.
Cirsium pumilum (Nutt.) Spreng.: Pike, hill prairie. 1761.
Comandra richardsiana Fern.: Pike, prairie opening. 1660.
Commelina diffusa Burm. f.: Scott, floodplain. 1780, 1782.
Corallorhiza odontorhiza (Willd.) Nutt.: Pike, moist woods. 1753, 1754.
Corallorhiza wisteriana Conrad: Pike, wooded stream bed. 1649.
Cyperus filiculmis Vahl. var. macilentus Fern.: Pike, dry blufftop. 1766, 1775.
Cyperus ovularis (Michx.) Torr.: Pike, sandy loess field road. 1700.
Danthonia spicata (L.) Beauv.: Pike, dry blufftop. 1733.
Digitaria ischaemum (Schreb.) Muhl.: Pike, soybean field. 1703.
Eragrostis poaeoides Beauv.: Pike, grassy farm road. 1704.
Erigenia bulbosa (Michx.) Nutt.: Pike, moist woods. 1628.
Erysimum repandum L.: Pike, by railroad. 1645.
Festuca obtusa Bieler: Pike, woods. 1664, 1668.
Geum vernum (Raf.) Torr. & Gray: Pike, dry wooded hillside. 1633, 1673.
Helianthus grosseserratus Martens: Scott, roadside. 1605.
Hieracium scabrum Michx.: Pike, dry woods. 1707, 1723.
Houstonia minima Beck.: Pike, dry bluff. 1654.
Iris pseudacorus L.: Pike, low wet area. 1687.
Kochia scoparia (L.) Roth.: Pike, stream edge under railroad bridge. 1729.
Laportea canadensis (L.) Wedd.: Pike, moist ground. 1696, 1705, 1749.
Lespedeza striata (Thunb.) Hook, & Arn: Pike, blufftop. 1699, 1708, 1727, 1744.
Ligustrum vulgare L.: Pike, floodplain. 1636.
Lindera benzoin (L.) Blume: Pike, woods by stream. 1694, 1751.
Linum usitatissimum L.: Pike, roadside. 1776.
Liparis lilifolia (L.) Rich.: Pike, wooded bluff. 1762, 1769, 1772.
Lonicera maackii Maxim.: Pike, wooded hillside. 1629.
Lonicera prolifera (Kirchn.) Rehd.: Pike, rocky wooded bluff. 1665, 1666.
Lonicera sempervirens L.: Pike, moist woods. 1686.
Monotropa uniflora L.: Pike, open woods. 1721.
Muhlenbergia schreberi J. F. Gmel.: Scott, dike. 1777.
Myosotis virginica (L.) BSP: Pike, field. 1672.
Nasturtium officinale R. Br.: Pike, shallow stream. 1612.
Onoclea sensibilis L.: Pike, wet ground. 1678.
Osmorhiza claytonii (Michx.) Clarke: Pike, floodplain. 1638, 1675, 1768.

Paspalum pubiflorum Rupr. var. glabrum (Vasey) Vasey: Scott, dike. 1608.
Phalaris arundinacea L.: Pike, wet ditch. 1674.
Poa sylvestris Gray: Pike, woods. 1698.
Polygonum erectum L.: Pike, farm lane. 1716.
Rorippa sylvestris (L.) Bess.: Pike, floodplain. 1685, 1711.
Scutellaria nervosa Pursh.: Pike, floodplain. 1657, 1695.
Sibara virginica (L.) Rollins: Pike, mudflat. 1623, 1634.
Silene nivea (Nutt.) Otth.: Pike, wooded floodplain. 1774.
Silene stellata (L.) Ait. f.: Pike, woods. 1773.
Smilax illinoensis Mangaly: Pike, rocky wooded hillside. 1663.
Specularia perfoliata (L.) A. DC.: Pike, wooded hillside. 1637, 1651, 1658.
Spiranthes ovalis Lindl.: Pike, open old field. 1720, 1755.
Stachys tenuifolia Willd. var. hispida (Pursh) Fern.: Pike, ditch at base of bluff. 1726, 1742; Scott, floodplain. 1784.
Taenidia integerrima (L.) Drude: Pike, rocky wooded bluff. 1622, 1650.
Thaspium trifoliatum (L.) Gray var. flavum Blake; Pike, moist woods. 1670.
Verbesina helianthoides Michx.: Pike, wooded hillside. 1736.
Viola striata Ait.: Pike, floodplain. 1639, 1640.
Zea mays L.: Pike, wooded slope. 1715.
Zizia aurea (L.) Koch.: Pike, moist wooded hillside. 1667.

COLOR FORMS COLLECTED

Cirsium discolor (Muhl.) Spreng. f. albiflorum (Britt.) House: Pike, roadside. 1743.

Mohlenbrock (1975) p. 439, states that white flowered specimens are rarely observed.

Cirsium vulgare (Savi) Tenore: Pike, cattle feedlot. 1728.

This plant had white flowers.

Delphinium tricorne Michx. f. albiflora Millsp.: Pike, wooded hillside. 1630.

Mohlenbrock (1981) p. 106 states that form albiflora has been found twice in the Pine Hills of Union County and that a large colony of white flowered plants has been seen in Randolph county. This collection extends the range of this form about 120 miles north.

UNUSUAL FLOWERING TIME

Aster novae-angliae L. characteristically flowers in late summer and fall (August - October per Mohlenbrock (1975, p. 428)). We noticed several plants growing in low ground in Pike county in full flower on June 24 and 25, 1981. We collected numbers 1759 and 1760.

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Harold N. Moldenke

CARYOPTERIS Bunge

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H. Bailey, Cycl. Am. Hort. 255, fig. 379 [Stand. Cycl. Hort. 679, fig. 382. 1914] (Ba--381084); Blanchard, Rév. Hort. 64: 324/325. 1892 (Ld); Hook. f., Curtis Bot. Mag. 111: pl. 6799. 1885 (Ld); Hsiao, Fl. Taiwan pl. 1057. 1978 (Ld); Iinuma, Somokou Zousatsu, ed. 1, 11:pl. 11. 1875 (Ld); Lindl., Edwards Bot. Reg. 32 [ser. 2, 19]: pl. 2. 1846 (Ba); Makino, Illust. Fl. Nipp. 185, fig. 554. 1940 (Ld, Ld); Spooner, Gard. Chron., ser. 3, 42: 409. 1907 (Ld); Turrill, Curtis Bot. Mag. 166: pl. 75. 1975 (Ld).

CARYOPTERIS INCANA f. CANDIDA (Schelle) Hara, Enum. Sperm. Jap. 1: 187. 1948.

Synonymy: Barbula sinensis Lour., Fl. Cochinch., ed. 1, 2: 367. 1790. Mastacanthus barbula Steud., Nom. Bot. Phan., ed. 2, 2: 105. 1841. Mastacanthus sinensis (Lour.) Endl. in Walp., Repert. Bot. Syst. 4: [3]. 1845. Mastacanthus sinensis Endl. apud Sieb. & Zucc., Abhandl. Akad. Wiss. Muench. Math.-Phys. 4 (3): 156, in syn. 1846. Caryopteris sinensis (Lour.) Dipp., Handb. Laubholzk. 1: 59. 1889. Caryopteris mastac. candida Hort. ex Schelle in Beissner, Schelle, & Zabel, Handb. Laubholz-Benen. 426, nom nud. 1903. Caryopteris incana var. candida (Schelle) Schneid., Illust. Handb. Laubholkz. 2: 596. 1911. Caryopteris incana candida [L. H. Bailey] ex Olmsted, Coville, & Kelsey, Stand. Pl. Names, ed. 1, 70. 1924. Caryopteris mastacanthus var. candida C. Schneid. ex Schelle, Pareys Blumengartn., ed. 1, 283, in syn. 1932. Caryopteris incana var. candida Schneid. ex Schelle, Pareys Blumengartn., ed. 1, 2: 283. 1932. Caryopteris incana candida Trelease, Pl. Mat. Decorat. Gard. Woody Pl., ed. 5, imp. 1, 145. 1940. Caryopteris incana var. candida [Hort.] ex L. H. & E. Z. Bailey, Hortus Sec. 145. 1941. Caryopteris mastacanthus f. candida Hort. ex Hara, Enum. Sperm. Jap., imp. 1, 1: 187, in syn. 1948. Caryopteris mastacanthus var. candicans Schelle ex Bean, Trees Shrubs Hardy Brit. Isls., ed. 7, 1: 366. 1950. Caryopteris mastacanthus var. alba Bean, Trees Shrubs Hardy Brit. Isls., ed. 7, 1: 366, in syn. 1950. Caryopteris mastacanthus alba Hort. ex Mold., Résumé 249, in syn. 1959. Caryopteris sinensis Dipp. ex Mold., Résumé 250, in syn. 1959. Caryopteris incana f. candicans (Schneid.) Hara ex Bean, Trees Shrubs Hardy Brit. Isls., ed. 8, 1: 519. 1970.

Bibliography: Lour., Fl. Cochinch., ed. 1, 2: 366--367 (1790) and ed. 2, 2: 444. 1793; Endl., Gen. Pl. 638. 1838; Steud., Nom. Bot. Phan., ed. 2, 2: 105. 1841; D. Dietr., Syn. Pl. 3: 619. 1843; Walp., Repert. Bot. Syst. 4: [3]. 1845; Lindl., Edwards Bot. Reg. 32 [ser. 2, 19]: pl. 2. 1846; Sieb. & Zucc., Abhandl. Akad. Wiss. Muench. Math.-Phys. 4 (3) [Fl. Jap. Fam. Nat. 2]: 156. 1846; Bocq., Adansonia, ser. 1, 2: 110. 1862; Bocq., Rév. Verbenac. 110, 1863; Pfeiffer, Nom. Bot. 1 (1): 614. 1873; Benth. in Benth. & Hook. f., Gen. Pl. 2 (2): 1157. 1876; Hook. f., Curtis Bot. Mag. 111 [ser. 3, 41]: pl. 6799. 1885; Maxim., Bull. Acad. Imp. Sci. St.-Pétersb. 31: 87. 1886; Durand, Ind. Gen. Phan. 322. 1888; Dippel, Handb. Laubholzk. 1: 59. 1889; André, Rév. Hort. 64: 324. 1892; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 272 &

447. 1893; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 178. 1895; Schelle in Beissner, Schelle, & Zabel, Handb. Laubholz.-Benen. 426. 1903; Tillier, Rév. Hort. 75: 16. 1903; Dalla Torre & Harms, Gen. Siphonog., imp. 1, 433. 1904; C. K. Schneid., Illust. Handb. Laubholzk. 2: 596. 1911; Olmsted, Coville, & Kelsey, Stand. Pl. Names, ed. 1, 70. 1924; L. H. Bailey, Man. Cult. Pl., ed. 1, imp. 1, 634 (1924) and ed. 1, imp. 2, 634. 1925; L. H. & E. Z. Bailey, Hortus, ed. 1, 124. 1930; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 169. 1932; Schelle, Pareys Blumengärt., ed. 1, 283. 1932; L. H. Bailey, Florists Handl. Verbenac. [mss.]. 1935; L. H. & E. Z. Bailey, Hortus, ed. 2, 124. 1935; Bobbink & Atkins, Roses Ornament. Trees Shrubs 52. 1935; Dreer, Gard. Book [97]: 21, 117, & 131 (1935) and [98]: 5, 21, & 121. 1936; L. H. Bailey, Man. Cult. Pl., ed. 1, imp. 3, 634. 1938; H. W. Harv., Ga. Univ. Agric. Ext. Serv. Bull. 402, ed. 2, 34. 1938; Sakata, Reliable Seeds Nursery 1939: 28. 1939; W. Trelease, Pl. Mat. Decorat. Gard. Woody Pl., ed. 5, imp. 1, 145. 1940; L. H. Bailey, Man. Cult. Pl., ed. 1, imp. 4, 634. 1941; L. H. & E. Z. Bailey, Hortus Sec., imp. 1, 145. 1941; Mold., Suppl. List Inv. Names [1]. 1941; Sakata, Reliable Seeds Nursery 1941: 54. 1941; Kelsey & Dayton, Stand. Pl. Names, ed. 2, 93. 1942; Mold., Alph. List Inv. Names 6. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 71 & 87. 1942; L. H. Bailey, Man. Cult. Pl., ed. 1, imp. 5, 634. 1944; E. L. D. Seymour, New Gard. Encycl., ed. 3, 154. 1944; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 272 & 447. 1946; Mold., Alph. List Inv. Names Suppl. 1: 2. 1947; Hara, Enum. Sperm. Jap., imp. 1, 1: 186--187. 1948; L. H. Bailey, Man. Cult. Pl., ed. 2, 846 & 1047. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 131, 157, & 178. 1949; Rehd., Bibliog. Cult. Trees 585--586. 1949; Angely, Cat. Estat. Gen. Bot. Fan. 17: 3. 1956; Mold., Résumé 168, 172, 214, 237, 249, 250, & 445. 1959; Bonstedt in Encke, Pareys Blumengärt., ed. 2, 2: 449. 1960; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 272 & 447. 1960; Mold., Résumé Suppl. 3: 19 & 27. 1962; Dalla Torre & Harms, Gen. Siphonog., imp. 2, 433. 1963; J. & L. Bush-Brown, Am. Gard. Book, ed. 4, 252 & 269. 1965; Ohwi, Fl. Jap. 766. 1965; E. Lawrence, South. Gard., ed. 2, 183. 1967; Pal & Krishnamurthi, Flow. Shrubs 22 & 132. 1967; W. Trelease, Pl. Mat. Decorat. Gard. Woody Pl., ed. 5, imp. 2, 145. 1968; Bean, Trees Shrubs Hardy Brit. Isls., ed. 8, 1: 519. 1970; Mold., Fifth Summ. 1: 287, 292, 309, 356, 395, 422, & 423 (1971) and 2: 856. 1971; R. Bailey, Good Housekeep. Illustr. Encycl. Gard. 4: 502. 1972; Hara, Enum. Sperm. Jap., imp. 2, 1: 186--187. 1972; L. H. & E. Z. Bailey, Hortus Sec., imp. 18, 145. 1974; Mold., Phytologia 31: 390 (1975) and 34: 272. 1976; Mold., Phytol. Mem. 2: 277, 281--283, 300, 346, 379, & 529. 1980; Mold., Phytologia 52: 429, 434, & 490. 1983.

Illustrations: Bobbink & Atkins, Roses Ornament. Trees Shrubs 52 [center] (in color). 1935; Dreer, Gard. Book [97]: 117 (in color). 1935.

Haec forma a forma typica speciei corollis albis recedit. This form differs from the typical form of the species in having white corollas. It is not merely a cultivar, as some authors claim, be-

cause it grows wild and native in China and elsewhere, occurring sporadically there along with the ordinary form. As grown in gardens, according to Bean (1970), "It is perhaps less hardy than the type".

Loureiro's Barbula sinensis (1790) apparently was this form, since he describes its corollas as white. His original description is: "Floribus verticillatis: foliis oblongis, serratis. Hab. Frutex lignosus, 1-pedalis: ramis ascendentibus, paucis. Folia ovato-oblonga, obtusa, serrata, basi integerrima, lineata, tomentosa, opposita: petiolis brevibus. Flor albus axillaris, verticillis fastigiatis. Planta grati odoris. Habitat Cantone Sinarum inculta." The type is deposited in Paris.

Ohwi (1965) refers to this color form as "A white-flowered phase", listing for it the Japanese vernacular name, "shirobana-dangiku". Bailey (1935) listed only Sanford as a seedsman or nurseryman offering this form to the horticultural trade. Kelsey & Dayton (1942) call it the "white bluebeard" as a standardized English common name.

Collectors describe the plant as an ill-smelling, low or erect shrub or subshrub, 0.2--1.5 m. tall, the flowers ill-smelling, one "petal" of the corolla "larger than the rest, fringed at the margin", the stamens [filaments] purple, the anthers blue but eventually turning black, and the fruit globose, "with 4 tufts of hair". They have encountered it in the wild in open ravines and open areas in general, as well as on sea-facing hills. It is said to be "fairly common" on dry sandy slopes on Lantao island according to Taam.

Although a white-flowered form of the species is mentioned by many authors, it is usually without a subspecific designation. The original publication of Barbula sinensis Lour. is often cited as first published by Loureiro in his Flora Cochinchinensis, edition 2 (1793), but it was actually published three years earlier in the first (1790) edition of the work.

P'ei (1932) cites, as white-flowered, Tak & Chow 2316 and Tsiang 1068 & 3257 from Kwangtung, China; the "stamens" are said to have been purple on Tsiang 1068.

Citations: CHINA: Kwangtung: Tak & Chow 2316 [Herb. Canton Chr. Coll. 14177] (Ca--318895); Tsiang 1068 (Du--250189), 3257 (N); Ying 1068 (Ca--358911). Province undetermined: A. Henry s.n. [Oct. 25] (N). CHINESE COASTAL ISLANDS: Lantau: Taam 1782 (Ca--82771, Mi, N, W--2072638). HONG KONG OFFSHORE ISLANDS: Port: Hu 12249 (W--2731212). CULTIVATED: Illinois: E. E. Green s.n. [Oct. 4, 1935] (Ba). New Jersey: G. H. M. Lawrence P.455 (Ba). New York: Nash s.n. [9.S.1898] (N). West Virginia: Davis & Davis 7200 (We).

CARYOPTERIS INCANA f. MACROPHYLLA Mold., Phytologia 23: 453. 1972.

Bibliography: Mold., Phytologia 23: 453. 1972; Anon., Biol. Abstr. 56 (3): B.A.S.I.C. S.39. 1973; Mold., Biol. Abstr. 56: 1243. 1973; Hocking, Excerpt. Bot. A.23: 291. 1974; Mold., Phytol.

Mem. 2: 300 & 529. 1980; Brenan, Ind. Kew. Suppl. 16: 58. 1981; Mold., Phytologia 52: 435. 1983.

This form differs from the typical form of the species in having the main leaves on flowering branches with their petioles 2.5--3 cm. long and their leaf-blades 8.5--9 cm. long and 4.5--5 cm. wide.

This form is based on a specimen gathered by an unknown collector somewhere in Japan on September 20, 1910, and is sheet number 1178283 in the United States National Herbarium in Washington.

Citations: JAPAN: Island undetermined: Collector undetermined s.n. [20 Sept. 1910] (W--1178283--type).

CARYOPTERIS INCANA f. NANA (Borsch) Mold., stat. nov.

Synonymy: Caryopteris mastacanthus nanus Borsch, Hardy. Alp. Pl. 8. 1927. Caryopteris incana var. nana [Cat. Wm. Borsch] ex L. H. & E. Z. Bailey, Hortus Sec., imp. 1, 145. 1941. Caryopteris incana var. nana Borsch ex Mold., Fifth Summ. 1: 422, in syn. 1971. Caryopteris mastacanthus nanus Dreer ex Mold., Fifth Summ. 1: 423, in syn. 1971.

Bibliography: Borsch, Hardy Herb. Alp. Pl. 8. 1927; L. H. Bailey, List Florists Handl. Verbenac. [mss.]. 1935; L. H. & E. Z. Bailey, Hortus Sec., imp. 1, 145. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 157 & 178. 1949; Rehd., Bibliog. Cult. Trees 586. 1949; Mold., Résumé 214, 249, & 445. 1959; Mold., Fifth Summ. 1: 354 & 422 (1971) and 2: 856. 1971; L. H. & E. Z. Bailey, Hortus Sec., imp. 18, 145. 1974; Mold., Phytol. Mem. 2: 277, 281, 304, 346, & 529. 1980; Mold., Phytologia 52: 435, 469, & 490. 1983.

Haec forma a forma typica speciei statura nana ramis decumbentibus vel usque ad 30--60 cm. adscendentibus vel prostratis recedit.

This form differs from the typical form of the species in its generally lower stature, the branches decumbent to prostrate or ascending 30--60 cm.

As yet I have been unable to trace this taxon nomenclaturally or bibliographically back farther than 1927, when William Borsch & sons described it in one of their catalogues as "(Blue Spirea) - Grows almost 3 ft. high and produces lovely lavender-blue flowers the whole length of its branches. A valuable plant for either pot culture or bedding, blooming continuously from September until cut down by frost", offering plants at 50 cents and 75 cents [U.S.A.] each.

On writing to the Borsch firm in Maplewood, Oregon, a letter of reply was received by me from Fred J. Borsch, dated November 14, 1947, in which he states that "To the best of my knowledge it was between 1926 and 1930 that we obtained stock of this plant from Henry Dreer of Philadelphia. We have not been listing it under that name ['Caryopteris mastacanthus nanus'] for the past twelve years. The Borsch nursery was sold to Saxton & Wilson in 1944."

The form apparently is a natural one, not merely a cultivar as some authors now seem to regard it, and the type should probably be the Chiao 18868 collection from Chekiang, China, cited below and

deposited in the United States National Herbarium in Washington. The form occurs on slopes and windswept cliffs in parts of China, Taiwan, and Honam island, described by some collectors as a dwarf form of the species, the stems decumbent or ascending, 1--2 feet tall. It has been found in anthesis and fruit in October and November. The corollas are described as "lobes lavender RHS Fan 2 Violet-Blue 91/A" on Peterson J.1358.

A similar habital form, with prostrate, spreading branches, is represented by C. forrestii Diels and some forms of C. mongholica Bunge.

Material of C. incana f. nana has been distributed in some herbaria as typical C. incana (Thunb.) Miq. and even as Abelia ionandra Hayata.

Citations: CHINA: Chekiang: Chiao 18868 [Herb. Univ. Nanking 18868] (N--isotype, W--1554162--type, Ws--isotype). Kiangsi: Lau 4785 (S, W--1753404). Kwangtung: Levine, Canton Chr. Coll. 1679 (Ka--63326, W--1173108), 3472 (W--1270984). TAIWAN: Suzuki 21426 (W--2063459); E. H. Wilson 11118 (W--1092620). CULTIVATED: Japan: Isle s.n. [Sept. 26, 1937] (Ka--89780). Pennsylvania: J. W. Peterson J.1358 (Ba).

CARYOPTERIS INCANA f. SUPERBA (Dreer) Mold., stat. nov.

Synonymy: Caryopteris mastacanthus superbus Dreer, Gard. Book [97]: 21, 117, & 131. 1935. Caryopteris incana var. superba (Dreer) Bobbink & Atkins, Roses Ornament. Trees Shrubs 52. 1935. Caryopteris incana superba Bobbink & Atkins ex L. H. Bailey, List Florists Handl. Verbenac. [mss.]. 1935. Caryopteris incana var. superba L. H. & E. Z. Bailey, Hortus Sec., imp. 1, 145. 1941. Caryopteris incana var. superba Hort. ex Mold., Known Geogr. Distrib. Verbenac., ed. 1, 71 & 82. 1942. Caryopteris incana var. superba "[Hort.] ex Bailey" apud Rehd., Bibliog. Cult. Trees 586. 1949.

Bibliography: L. H. Bailey, List Florists Handl. Verbenac. [mss.]. 1935; Bobbink & Atkins, Roses Ornament. Trees Shrubs 52. 1935; Dreer, Gard. Book [97]: 21, 117, & 131 (1935) and [98]: 5, 21, & 121. 1936; Sakata, Reliable Seeds Nursery 1939: 28. 1939; Totty's Catalogue 1939: 35. 1939; L. H. & E. Z. Bailey, Hortus Sec., imp. 1, 145. 1941; Sakata, Reliable Seeds Nursery 1941: 94. 1941; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 71 & 87 (1942) and ed. 2, 157 & 178. 1949; Rehd., Bibliog. Cult. Trees 586. 1949; Mold., Journ. Calif. Hort. Soc. 15: 87. 1954; Mold., Résumé 214, 249, & 445. 1959; Sharma & Mukhopadhyay, Journ. Genet. 58: 359. 1963; Bose, Handb. Shrubs 36: 122. 1965; J. & L. Bush-Brown, Am. Gard. Book, ed. 4, 378. 1965; E. Lawrence, South Gard., ed. 2, 183. 1967; Pal & Krishnamurthi, Flow. Shrubs 132. 1967; Mold., Fifth Summ. 1: 356, 422, & 423 (1971) and 2: 856. 1971; L. H. & E. Z. Bailey, Hortus Sec., imp. 18, 145. 1974; Mold., Phytol. Mem. 2: 346 & 529. 1980; Mold., Phytologia 52: 435. 1983.

Illustrations: Bobbink & Atkins, Roses Ornament. Trees Shrubs 52 [left] (in color). 1935; Dreer, Gard. Book [97]: 117 (in color) (1935) and [98]: 5 & 121. 1936.

Haec forma a forma typica speciei corollis rubellis recedit. This form differs from the typical form of the species in having pink corollas.

Dreer (1935) describes this plant as "A handsome and free-flowering woody perennial plant of unusual appeal. Well branched, growing 2 to 3 feet high with long stems covered with showy whorls of attractive clear-colored flowers during September and October. Well adapted to cutting." He describes three color forms: blue, pink, and white. The first of these actually is the true C. incana (Thunb.) Miq.; the third is what we now call C. incana f. candida (Schelle) Hara., while the pink form is the form to which I am restricting the form name, superba.

Totty (1939) also describes this plant in a similar fashion, adding that it is "valuable on account of its late flowering habit". The pink-flowered form is also listed, without a special name, by Sakata (1939, 1941), Bose (1965), Lawrence (1967), Sharma & Mukhopadhyay (1967), and Pal & Krishnamurthi (1967). Bailey (1935) listed it as offered to the horticultural trade only by Dreer in Philadelphia, Pennsylvania, Schling in New York City, and Bobbink & Atkins in East Rutherford, New Jersey.

Considerable effort has been expended by me to ascertain the original dates of publication of the names involved in the nomenclature of this taxon. On the recommendation of the late Dr. Liberty Hyde Bailey, letters of inquiry were sent on August 18, 1947, to Bobbink & Atkins, W. Atlee Burpee (Philadelphia), James C. Clark (Riverton, New Jersey), Henry A. Dreer, Gulf Stream Nursery per Jacques Le Gendre (Wachapreague, Virginia), Max Schling, and Totty's (Madison, New Jersey), and on September 11, 15, & 26 to Max Schling Junior, Harry C. Sim (Riverton, New Jersey), and P. J. Van Melle (Poughkeepsie, New York). These missives elicited some interesting replies.

From Bobbink & Atkins [per F. Hendrickx, letter of September 2, 1947]: "We are under the impression that the Caryopteris incana, var. superba, was originally introduced here by the Holland Nurseries. We have, in the meantime, written to Holland and are anxious to see what information we will get from them regarding this plant. As soon as we do get a reply we will be glad to communicate with you further." No further communication was received by me.

From Burpee came the report [per Almeda P. Holgate, letter of September 30, 1947] that "We have checked in all of our old catalogues and do not find this listed in any of them. [However,] I do know that Wayside Gardens, Mentor, Ohio has listed Caryopteris for some time."

From Dreer came the response [per Alfred Putz, letter of August 20, 1947]: "Much to our regret we have no record as to the original source of the seed -- such as we believe were the starting point -- and a careful search through our records did not turn up anything that may lead us to any conclusion. The writer remembers seeing it at our Riverton Nursery and in fact he took the two photographs which are enclosed. We started with a blue variety abd later added the pink and white which appeared as mutations in the sowing

we originally made.

"A search through some records we inherited from the nurseries when they were closed down, does not disclose any source of supply from other nurseries and that strengthens our belief that we had our start from seed but where it came from we do not know. In reference to the photographs showing the branches displayed in the pots this means was used merely to give us an opportunity to arrange them with greater ease than would have been possible if they had been shown in a vase." I was referred to James C. Clark who was in charge of the nurseries at the time that the plant was introduced. Unfortunately, no reply was elicited from Mr. Clark.

From the Gulf Stream Nursery [per J. L. Legendre, letter dated September 17, 1947] came this statement: "As far as I can remember you refer to an offer made in a Dreer Catalogue of the three Caryopteris, Blue, White and Pink. Seeds of these three colors had been received from Japan and plants were raised at the nursery at Riverton, N. J. I do not remember if these three Caryopteris were listed as just mastacanthus or as mastacanthus superbus. One thing I feel rather certain that this name was first applied by Dreer and as far as I know the plant offered was identical to the variety I have always known as mastacanthus outside of the fact that no plants of the White and Pink forms had ever been offered in this country as far as I know."

From Schling [per Max Schling, Jr., letter dated September 10, 1947] came the assertion that his father "more than likely" secured Caryopteris from Bobbink & Atkins and offered it in "a catalog evidently published at the time of the first world war or shortly before by J. Horace McFarland Company in Harrisburg, Pa." In a further letter, dated September 18, 1947, he states that "Although I have searched through our catalogs, I find no trace of Caryopteris Mastacanthus superbus and I have no way of knowing whether such a variety actually existed or whether it was listed by my father in error. The information you have that it may have come from Holland leads me to believe that perhaps 'superbus' was tacked on to the name for advertising reasons only."

From Harry C. Sim [letter of September 22, 1947]: "From memory I think that Dreer found seed offered in three colors, blue, pink and white, in a Japanese catalogue (probably Sakata's) in the late twenties or early thirties. Whether the word 'Superbus' was added by Dreer after testing it out or for merchandising purposes I cannot now say....Like many other Japanese introductions you will find this variety varies very much from what we know as Caryopteris Mastacanthus or Incana as offered by growers in the United States. It is not as shrubby or hardy as the type as we know it, being more rampant in growth and should be treated more as an annual for best garden results. In the few years I had occasion to grow this variety I found that seed sown in early spring indoors produced very free flowering plants (true to color) in early fall. Taken all in all it was one of the outstanding flowers."

From Totty's [per A. L. Moran, letters dated September 25 & 29, 1947]: "We have been trying to locate where the Caryopteris Masta-

canthus superbus came from and we have finally decided it was a variety we brought in from Dreer's of Riverton, N. J.....The description of the Caryopteris mastacanthus superbus appeared in Totty's catalogue of 1939."

Citations: CULTIVATED: California: Walther s.n. [San Rafael, Oct. 17, 1922] (Gg--31999). New Jersey: Putz C.1 (N--photo), C.3 (N--photo).

CARYOPTERIS INCANA var. SZECHUANENSIS Mold., Phytologia 23: 453. 1972.

Bibliography: Mold., Phytologia 23: 453. 1972; Anon., Biol. Abstr. 56 (3): B.A.S.I.C. S.39. 1973; Mold., Bio. Abstr. 56: 1243. 1973; Hocking, Excerpt. Bot. A.23: 291. 1974; Mold., Phytol. Mem. 2: 277 & 529. 1980; Brenan, Ind. Kew. Suppl. 16: 58. 1981; Mold., Phytologia 52: 434 & 490. 1983.

This variety differs from the typical form of the species in having its branches uniformly foliose, the internodes about 2 cm. long, the petioles uniformly about 4 mm. long, and the leaf-blades remarkably uniform, lanceolate-ovate, 2.5--3 cm. long, 1--1.5 cm. wide, regularly incised-dentate along practically all the margins, the incisions antrorse, 2--3 mm. long, obliquely broad-based, apically bluntly subacute, revolute-margined, and the very abundant and fine vein- and veinlet-reticulation conspicuously and beautifully impressed on the upper surface.

The variety is based on Ernest Henry Wilson 2221 from somewhere in western Szechuan, China, collected in August, 1908, and deposited in the United States National Herbarium in Washington. Thus far it is known to me only from the original collection.

Citations: CHINA: Szechuan: E. H. Wilson 2221 (Ld--isotype, W--777404--type).

CARYOPTERIS MONGHOLICA Bunge, Uchen. Zapisk. Kazan. Univ. 4: 179 [Pl. Monghol.-chin. Dec. 1: 27--28]. 1835.

Synonymy: Caryopteris mongolica Bunge ex Jacques, Ann. Fl. Pom. [Journ. Jard.], ser. 2, 1: 319. 1843. Cariopteris mongolica Bunge ex Franch., Nouv. Arch. Mus. Paris, ser. 2, 6: 111. 1883. Caryopteris mongolica Maxim. ex Diels, Notes Roy. Bot. Gard. Edinb. 5: 296. 1912.

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St.-Pétersb. 23: 389. 1877; Maxim., Mél. Biol. Acad. Sci. St.-Pétersb. 9: 830. 1877; Maxim., Bull. Soc. Nat. Mosc. 54: 41. 1879; Franch., Nouv. Arch. Mus. Hist. Nat. Paris, ser. 2, 6: 111. 1883; Franch., Pl. David., imp. 1, 1: 231. 1884; Nicholson, Illust. Dict. Gard. 1: 274. 1884; Maxim., Mél. Biol. Acad. Sci. St.-Pétersb. 12: 523--524. 1886; Maxim., Bull. Acad. Imp. Sci. St.-Péters. 31: 87--88. 1886; Forbes & Hemsl., Journ. Linn. Soc. Lond. Bot. 26 [Ind. Fl. Sin. 2]: 264. 1890; Jacks. in Hook. f. & Jacks., Ind. Kew., inp. 1, 1: 447. 1893; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 176 & 178, fig. 66 E--G. 1895; Bretschn., Hist. Europ. Bot. Discov. China 338. 1898; C. K. Schneid., Illust. Handb. Laubholzk. 2: 587, 596, & 597, fig. 386 q & r. 1911; Diels, Notes Roy. Bot. Gard. Edinb. 5: 296. 1912; Chung, Mem. Sci. Soc. China 1 (1): 228. 1924; Rehd., Man. Cult. Trees Shrubs, ed. 1, imp. 1, 778. 1927; L. H. & E. Z. Bailey, Hortus, imp. 1, 124. 1930; Kammerer, Bull. Pop. Inform. Morton Arbor. 5: 28 & 50. 1930; Stapf, Curtis Bot. Mag. 154: pl. 9219. 1930; Stapf, Ind. Lond. 2: 82. 1930; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 163 & 165--168, pl. 30. 1932; Schelle, Pareys Blumengärtn., ed. 1, 283. 1932; Wilder, Frag. Path, imp. 1, 113 & 385. 1932; Bean, Trees Shrubs Hardy Brit. Isls. 3, ed. 1, 75. 1933; Chittenden, Gard. Chron., ser. 3, 94: 226. 1933; Chittenden, Journ. Roy. Hort. Soc. 59: 301. 1934; Junell, Symb. Bot. Upsal. 1 (4): 115. 1934; Rehd., Man. Cult. Trees Shrubs, ed. 1, imp. 2, 778 (1934) and ed. 1, imp. 3, 778. 1935; L. H. Bailey, List Florists Handl. Verbenac. [mss.]. 1935; L. H. & E. Z. Bailey, Hortus, imp. 2, 124. 1935; Bean, Trees Shrubs Hardy Brit. Isls. 3, ed. 2, 75. 1936; Hillier, Journ. Roy. Hort. Soc. 66: 107--108. 1936; Makins, Ident. Trees Shrubs, ed. 1, 62 & 258, fig. 50F. 1936; Wilder, Frag. Path, imp. 2, 113 & 385. 1936; Mold., Annot. List 108. 1939; Rehd., Man. Cult. Trees, ed. 2, imp. 1, 806 & 933. 1940; L. H. & E. Z. Bailey, Hortus Sec., imp. 1, 145. 1941; Doney, Brooklyn Bot. Gard. Rec. 30: 23. 1941; Mold., Suppl. List Inv. Names 2. 1941; E. H. Walker, Contrib. U. S. Nat. Herb. 28: 655. 1941; Wangerin & Krause, Justs Bot. Jahresber. 60 (1): 753. 1941; Kelsey & Dayton, Stand. Pl. Names, ed. 2, 92 & 93. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 56, 71, & 87. 1942; E. L. D. Seymour, New Gard. Encycl., ed. 3, 154. 1944; Erdtman, Svensk Bot. Tidsk. 39: 283--284. 1945; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 447. 1946; Mold., Alph. List Inv. Names Suppl. 1: 4. 1947; Makins, Ident. Trees Shrubs, ed. 2, 62, 289, & 355, fig. 350 F. 1948; L. H. Bailey, Man. Cult. Pl., ed. 2, 846 & 1047. 1949; "R. G.", N. Y. Times August 23 X: 23. 1949; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 131, 157, & 178. 1949; Rehd., Bibliog. Cult. Trees 586. 1949; Turrill, Curtis Bot. Mag. 166: pl. 75. 1949; Bean, Trees Shrubs Hardy Brit. Isls., ed. 7, 1: 366--367. 1950; Rehd., Man. Cult. Trees Shrubs, ed. 2, imp. 2, 806 & 933. 1951; Blackburn, Trees Shrubs East. N. Am. 108. 1952; Grubov, Konsp. Fl. M.N.R. 233. 1955; Bean in Chittenden, Roy. Hort. Soc. Gard. Dict. 1: 405. 1956; Boerner in Maatsch, Pareys Illust. Gartenbaulex. 1: 205. 1956; Wyman, Shrubs Vines Am. Gard. 121, 122, & 415. 1956; Chen' & Chzhou, Rast. Pokrov. Sulenkhe 89. 1957; Iljin, Acad. Sci. Bot. Inst. Dept. Repr.

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Illustrations: Jacq., Ann. Fl. Pom. [Journ. Jard.], ser. 2, 3: 336/337, pl. 41 (in color). 1845; Gerard, Hortic. Univ. 7: 40. 1846; Bocq. in Baill., Adansonia, ser. 1, 2: [Rév. Verbenac.] pl. 19, fig. 1--9. 1862; Carr., Rév. Hort. 44: [450] (in color). 1872; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 176, fig. 66 E--G. 1895; C. K. Schneid., Illust. Handb. Laubholzk. 2: 587 & 596. 1911; Kammerer, Bull. Pop. Inform. Morton Arb. 5: 50. 1930; Stapf, Curtis Bot. Mag. 154: pl. 9219. 1930; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] pl. 30. 1932; Makins, Ident. Trees Shrubs, ed. 1, 62, fig. 50 F (1936) and ed. 2, 62, fig. 50 F. 1948; Turrill, Curtis Bot. Mag. 166: pl. 75. 1949; Iljin, Acad. Sci. Bot. Inst. Dept. Repr. Mat. Hist. Fl. Veg. USSR 3: 215, fig. 44. 1958.

A semi-hardy, small, ornamental bush, subshrub, or bushy shrub, slightly to very aromatic, thriving best in regions of alternating severe climates, prostrate or suberect to erect, 0.3--1 m. tall,

basally woody; branches long and slender, the young shoots erect, gray-downy throughout with minute, closely appressed, fine, more or less curly, white hair, the floriferous portions usually to about 35 cm. long; leaves decussate-opposite, short-petiolate, reduced in size upwards; petioles slender, to 1 cm. long; leaf-blades linear to linear-lanceolate, rarely lanceolate, basically green or yellow-green to grayish-green (especially so above), 1.5--4.5 cm. long, 3--10 mm. wide, apically acute, marginally normally entire or subentire, basally acutely attenuate into the petiole, usually dark and dull grayish-green above, almost white beneath, often silvery- or gray-downy on both surfaces (but especially so beneath) with close very minute puberulence; inflorescence usually solitary in the uppermost leaf-axils, slender-stalked; peduncles very slender, about 1 cm. long; cymes in up to 5 somewhat distant pairs, 3--4 cm. long, 3--9- [mostly up to 6-] flowered, the flowers 1.2--1.5 cm. long, "shiny", fragrant; pedicels 3--7 mm. long; calyx campanulate, often pale-blue, 5-lobed or 5-cleft to the middle, the teeth or lobes lanceolate to linear-lanceolate or awl-shaped, subequal; corolla bilabiate, about 1.5 cm. long, mostly blue, sometimes lavender-blue or violet, the tube cylindric, 6--7 mm. long, the throat closed within by villous or puberulent hairs, the upper lip 4-lobed with small, ovate, about 5 mm. long, apically acute, wavy, or obscurely toothed lobes, the lower lip 1-lobed, much larger than the others, 1 cm. long, spoon-shaped, oblique, basally clawed, and marginally deeply and elegantly fimbriate-fringed, the fringes often pale or white; stamens didynamous, unequally paired, long-exserted about 6 mm. beyond the corolla during anthesis; filaments straight, blue or pale-blue, about 1 cm. long; anthers very small, nigrescent, the two thecae parallel; pollen blue; style and stigma long-exserted, equaling the stamens; ovary obscurely 4-lobed or 4-angled; fruiting-calyx 8--9 mm. long, inflated, the lobes more or less ampliate and often triangular; capsule much compressed, suborbicular, about 7 mm. long and wide, externally smooth; nutlets flat, narrowly winged.

This species, the type species of the genus, is based on an unnumbered collection made by Alexander Andrejewitsch von Bunge somewhere in Chinese Mongolia, probably deposited in the Leningrad herbarium. The species appears to be native only in Mongolia and northern China, but occurs also in rather limited cultivation. Its scarcity in cultivation is chiefly because of its requirement of extremely cold winters and extremely hot summers. In its native haunts collectors have encountered it on mountainsides, sandy slopes, and exposed, dry, clay cliffs, as well as in the "boulder wash of open canyons". Russian writers include it among so-called desert dwellers. It has been collected at 1800--2600 m. altitudes, flowering from June to September (mostly in August and September) -- in New Zealand gardens also in March -- and in fruit in August and September.

Encke (1960) asserts that the plant never grows over 1 m. tall and that it is not as handsome in cultivation as the more commonly grown C. incana (Thunb.) Miq. and its varieties and hybrids. Hoag

(1965) says that it is "less shapely and with duller flowers than the hybrid", C. Xclandonensis Simmonds, between it and C. incana. Ching found it to be "quite common on exposed, dry, clay cliffs" in Kansu, China. In Shansi it is said to be employed medicinally by the native inhabitants.

The only recorded vernacular and common names for C. mongholica are "caryoptéride de la Mongolie", "Mongolia bluebeard", and "wash bash". It was apparently first introduced into cultivation, according to Bean (1956), in France in 1844, where it soon died out, to be reintroduced, according to Encke (1960), in 1866.

Most authors describe the corollas as "blue" and they are so described also on Ching 1086, Ngan 82, and Roerich Exped. 453, while on Trippner 203 they are said to have been "sky-blue", on Sykes 198/64 "mauve-blue", on Kucyniak 1536-40 "blue or purple", and on Roerich Exped. 404, 491, & 612 "lilac".

Bean (1970) tells us that "It flowered in France as long ago as 1844 and has been re-introduced on several occasions since then. This handsome species does not appear to be long-lived in this country [England]. In its native habitat it experiences very cold winters but these are followed by summers much hotter than ours and, like many species from such regions, it does not take kindly to our softer, more equable climate. This, at any rate, would seem to be the reason why it has proved a failure in gardens where many genuinely tender plants thrive. It grew well for a time at Rowallane in Co. Down.....but the plant died and the Hon. Mrs. O'Neil tells us that it must be many years since the species has been cultivated there. It has been grown successfully in the Cambridge Botanic Garden, however, and it is, perhaps, in that part of England and in E. Anglia, that it is likely to succeed best. This is true of many plants from more arid and more extreme climates than ours."

Kammerer (1930) reports that "Though the upper surfaces of the leaves are dusty green they have a sufficient silvery cast underneath to justify their inclusion in the gray foliage group [of cultivated shrubs]. The conspicuous violet or lavender blue flowers, borne in dense axillary cymes at a time when blossom is rather scarce in the garden, are really the most noteworthy feature of this Caryopteris. Being native of a somewhat less severe climate, its branches usually kill back to the ground each winter with us [in Illinois, U.S.A.]. It can be depended upon to send up new flowering shoots the following spring, however. For best results plant it in a well drained soil where it has full exposure to the sun."

Stapf (1930) notes that the species is "affinis C. Mastacantho, Schauer, sed foliis integris, inflorescentia laxa, filamentis longis, fructo maiore compresso plane distincta; C. Forrestii, Diels, quae etiam foliis integris gaudet, habitu magis fruticoso, foliis lineari-oblongis obtusis, cymis contractis, floribus minoribus, filamentis multo brevioribus differt."

P'ei (1932) cites Ngan 12 from Shansi and Chaney 325 & 625 and David 2858 from Mongolia.

Junell (1934) discusses the gynoecium morphology of this species on the basis of Ikonnikov-Galitzky 366 in the Stockholm herbarium. Erdtman (1945) describes its pollen morphology on the basis of a Tatarinov collection in the same herbarium. He finds the pollen grains to be tricolpate, subprolate, and apparently externally smooth. Bocquillon (1862) illustrates the floral anatomy on the basis of a Bunge (perhaps the type) collection in the Paris herbarium and specimens in that same herbarium from plants cultivated in the Paris and Orleans botanic gardens.

Walpers (1845) refers to the "paniculis axillaribus oppositis vel alternis et terminalibus" and gives the distribution of the species as "in rupibus apricis montium Mongholicae fere totius, exceptis regionibus maxime borealibus et maxime australibus". Dietrich (1843) also refers to alternate or opposite, axillary and terminal "panicles".

Walker (1941) cites Shan 1086, describing the plant as 30 cm. tall, the flowers fragrant, and the corollas "shining blue", averring that the species is fairly common on exposed, dry, clay cliffs.

Gibbs (1974) found syringin absent from the plant's stems and the HCl/methanol test negative.

Grubov (1955) cites the Maximowicz (1877) reference to C. mongholica as "1876" and lists the species as though from Russian (Outer) Mongolia, but seems to cite only collections made in Inner (Chinese) Mongolia and apparently only regards it as possible also occurring in the USSR.

Forbes & Hemsley (1890) cite only Bunge s.n. from "North China" -- the type collection -- and Przewalsky s.n. from Kansu, commenting that the species is "common in southeastern Mongolia". Franchet (1884) cites David 2858 from Mongolia and says that the plant is an "Arbuste très aromatique et qui abonde sur les coteaux pierreux de tout l'Oulachan". Maximowicz (1886) cites unnumbered collections of Bunge, David, Kirilow, Przewalsky, and Tatarinov from Inner Mongolia.

A very interesting letter from Robert A. DeFilipps of the Endangered Species Project of the Department of Botany at the United Syates National Museum of Natural History, Washington, dated June 10, 1977, states that "The Smithsonian Institution is cooperating with the U. S. Fish and Wildlife Service in trying to assess the status of plants included in the appendices to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973). We would be most grateful if you could provide us with any information on Caryopteris mongholica that would help us to understand its abundance in nature, the effect that international trade might have on its survival as a species, and the desirability of regulating its trade. Our present knowledge is unfortunately limited to the brief mention of it in your Fifth Summary of the Verbenaceae. Specifically we would like to have any information on the following: How abundant is Caryopteris mongholica? Is it either endangered or threatened? How extensively is it collected from the wild? What is it used for? To what extent is it in international trade? To what extent is it used locally?

Is it cultivated for commercial use? What percentage of the plants in trade, if any, are from the wild vs. from cultivated material? In your opinion, should trade in C. mongholica require international protection in the form of import and export permits?" My response, in part, was that "In general, I would almost always favor the prohibition of live material of taxa like this in commerce, except under special dispensation to botanical gardens where attempts would be made to preserve the species (NOT with any hybridization or other manipulation of its natural characters) and propagate it. I would so recommend the present species."

According to Bailey (1935) the species was at that time offered in the horticultural trade by Sanford, D. H. Snowberger (Fayette, Idaho), LeMac, W. A. Toole (Baraboo, Wisconsin), Preece & Nicholls (Victoria, British Columbia), Floraire, Kaye, and Knap Hill nurseries.

Wangerin & Krause (1941) mistakenly cite the Stapf (1930) reference in Curtis Botanical Magazine as "1931". Similarly, the Walker (1941) reference is sometimes mis-dated as "1942" in bibliographies. P'ei (1932) cites the Franchet (1883) reference as "6 (2): 111. 1884" and the Stapf [as "Stapt"] 1930 reference as "t. 2916. 1828".

It is also worth noting here that Caryopteris glossocarya Bocq. is sometimes included in the synonymy of C. mongholica, but it seems, rather, to belong to that of Glossocarya mollis Wall.

Material of Caryopteris mongholica has been misidentified and distributed in some herbaria as Dracocephalum foetidum Bunge and as Lithospermum sp. On the other hand, the Brumbach 7273, distributed as typical C. mongholica, actually represents its var. serrata Maxim.

Citations: CHINA: Inner Mongolia: Chaney 325 (Ca--295317, N, W--1425021), 625 (Ca--295602); Collector undetermined 380 (N); David 2858 (W--293048, W--2497331); J. Eriksson 75 (W--1655072), 520 (W--1655313); Herb. Acad. Petrop. 117 (Mu--1122); Hsia 2953 (N); Roerich Exped. 404 (W--1658234), 453 (W--1658263), 491 (W--1658280), 612 (W--1658343); Ikonnikov-Galitzky 180 (Ca--475079), 366 (Ca--475078, S); Kraschenninikov 81 (Ca--598133); Potanin s.n. [Ordos, 1884] (Br, F--photo, Ld--photo, N--photo, Si--photo), s.n. [Changai, 1886] (Br, S); Przewalsky s.n. [Mont. Muniula, 1871] (Mu--1714); Taterinow s.n. [Mongolia chinensis] (S); Zema & Kinov s.n. [Lebedev 136a] (N). Kansu: Ching 1086 (W--1246074); Trippner 203 (Mu). Shansi: Ngan 12 (Ca--270486), 82 (Ca--270427). CULTIVATED: Belgium: Lejeune s.n. [1850] (Ba); Martens s.n. [h. b. lov. 1845] (Br, Br). England: Moldenke & Moldenke 9266 (N). Germany: Herb. Kummer s.n. [hort. Monac. VIII.1856] (Mu--1286); Herb. Zuccarini s.n. (Mu--1120); Schwaegrichen s.n. [hort. Lipsiensis] (Mu--1287). New Zealand: Sykes 198/64 (Nz--149643). Quebec: Kucyniak 1536-40 [August 10, 1942] (Bz, Mg), 1536-40 [August 12, 1942] (Ba, Mg). MOUNTED ILLUSTRATIONS: Carr., Rév. Hort. 44: [450]. 1872 (Ld); P'ei, Mem. Sci. Soc. China 1 (3):

pl. 30. 1932 (Ld).

CARYOPTERIS MONGHOLICA var. SERRATA Maxim., Bull. Acad. Imp. Sci. St.-Pétersb. 31: 88. 1886.

Bibliography: Maxim., Bull. Acad. Imp. Sci. St.-Pétersb. 31: 88. 1886; Maxim., Mél. Biol. Acad. Sci. St.-Pétersb. 12: 524. 1886; Bean, Trees Shrubs Hardy Brit. Isls., ed. 7, 1: 367 (1950) and ed. 8, 1: 519. 1970; Mold., Phytologia 31: 391. 1975; Mold., Phytol. Mem. 2: 346 & 529. 1980; Mold., Phytologia 52: 434. 1983.

This variety differs from the typical form of the species in its sparsely and irregularly dentate leaf-blades.

The variety is based on an unnumbered Przewalsky collection from "Chinae prov. Kansu ad Hoangho super., alt. 7 mill. ped. supra mare, jugo Nan-shan inter Mongoliam et Tsaidam finitimo".

As pointed out by Bean (1970), both this variety and the typical C. mongholica Maxim. "are readily distinguished by the narrowness of the leaves".

The collection cited below, distributed as typical C. mongholica, exhibits some entire and some serrate leaves and I am assuming that it represents the present variety. It was grown in a border planting, is described as having been a shrub 1.5 m. tall, and is said to have had "violet-blue" corollas.

Citations: CULTIVATED: Pennsylvania: Brumbach 7273 (Ba).

CARYOPTERIS NEPALENSIS Mold., Phytologia 7: 77--78. 1959.

Bibliography: Mold., Phytologia 7: 77--78. 1959; Mold., Résumé Suppl. 1: 11. 1959; Mold., Biol. Abstr. 35: 1688. 1960; Hocking, Excerpt. Bot. A.4: 592. 1962; G. Taylor, Ind. Kew. Suppl. 13: 25. 1966; Mold., Fifth Summ. 1: 269 (1971) and 2: 856. 1971; Anon., Biol. Abstr. 56 (10): B.A.S.I.C. S.42. 1973; Mold., Biol. Abstr. 56: 5366. 1973; Mold., Phytologia 26: 177. 1973; Hocking, Excerpt. Bot. A.23: 293. 1974; Mold., Phytol. Mem. 2: 257, 346, & 529. 1980; Brenan, Ind. Kew. Suppl. 16: 58. 1981; Mold., Phytologia 52: 434. 1983.

A loosely growing shrub, 2--4 m. tall; branches and branchlets apparently wide-spreading, slender, acutely tetragonal, sparsely and minutely puberulent; nodes annulate; principal internodes 4--10 cm. long; leaves decussate-opposite; petioles short, 3--14 mm. long, rather densely short-pubescent or puberulent; leaf-blades rather uniformly green on both surfaces or somewhat lighter beneath, beautifully ovate, 4--15 cm. long, 2.8--10.5 cm. wide, apically rather long-acuminate, marginally uniformly serrate except on the acumination and base, basally varying from rounded to truncate or subcordate, very sparsely and minutely puberulent on both surfaces, slightly scabridous and sometimes rugose above, those in the terminal inflorescence smallest; midrib slender, flat above, prominulent beneath; secondaries 4--6 per side, beautifully arcuate-ascending, flat above, prominulent beneath, not plainly anastomosing; tertiaries numerous, subparallel, uniting the secondaries with the midrib and issuing at approximately right angles to them, rather obscure above, subprominulous beneath; inflorescence massive, terminal and thyrsoid, also loosely cymose

in the uppermost leaf-axils, the axillary cymes long-pedunculate, divaricate, very loosely wide-spreading, rather many-flowered, to 12 cm. long and 9 cm. wide, simple or compound and foliose, the cyme-branches very slender, acutely tetragonal, densely incanous-puberulent; peduncles slender, acutely tetragonal, 4--8 cm. long; terminal thyrse massive, often to 50 cm. long and 25 cm. wide, very loosely many-flowered, often foliose, the rachis, sympodia, and cyme-branches sharply tetragonal, more or less densely white-puberulent; bractlets numerous, broadly linear or very narrowly elliptic, 2--7 mm. long, to 1 mm. wide, densely puberulent, a pair at every node of the inflorescence to the ultimate flowers, conspicuous on the cyme-branches; pedicels slender, 1--3 mm. long, densely white-puberulent; calyx campanulate, about 3 mm. long and wide, densely white-puberulent, the rim 5-toothed or 5-lobed, the teeth spreading, ovate, 1--1.5 mm. long, apically acute; corolla zygomorphic, pink, its tube slender, about 10 mm. long, externally white-puberulent, the limb about 15 mm. wide, white-puberulent beneath; stamens long-exserted, the filaments and anthers pink; fruiting-calyx herbaceous, campanulate, rather closely appressed to the fruit, to 5 mm. long and wide, externally rather densely whitish-puberulent with antrorsely appressed hairs, the rim very plainly 3-lobed with broadly ovate and apically subacuminate lobes or teeth; fruit capsular, subglobose, 4--5 mm. long and wide, externally minutely puberulent, conspicuously venose.

This species is based on Polunin, Sykes, & Williams 537 from among scrub thickets at the edge of cultivation at Jajakot, Pokhra, Nepal, at an altitude of 3500 feet, collected on August 21, 1952, and deposited in the herbarium of the British Museum (Natural History) in London. It is obviously related to C. chosenensis Mold. of China, Korea, and Japan, and will have to go with it into the segregated genus if and when such a genus is established. Certainly these two species do not seem to belong naturally in the genus Caryopteris.

Collectors have encountered C. nepalensis on hillsides, among other shrubs on steep banks, and in scrub thickets, at 3000--5500 feet altitude, in anthesis in August and October. The corollas are said to have been "pink" on Stainton, Sykes, & Williams 7593 & 8924 and "the limb RHS Rhodamine Purple 29/2, the remainder 29/3" on their 8924. The Peterson collection, cited below, was taken from material grown in Pennsylvania from seed collected in Nepal by Creech & DeVos in 1963.

Material of C. nepalensis has been misidentified and distributed in some herbaria as Clerodendrum sp.

Citations: NEPAL: Polunin, Sykes, & Williams 527 (Bm--type, Ld--photo of type, N--isotype), 5723 (Bm); Stainton, Sykes, & Williams 4149 (Bm, N), 5762 (Bm, N), 7593 (Bm, Ld, N), 8924 (Bm, N). CULTIVATED: Pennsylvania: J. W. Peterson 11 (Ba).

CARYOPTERIS NEPALENSIS var. PARVIFOLIA Mold., Phytologia 26: 177. 1973.

Bibliography: Anon., Biol. Abstr. 56 (10): B.A.S.I.C. S.42.

1973; Mold., Biol. Abstr. 56: 5366. 1973; Mold., Phytologia 26: 177. 1973; Hocking, Excerpt. Bot. A.23: 293. 1974; Mold., Phytol. Mem. 2: 257, 346, & 529. 1980; Brenan, Ind. Kew. Suppl. 16: 58. 1981; Mold., Phytologia 52: 434. 1983.

This variety differs from the typical form of the species in having its mature leaves only 4--7 cm. long and 3.2--4.5 cm. wide.

The variety is based on Gillis 11406 from cultivated material at the United States Department of Agriculture Plant Introduction Station at Miami, Florida, collected on July 14, 1972, and deposited in the Lundell Herbarium at the University of Texas, Austin. The type plant was grown from seed collected along a path in Raku, Nepal, at an altitude of 5000 feet, in 1963 (Pl. Introd. 285370, M-20161). Thus far the variety is known (to me) only from the original collection.

Citations: CULTIVATED: Florida: Gillis 11406 (Ld--type).

CARYOPTERIS NEPETAEFOLIA (Benth.) Maxim., Bull. Acad. Imp. Sci. St.-Pétersb. 23: 390. 1877.

Synonymy: ?Teucrium nepetaefolium Benth. in A. DC., Prodr. 12: 580. 1848. Caryopteris nepetaefolia Benth. ex Maxim., Bull. Acad. Imp. Sci. St.-Pétersb. 23: 390, in syn. 1877. Cariopteris nepetaefolia Maxim. ex Franch., Nouv. Arch. Mus. Paris, ser. 2, 6: 111. 1883. Caryopteris nepetaefolia Maxim. apud Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 447. 1893. Caryopteris nepetifolia Maxim. ex Matsum., Icon. Pl. Koisikav. 1: pl. 50. 1912. Caryopteris nepatifolia Maxim. ex Mold., Phytol. Mem. 2: 379, in syn. 1980.

Bibliography: Benth. in A. DC., Prodr. 12: 580. 1848; Hemsl., Journ. Bot. 14 [ser. 2, 5]: 208. 1876; Maxim., Bull. Acad. Imp. Sci. St.-Pétersb. 23: 390. 1877; Maxim., Mél. Biol. Acad. Sci. St.-Pétersb. 9: 830. 1877; S. Moore, Journ. Bot. 16 [ser. 2, 7]: 138. 1878; Maxim., Bull. Soc. Nat. Mosc. 54: 40. 1879; Franch., Nouv. Arch. Mus. Hist. Nat. Paris, ser. 2, 6: 111. 1883; Franch., Pl. David., inp. 1, 1: 231. 1884; Maxim., Bull. Acad. Imp. Sci. St.-Pétersb. 31: 76 & 88. 1886; Maxim., Mél. Biol. Acad. Sci. St.-Pétersb. 12: 524. 1886; Forbes & Hemsl., Journ. Linn. Soc. Lond. Bot. 26 [Ind. Fl. Sin. 2]: 264. 1890; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 1, 1: 477. 1893; Briq. in Engl. & Prantl, Nat. Pflanzenfam., ed. 1, 4 (3a): 178. 1895; Matsum., Icon. Pl. Koisikav. 1: pl. 50. 1912; Stapf, Ind. Lond. 2: 82. 1930; P'ei, Mem. Sci. Soc. China 1 (3): [Verbenac. China] 163, 164, & 173--174. 1932; Hand.-Mazz., Act. Hort. Gotob. 9: 68--69. 1934; Mold., Suppl. List Inv. Names 2. 1941; Mold., Alph. List Inv. Names 12. 1942; Mold., Known Geogr. Distrib. Verbenac., ed. 1, 56 & 87. 1942; Erdtman, Svensk Bot. Tidsk. 39: 282--284, fig. 5. 1945; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 2, 1: 447. 1946; Mold., Known Geogr. Distrib. Verbenac., ed. 2, 131 & 178. 1949; Iljin, Acad. Sci. Bot. Inst. Dept. Repr. Mat. Hist. Fl. Veg. USSR 3: 216. 1958; Mold., Résumé 168, 249, 250, 354, 418, & 445. 1959; Jacks. in Hook. f. & Jacks., Ind. Kew., imp. 3, 1: 447. 1960; Mold., Fifth Summ. 1: 287, 422, & 423 (1971) and 2: 641, 773, & 856. 1971. [to be continued]

THE ALGAE OF NEW JERSEY (U.S.A.)
V. CYANOPHYTA (BLUE-GREEN ALGAE)

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This is the fifth paper in a series examing the distribution of algae in the State of New Jersey (U.S.A.). The genera are again arranged alphabetically. If no citation is given, the species was noted by the author.

The taxonomy and classification of the blue-green algae is in termoil. Dr. Francis Drouet has intensely studied this algal group and he believes that some characteristics traditionally used to classify blue-green algae, such as sheath, protoplasmic granules, placement of spores, the presence of a gelatinous matrix, etc., are environmentally variable. Drouet, therefore, bases his classification upon cells or trichomes only.

Of course, not all phycologists agree with Drouet. In the following list, the algae are presented as named by the original investigator(s) and Drouet's suggestions for the taxa are noted in brackets.

This document was prepared on the Apple III, Rutgers University, Zoology Department.

CYANOPHYTA BLUE-GREEN ALGAE

Anabaena circinalis (Kutz) Rab
Hackensack River;(Nostoc commune)
Anabaena cupressaphila Wolle
on trunks of trees growing in marshes near the water's edge (1,8,9);(Calothrix parietina)
Anabaena flos-aquae (Lyngb) Breb
common on stagnant freshwater (1);(Microcoleus vaginatus)
Anabaena flos-aquae var. aestuartii Wolle
very abundant on pond at Dennisville (1);common on stagnant freshwater (8);Pine Barrens (6);(Anabaina oscillarioides)
Anabaena flos-aquae var. circinalis (Rab) Kirch
very abundant on pond at Dennisville (1);(Nostoc commune)
Anabaena oscillarioides Bory
in brackish ditches, southern parts of the state (1);brackish ditches (8,9)
Anabaena spiroides var. crassa Lemm
D/R Canal, Oct (7);(Nostoc commune)
Anabaena torulosa (Carm) Lag
marine, on decaying algae at Camden, Atlantic City and Newark Bay (1);with other algae forming a brownish jelly in a pool east of Camden, also Newark Bay, Atlantic City (8);(Anabaina oscillarioides)
Anabaena variabilis Kutz
D/R Canal, Jul-Aug (7);freshwater, Somerset, pools, Bound Brook (8);(Anabaina oscillarioides)

Aphanizomenon flos-aquae (L) Ralfs
D/R Canal, Sept-Nov (7);Hackensack River;Oradell Reservoir, abundant Jun-Aug (2);(Microcoleus vaginatus)
Aphanocapsa delicatissima W & G West
Hackensack River
Aphanocapsa virescens (Hass) Rab
on wet stones and rocks (1)
Aphanotheca prasina A Br
freshwater, occasional, floating on ponds (1,8)
Aphanotheca saxicola Nag
Hackensack River
Brachytrichia quoyi (C Ag) Born & Flah
marine, Atlantic City (1,8)
Calothrix brebissonii Kutz
freshwater, on stones in ponds, frequent (1,9)
Calothrix confervicola (Roth) Ag
marine, on rockweed in Atlantic City, Hoboken, Communipaw and New York Bay (1,8);on various algae, Atlantic City (4);(Calothrix crustacea)
Calothrix crustacea Schousbae & Thuret
marine, on rockweed (1,4,8)
Calothrix dillwynii Hass
frequent in freshwater swamps (1);swamps, etc. (9)
Calothrix fusca Born & Flah
state, Oct 1892 (8);Oradell Reservoir, common in plankton, Jul-Aug (2)
Calothrix gypsophila Kutz
freshwater, rocky shores of Lake Hopatcong (1,9)
Calothrix lacucola Wolle
freshwater, Split Rock Pond (1,8,9)
Calothrix meneghiniana Kirch
freshwater, frequent on submerged wood, etc, (1)
Calothrix parietina (Nag) Thur
on submerged stones in shallow water (8)
Calothrix pulvinata (Mert) Ag
wharves, Atlantic City (1,4,8);(Calothrix crustacea)
Calothrix radiosa (Kutz) Kirch
freshwater, Morris Pond (1)
Calothrix scopulorum (Web & Mohr) Ag
wharves, Hoboken, Atlantic City, Beeseley's Point (1;8);on woodwork, Atlantic City (4);(Calothrix crustacea)
Chaemosiphon incrustans Grun
on centric diatoms in the Hackensack River;(Entophysalis)
Chroococcus limneticus Lemm
D/R Canal, Jul-Feb (7);Hackensack River
Chroococcus limneticus var. subsalsus Lemm
Hackensack River
Chroococcus multicoloratus Wood
Hackensack River
Chroococcus rufescens (Breb) Naeg
terrestrial, frequent on moist rocks (1)
Chroococcus turgidus (Kutz) Lemm.
terrestrial, frequent on moist rocks (1;8);Pine Barrens (5);New Brunswick (3);Hackensack River (Anacystis dimidiata)

Clathrocystis roseo-persicina Cohn
on marshes, mud and small pebbles, Atlantic City (1);abundant, marshes, Atlantic City (4)
Coelosphaerium keutzingianum Nag
frequent on stagnant pools (1,8);D/R Canal (7);Hackensack River
Coelosphaerium naegelianum Unger
D/R Canal, Aug-Oct (7);Hackensack River
Cylindrospermum limnicola Kutz
wet places on dead wood, etc (1);(Anabaina licheniformis)
Cylindrospermum macrospermum Kutz
frequent in wet places on dead wood, etc (1);(Anabaina oscillarioides)
Cylindrospermum minutum Wood
forming with other algae a ferrugenous brown, gelatinous mass, growing in a deep, shaded, very stagnant pool, and Spring Garden in wet places on dead wood (8)
Cylindrospermum stagnale (Kutz) Born & Flah
frequent in wet places on dead wood (8);(Nostoc commune)
Desmonema wrangelii (Ag) Born & Flah
swamps, Morris Pond (8)
Dichothrix meneghiniana (Kutz) DeToni
frequent on submerged wood in freshwater (8)
Entophysalis granulosa Kutz
marine, on shells at Atlantic City (1);on old shells at Atlantic City, forming a crumbly incrustation at the highwater mark and seeming to prefer lagoons or high-tide pools where the water is quite salt and where the level doesn't vary much (8);(Entophysalis deusta)
Eucapsis alpina Clem & Shantz
Pine Barrens (5)
Gloeocapsa alpicola (Lyng) Born
Hackensack River
Gloeocapsa crepidinum Thur
marine, on wharves at Atlantic City (1,4,8);(Entophysalis deusta)
Gloeocapsa magma (Breb) Kutz
terrestrial, frequent on shaded rocks (1,8)
Gloeocapsa rupestris Kutz
state (8)
Gloeothece confluens Naeg
terrestrial, on wet rocks (1,8)
Gloeotrichia natans (Hedw) Thur
freshwater, frequent in small ponds and pools (1)
Gloeotrichia pisum (Ag) Thur
freshwater, parasitic on other aquatic plants (1)
Gomphosphaeria aponina Kutz
freshwater, in pools and ponds (1,8);Hackensack River
Gomphosphaeria lacustris Chod
Hackensack River
Gomphosphaeria wichurae (Hilse) Drouet & Daily
Hackensack River
Hapalosiphon braunii Kutz
in ponds, on submerged plants, Atsion and Hammonton (1)
Hapalosiphon brebissonii Kutz
in ponds, on submerged plants (1);Dennisville (9);Pine Barrens

Hapalosiphon fontinalis (Ag) Born
on submerged plants in ponds at Dennisville, Atsion, Hammonton (8)
H. fontinalis var. tenuisimus (Grun) Coll & Setch
state (8)
Hapalosiphon fuscescens Kutz
frequent in ponds (1,9)
Hapalosiphon tenuissimus Grun
ponds and wet ground (1,9);Pine Barrens (6)
Hydrocoleum lyngbyaceum Kutz
on moist low grounds near Atlantic City (8);(Microcoleus lyngbyaceus)
Hypheothrix coriacea forma meneghinii Kutz
damp earth (8)
Hypheothrix pallida Kutz
forming reddish-brown stratum on dry ground, wet soil, old meadow grounds (8)
Isactis caespitosa (Kutz) Wolle
freshwater, frequent on submerged stones in shallow water (1);state (9)
Isactis fluviatilis (Rab) Kirch
freshwater, rocky margins of Green Pond (1)
Isactis plana (Harv) Thur
stones and old oyster shells, Atlantic City (1,8,4)
Leptothrix aeruginea (Kutz) Kirch
freshwater, frequent in ponds (1)
Leptothrix ochracea Kutz
freshwater, in ditches and small pools, frequent (1)
Leptothrix rigidula Kutz
marine, on algae, Atlantic City (1)
Lyngbya aerugine-caerula (Kutz) Gom
common, Jun-Jul, Nov (2)
Lyngbya aestuarii (Mertens) Liebm
marine, brackish ditches at Hoboken, common in salt ponds and marshes about Newark Bay, Perth Amboy, Absecon (1);in pools of moist earth subject to inudation from flowing tides, in ponds and pools in salt water marshes, Perth Amboy, Absecon, brackish ditches at Hoboken, common on marshes on floating eel grass, Atlantic City, in salt marshes about Newark Bay, in salt ditches, Cape May (8);common on marshes, Atlantic City (4);Pine Barrens (6);(Microcoleus lyngbyaceus)
Lyngbya aestuarii forma aeruginosa (Ag) Wolle
on ground or in brackish ditches (8)
Lyngbya aestuarii forma minus Liebm
Absecon, Perth Amboy (9)
Lyngbya arenarium (Kutz) Rab
on low moist grounds near Atlantic City (1,9)
Lyngbya bergei G M Smith
D/R Canal, Jul-Dec (7)
Lyngbya cataracta (Rab) Wolle
in rapid waters, frequent (1)
Lyngbya lutea (Ag) Gom
on wharves, Atlantic City (8);(Oscillatoria lutea)

Lyngbya luteo-fusca Ag
Hoboken,wharves between tide marks,Atlantic City (1)
Lyngbya majuscula (Dillw) Harv
marine, Newark Bay, on stems of floating eel grass in Atlantic City, Cape May, New York area (1);Newark Bay, Hudson River and on eel grass at Atlantic City (8);not uncommon, floating (4);(Microcoleus lyngbyaceus)
Lyngbya obscura Wolle
freshwater, ponds and pools (1,9)
Lyngbya pallida (Naeg) Kutz
wet soil and old meadow grounds (1);exposed wet soil, old roadways, old meadow grounds (9)
Lyngbya phormidium Kutz
freshwater, on marsh bottoms, frequent (1)
Lyngbya rupestre (Ag) Kutz
on rocks, Palisades (1)
Lyngbya semiplens (C Ag) J Ag
Hudson, Hoboken, on wharves between tide marks at Atlantic City (8);(Microcoleus lyngbyaceus)
Lyngbya tenerrima Thur
marine, on wharves, Atlantic City (1);in small quantity, among other algae, Atlantic City (4)
Lyngbya vulgaris (Kutz) Kirch
freshwater, on moist soil, frequent (1)
Lyngbya wollei Farlow
freshwater, Lake Hopatcong, Swartswood Pond (1);widely distributed, pond near Stanhope (9)
Marsoneilla elegans Lemm
D/R Canal, Oct (7)
Mastigonema aerugineum (Kutz) Kirch
freshwater, common in small ponds (1);state (9)
Merismopedia convolutum Breb
freshwater, frequent in ponds (1,8)
Merismopedia elegans A Br
D/R Canal, Jul-Oct (7);Hackensack River;(Agmenellum thermale)
Merismopedia glauca (Ehr) Nag
D/R Canal, Oct (7);Hackensack River
Merismopedia punctata Meyen
Pine Barrens (5);(Agmenullum quadruplictum)
Merismopedia tenuissima Lemm
D/R Canal, Jul-Sep (7);Hackensack River
Microcoleus chthanoplastes Thur
marine, on marshes, Atlantic City (1);brackish pools, Atlantic City, moist earth (8);on marshes, mixed with other algae (4);Hackensack River;(Schizothrix arenaria)
Microcoleus anguiformis Harv
terrestrial (1);Pine Barrens (6)
Microcoleus hyalinus (Kutz) Kirch
freshwater, in ponds on sphagnum (1);ponds (9)
Microcoleus lacustris
Pine Barrens (6)
Microcoleus pulvinatus Wolle
mill race, Bamber (1,9);the thalli of all possible sizes from 1-10" in diameter are attached to stones and grasses looking like

boulders in the bottom of a mill race with rapidly running water (8);Pine Barrens (6)
Microcoleus terrestris Desmog
terrestrial, on moist earth, frequent (1)
Microcoleus vaginatus (Vaucher) Gom
on moist earth (8)
Microcystis ichthyoblabe Kutz
occasional in small ponds (8)
Microcystis pallida (Farlow) Lemm
on decaying algae, Atlantic City (8)
Microcystis progenita (Bres) Rab
terrestrial, wet timbers, trunks of trees, etc (1)
Nostoc alpinum Kutz
dripping rocks, Palisades (1);(Nostoc commune)
Nostoc austinii Wood
growing admist mosses on rocks, near Gloucester (8);(Nostoc commune)
Nostoc caeruleum Lyngb
in ponds and on dripping rocks (1)
Nostoc comminutum Kutz
on pond water, frequent (1,8);(Nostoc commune)
Nostoc commune Vauch
on wet ground, common (1);common on wet ground, dripping rocks, Palisades (8)
Nostoc depressum Wood
attached to a brook moss, growing in a rapid rivulet in the northern part of the state (8);(Nostoc commune)
Nostoc microscopicum Carm
frequent on moist rocks (8);(Nostoc commune)
Nostoc pruniforma Ag
in ponds (1);(Nostoc commune)
Nostoc punctatum Wood
damp ground, Sep (8);(Nostoc commune)
Nostoc rupestre Kutz
on moist rocks, frequent (1);(Nostoc commune)
Nostoc sphaericum Vauch
on wet rocks, abundant (1,8)
Oncobyrsa cesatiana Rab
New Brunswick (3)
Oscillatoria amphibia Ag
New Brunswick (3)
Oscillatoria angustissima West & West
Hackensack River
Oscillatoria brevis Kutz
freshwater, in marshes (1, 8);Hackensack River;(Arthrospira neapolitana)
Oscillatoria formosa Bory
Oradell Reservoir, occasional, Jul (2);New Brunswick (3);Hackensack River
Oscillatoria froelichii Kutz
freshwater, on sluggish and stagnant water (1)
Oscillatoria gracillima Kutz
freshwater on small ponds (1)
Oscillatoria imperator Wood

freshwater, frequent in ponds and pools (1)
Oscillatoria leptotricha Kutz
brackish water (9)
Oscillatoria limnmetica Lemm
New Brunswick (3)
Oscillatoria limosa Ag & Gom
terrestrial, on wet earth, frequent (1);Stapleton and Tomkinsville, Staten Island, frequent on wet earth (8);New Brunswick (3);Hackensack River
Oscillatoria littoralis Carm
marine, salt water marshes, frequent (1,9)
Oscillatoria major Vauch
freshwater, on sluggish and stagnant waters (1,8)
Oscillatoria natans Kutz
freshwater, on ponds (1)
Oscillatoria nigra Vauch
D/R Canal, May-Dec (7);in wet places (1,8)
Oscillatoria ornata Kutz
New Brunswick (3)
Oscillatoria princeps Vauch
freshwater, on pools, Dennisville (1,8);Pine Barrens (5)
Oscillatoria sancta (Kutz) Gom
Hackensack River
Oscillatoria splendida Kutz
on small freshwater ponds, in ditches of brackish water (8);Hackensack River
Oscillatoria subtarulosa (Breb) Farlow
marine, brackish water and pools, Atlantic Co (1);found with Oscillatoria subuliformis, Atlantic City (4)
Oscillatoria subuliformis Kutz
marine, in brackish water and pools, Atlantic Co (1,8);mixed with other algae, Atlantic City (4); (Porphyrosiphon notarisii)
Oscillatoria tenuis Ag
stagnant water (1,8);Pine Barrens (5);Oradell Reservoir, occasional, Jun-Aug (2);New Brunswick (3);Hackensack River
Oscillatoria tenuis var. natans (Kuet) Gom
freshwater ponds, frequent (8)
Phormidium autumnale (Ag) Gom
on moist soil (8);(Microcoleus vaginatus)
Phormidium incrustatum var. cataractarum (Naeg) Gomont
rapid water (8)
Phormidium retzii forma rupestris (Kutz) Gom
on rocks, Palisades (8)
Phormidium uncinatum (Ag) Gom
New Brunswick (3)
Plectonema tomasinianum (Kutz) Born
frequent on stones in ponds or floating, Hammonton (8)
Plectonema wollei Farlow
the floating mass was fully 10 yards long, 2-4 yards wide, a foot or more in thickness and so densely matted it was impossible to break through with a rowboat, in pond near Stanhope, also Sussex, Lake Hopatcong, Swartswood Pond (8)
Polycystis aeruginosa Kutz
D/R Canal, Jul-Oct (7);Hackensack River

Polycystis flos-aquae (Wittr) Kirc
Hackensack River
Polycystis ichthyoblabe Kutz
freshwater, occasional in small pools (1)
Polycystis pallida (Kutz) Farlow
marine, on decaying algae, Atlantic City (1,4)
Rivularia atra Roth
stones at Atlantic City (1,8);(Calothrix crustacea)
Rivularia dura Kutz
freshwater, attached to other aquatic plants in ponds, frequent (1,8);(Calothrix parientina)
Rivularia haematites (D C) Ag
rocky margins of Green Pond (8)
Rivularia hospita Thur
on an oyster shell, Atlantic City (4)
Rivularia natans (Hedwig) Welw
small ponds and pools (8)
Rivularia polyotis (J Ag) Born & Flah
marine, on roots of Spartina and on oyster shells, Atlantic Co (1,8);(Calothrix crustacea)
Schizothrix hyalina Kutz
in ponds on sphagnum (8)
Scytonema austinii Wood
forming a sort of miniature turfy cushion upon the rocks, Little Falls (8)
Scytonema calotrichoides Kutz
on submerged sticks in ponds (1,9)
Scytonema cinerum Menegh
Godwinville, on moist rocks (1,9)
Scytonema gracile Kutz
on rocky shores of Morris Pond (1,9)
Scytonema guyanese (Mont) Born & Flah
forming an extended olive green stratum, a little above the water level on the plank sides of a neglected basin of sea water, Perth Amboy, July, 1878 (8)
Scytonema hafmanni Ag
on moist earth, wood and rocks (8)
Scytonema immersum Wood
forming a flocculent, greenish black, slimy coating to the stems and finely dissected leaves of Ranunculus aquetilis in Shepherds Mill Pond, near Greenwich (8)
Scytonema mirabile (Dillw) Born
frequent on submerged sticks in ponds (8)
Scytonema myochrous (Dillw) Ag
on moist ground, Closter, Morris Pond (1,8)
Scytonema naegelii Kutz
moist rocks, Closter and Godwinville (1)
Scytonema natans Breb
floating in ponds, Hammonton and elsewhere (1)
Scytonema ocellatum Lyng
on moist rocks, Godwinville (8)
Scytonema tolypothrichoides Born & Flah
frequent on wet rocks (1,8);Pine Barrens (5)
Sirosiphon compactus Kutz

on moist rocks (1)
Sirosiphon coralloides Kutz
on rocky shores of Green Pond (1,9);Pine Barrens (6)
Sirosiphon ocellatus Kutz
in swampy places on submerged sticks (1)
Sirosiphon pulvinatus Breb
on moist rocks (1)
Sphaerozyga carmichaelii Harv
common on muddy flats and in shallow pools in marshes (4);(Anabaina oscillarioides)
Sphaerozyga polysperma Kutz
freshwater, in pools, Bound Brook (1);(Anabaina oscillarioides)
Sphaerozyga saccata Wolle
Cranbury Pond (9);(Hapalosiphon)
Spirulina laxa G M Smith
New Brunswick (3);Hackensack River
Spirulina princeps West & West
Hackensack River;(Spirulina subsalsa)
Spirulina subsalsa Oersted
mixed with Oscillatoria, Atlantic City, also Swimming River, mixed with other minute forms, Atlantic City (8)
Spirulina tenuissima Kutz
marine, Atlantic City, mixed with other minute forms, Swimming River (1);in small quantity, mixed with Oscillatoria, Atlantic City
Stigonema informe Kutz
on stones constantly washed by the waves, along the rocky shores of Green Pond (8)
Stigonema ocellatum (Dillw) Thur
forming, with various other species of algae, a gelatinous blue-green or brown stratum, in a very stagnant pool, on submerged sticks in swampy places or in dark brown waving tufts, about a half inch in length, Bamber Lake (8)
Stigonema panniforme (Ag) Kirchner
frequent on moist rocks (8)
Stigonema turfaceum (Breb) Cooke
growing on exposed faces of rocks (8);Pine Barrens (5)
Symplocastrum friesii (Ag) Kirch
shaded clay banks, Bergen (8)
Symphosiphon austinii Wood
on wet rocks, Little Falls (1,9)
Symphosiphon hafmanni (Ag) Kutz
on moist earth, wood and rocks (1)
Symploca lucifuga Harv
terrestrial, on shaded clay banks, Bergen Co (1,9)
Symploca muralis Kutz
Pine Barrens (5)
Symploca muscorum (Ag) Gom
on marsh bottoms (8)
Tolypothrix aegogropila (Kutz) Kirch
Budd Lake (1,9)
Tolypothrix distorta Kutz
in ponds (1);rocky shores of Morris Pond (7)
Tolypothrix lanata (Desv) Wartm

clusters torn from attachment by storm, Budd Lake (8)
Tolypothrix muscicola Kutz
frequent in sluggish water (1)
Tolypothrix penicillata (Ag) Thur
on moist rocks, Closter and Godwinville (8)
Tolypothrix tenuis Kutz
in ponds, often very abundant (1,8)
Tolypothrix tenuis forma bryophila Rab
ponds, very abundant (8,9)
Wollea saccata (Wolle) Born & Flah
frequent in cranberry pond, Sussex Co (1);(Hapalosiphon)
Xenococcus schoushoei Thur
marine, growing on Lyngbya luteo-fusca at Atlantic City (1,8);(Entophysalis conferta)

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BOOK REVIEWS

Alma L. Moldenke

"THE GROWTH OF BIOLOGICAL THOUGHT, Diversity, Evolution, and Inheritance" by Ernst Mayr, xvii & 974 pp, & 3 tab. Belnap Press of Harvard University Press, Cambridge, Massachusetts 02138. 1982. $30.00.

If only there could be delivered with this wonderfully valuable book some magic package of many quiet hours in blocked series for careful reading! I took my copy on vacation for morning, afternoon and bedtime reading. Mayr's expressed orientation is to a history on concepts and ideas dominating modern biology with emphasis on their background and development, which he is preeminently qualified to do. In Part I: Diversity of life is considered from macrotaxonomy or basic classification, then common ancestry grouping and then microtaxonomy at the species level. In Part II: Evolutionism views the church-influenced lack of such, Darwin's evidence for it, common descent, natural selection, evolution of man and in modern thought. In Part III: Variation and its Inheritance explains the ramifications from early theories and breeding experiments through the DNA double helix. "Perhaps the most impressive aspect of current biology is it unification. Virtually all the great controversies of former centuries have been resolved." Assuredly this book is bound to become a classic.

"NATURE CLOSE UP - A Fantastic Journey into Reality" by Andreas Feininger, 160 pp., 12 color & 84 b/w photo. Dover Publications, Inc., New York, N. Y. 10014. 1981. $8.95 paperbound oversize.

Dover, as a reprint house, over the years has always shown fine quality choice in what it republishes. This beautiful work came from "Mountains of the Mind: A Fantastic Journey into Reality" from Viking Press, N. Y., in 1977. Some parts, in turn, came from Life Magazine as early as 1949. The photographs are expectedly Feininger-wonderful and quite well printed, the text is stimulating and important. He "wanted to give the reader a new point of view.....to show him familiar subjects in new perspectives, stimulate his mind, and make him aware of things and relationships he may not have known or thought of before." The "captions were specifically written to supply additional information, liberate the creative faculties of the reader, stimulate his imagination, and send him off on a fantastic journey into reality."

Put a copy first on your night table and then on your coffee table for wonderful shared trips!

"TREES OF NORTH TEXAS" by Robert A. Vines, xx & 466 pp., 3 b/w maps, 248 line draw. University of Texas Press, Austin, Texas 78712. 1982. $24.95 clothbound & $10.95 paperbound.

This is the second field manual excerpted from "Trees, Shrubs and Woody Vines of the Southwest" by the same recently deceased author. Its purpose "is to identify by full descriptions all illustrations of the native and naturalized trees of the north Texas zone [which is] west of the Pineywoods and Post Oak Savannah and north of the limestone Edwards Plateau", principally prairie grasslands. After common and scientific names the following topics are discussed for each tree: field identification, flowers, fruit, leaves, twigs, bark, wood, range and remarks with derivation of the names and interesting tidbits. As a generic name Taxodium is spelled the usual way but as a family name it appears with two "i"s. Vitex agnus-castus has the Asian mainland given as its original home instead of the Mediterranean area, its actual homeland; it is V. negundo which hails from mainland Asia and now both cultivated and naturalized in Texas.

"FERNS AND FERN ALLIES OF THE DRIFTLESS AREA OF ILLINOIS, IOWA, MINNESOTA AND WISCONSIN" by James H. Peck, 140 pp., 3 b/w fig., 3 tab. & 86 county distribution maps. Contributions in Biology and Geology No. 53, Milwaukee Public Museum, Milwaukee, Wisconsin 53233. 1982. $12.50 paperbound plus $1 shipping & handling.

This Driftless Area occurs at the junction of three vegetation formations - Tall Grass Prairie, Eastern Deciduous Forest and Northern Mixed Coniferous Forest - and has a great diversity of species from these adjacent areas. These pteridophytes are represented by 12 families, 28 genera, 73 species, 13 hybrids and 6 infraspecific taxa. There are highly operative keys first to genera and then to species. Geographic distribution maps show not only this area but also specimen distribution in the 6 contiguous states based on careful herbarium and field studies. This should prove to be a very helpful publication.

"THE SAVORY WILD MUSHROOM" by Margaret McKenny (1962) revised and enlarged by Daniel E. Stunt (1971), xvi, 242 & 16 pp., 256 b/w & 64 color photo., University of Washington Press, Seattle, Washington 98105. 6th printing, 1978. $9.95 clothbound & $5.95 paperbound.

This excellently illustrated book about edible gilled mushrooms, boletes, chanterelles, puffballs, polypores, spine, coral, jelly and cup fungi provides good short descriptions, cautions about mushroom poisons, hunting techniques and wild mushroom recipes. Since almost 90 percent of the species are not limited to the Pacific Northwest, this book can be and has been a great help in most of North America.

Inasmuch as we do no editing, papers accepted for publication *must* be submitted in *exactly* the form that the author wants to have them published. They will then be photographed and printed by photo-offset in exactly the form as submitted except that we will add page numbers and running-heads.

Typescripts should be prepared single-spaced on clean white heavy bond smooth and opaque paper. Elite type is probably the most space-economical. Typescript text must not exceed a rectangle 5⅝ inches wide (horizontal) by 8⅝ inches high (vertical), not including the running-head and page number.

The title of the paper should be typed in all uppercase (capital) letters with 2 blank lines above the title and one beneath; then the name of the author in ordinary upper-and lower-case letters, along with his address (if so desired); followed by 2 blank lines; then the first line of text. It is usually best to leave a blank line between paragraphs.

All scientific plant and animal names *and* group names should be typed either in italic type (if available) or underscored. Any corrections in the text made by the author must be complete and neat as they will be photographed as they are.

The finished typescript as submitted by the author will be reduced from the 8⅝ x 5⅝ inch size as submitted to 6 2/8 x 4 inches by the printer. It is therefore advisable to place a centimeter or millimeter scale on all text figures and plates included.

Use a *new* heavily inked black typewriter ribbon and be sure to *clean* the type on the typewriter after each several pages of typing.

Cost of publication at present is $10.00 US per page,with no subsequent rebates, but this rate may vary depending on inflation and costs, so it is best to inquire as to current rates. The page charges are due *with* the typescript and no paper will be published before payment is received in full. Each author will receive gratis a proportionate share of the printed copies remaining after paid subscriptions are filled, but if separates (reprints or offprints) are desired, these will be charged extra in accord with the current rate for offprints provided by the printer. The cost of all such separates ordered must also be paid for in advance at the time the typescript is sent. No orders for separates will be accepted later, nor can additions or corrections be accepted.

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