SUFFLEKEXARY
NOTES
ON
THE
AMERICAN
SPECIES
OF
ERYTHRINA. III.
B. A. WHITKOFF

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Introduction

My monograph on this group of plants appeared in print in October 1939 (1) and the last supplementary notes were published in November 1943 (5).

Abundant new collections, as well as old collections which had not been seen by me previously but have become available since then, are cited in this paper. These extend our knowledge of certain species previously known from incomplete material. Extensions of ranges are noted for many species; one, E. elena, which was described as new since 1943, is reviewed; one new species, E. oliviae, is described; and three, E. occidentalis, E. panamensis and E. colombiana, are now placed in synonymy.

No need has arisen to arrange the species in a new order or to rewrite the keys. Since the monograph appeared, only three new species have been described, and three reduced to synonymy. For a list of these, see Appendix I.

Since 1941 I have examined and annotated specimens in 58 herbaria. It is, therefore, safe to assume that few collections of American species of Erythrina have escaped my attention. The exception is Museum d'Histoire Naturelle, Paris which it was not possible to visit in 1968.

Distribution of species has been compiled from 300 or more collections examined and cited in my papers on the genus (See Appendix XII). Particular effort has been made to make the records as complete as possible. Instead of borrowing specimens I visited many herbaria in person and examined all the available material. It often happens that not all available specimens are sent on loans and these can be more surely located and examined on the spot. Knowledge of the geographical ranges of species is not only of intrinsic importance but often is of great help in identification.

The data on the chromosome number of various species of Erythrina are probably fairly complete. The records were well searched.

New species of Erythrina are to be expected in the species-group Herbaceae, also possibly in the species-group Eudes. It is not likely that any of these will come to light in the United States, the West Indies, or the lowlands of Central and South America. Some new species likely will turn up in the highlands of Central America and Mexico, and from the poorly collected subandean regions of Colombia, Ecuador, Peru and Bolivia.

As regards range extensions and determination of the limits of distribution of various species, new collections from the regions enumerated above (the highlands of Central America and Mexico and the subandean Colombia, Ecuador, Peru and Bolivia) are of particular interest.

Further substantial progress in our knowledge of American Erythrina will probably come largely through application of experimental taxonomic techniques. In order to understand certain entities, especially in the species-groups Coralloidendra, Variegatae and Herbaceae, it is essential to grow, study, and experiment with living
material. For more details see "Problems in the American species of Erythrina". One of the best places for experimentation is probably Atkins Garden & Research Laboratory in Cuba which already possesses a good collection of Erythrina and of other woody Leguminosae. Because this place is in the dry tropics, many Erythrina species will flourish there.

In 1969 and 1970 I hope to assemble for farther cytological work freshly collected seeds of a substantial number of those species of which chromosome numbers are not yet known. The genus Erythrina has been intensely studied by cytotaxonomists; however, additional counts will be very helpful.

The genus Erythrina has been studied in greater detail by chemists than any other genus of tropical Leguminosae. The remains of the very extensive collection of Erythrina seeds assembled by me in the thirties from various parts of the world for studies at Merck Sharp & Dohme Laboratories by Dr. Karl Folkers and his co-workers, have been distributed for studies to three chemical laboratories.

Before long new data should be available on Erythrina alkaloids. New collections of seeds of species hitherto not studied chemically, are contemplated.

Problems in the American species of Erythrina

There seems to be no outstanding problem in the species-groups Fuscae, Cristae-galli, Vernae, Speciosa, Edules, Leptobrizae and Cubenses. New species are expected in the Edules as subandean South America is better collected. Fruit and seeds of E. polychaeta, E. breviflora fma. oaxacana and E. montana are still not known and their collection will be of interest.

Insufficient material of species-group Corallodendra was available to me when I was working on the monograph in 1938/9. In fact even now these species are poorly represented in the herbaria. It is clear that E. peruviana, E. pallida, E. mitis, E. buchii, E. lentopoda, E. elenae, E. esserii and E. amazonica are sufficiently differentiated and should remain as distinct species. I question what will happen to the poorly understood E. similis and to the three varieties of E. corallodendron when further extensive collections become available and carefully conducted cultural experiments are made.

The species-group Variegatae presents a problem. E. velutina seems to be confined to the drier tropics. It is found in the West Indies, in northern Venezuela and in northern Colombia; on the west coast it reappears in Ecuador and the Galapagos Islands; on the east coast, in the State of Ceara, Brazil and practically throughout southern Brazil. It will be important to ascertain the real nature of E. grisebachii, confined to Cuba, and of E. velutina fma. aurantiaca, known so far only from the island Fernando Noronha and the State of Ceara, Brazil. As is the case with the members of the species-group Corallodendra, this could be best done by studying cultivated plants of each, grown from seeds side by side. It will also be necessary to reexamine genuine E. velutina as found in Cuba, and very poorly represented in herbaria. I do not exclude the possibility that eventually E. grisebachii may be reduced to a geographic subspecies or a form under E. velutina.
Additional collections of *E. flamma*, *E. polychaeta*, two forms of *E. breviflora*, *E. hortida*, *E. montana*, all species of the species-group Corallodendra, *E. goldmani*, *E. gibboa*, *E. costaricensis* and *E. cochleata* will contribute valuable data of one sort or another to a more complete understanding of these species.

In 1939 I discussed in a tentative way the relationship of the species (1:213–216). It is unfortunate that not much progress has been made on this line of inquiry. By now it is clear that knowledge of the chromosome numbers and study of the wood anatomy are of no assistance on this problem.

The distribution of particular alkaloids in the seeds of various species of *Erythrina* (and as a short cut the comparative paralysis potency values as determined from the seeds) is helpful in some cases in indicating relationships. However, this information has no bearing on the problem of what species-groups are more primitive. I have no direct and irrefutable evidence, but I still believe that the Corallodendra and the Herbaceae are relatively modern and they appear to be still in process of differentiation. These two groups, so abundantly represented in America, are manifestly related. I can suggest no reason why the Herbaceae has so far outstripped the other groups as regards number of species. The Herbaceae contain 21 species; the Corallodendra 10 species and 2 varieties, while eight other species-groups together contain only 20 species and 3 forms.

Comparative study of the wood structure of species of *Erythrina*

Cozzo (11) studied the comparative wood anatomy of 3 Argentinian species, *E. crista-galli* (*"Seibo"*), *E. falcata* (*"Seibo de Jujuy"*), and *E. dominguezii* (*"Seibo chaqueno"*). This study was made on two authentic wood samples of each species, backed by vouchers. A key is given for separating the three species on anatomical characters of the wood.

Mention has been made in a previous paper (5:233) of a collection of authentic wood samples of *Erythrina* that I assembled for comparative study concurrently with the seed collection. Unhappily the study of this material was not pursued to a conclusion. I was informed that the similarity in wood structure between many of the species was so great that no taxonomically useful differential characters could be expected to emerge.

I. Fuscae


Chromosome numbers: 2n = 62, voucher: Otero 128 (Krukoff Herb. 9215) from Puerto Rico; 2n = 62, voucher not seen: Service Forestal s.n. (USDA plant introduction number 150390); 2n = 42, voucher not seen: W. B. Clarke & Co., San Jose, Calif. (BSF 9914-12) from plant cult. in California (6:108).

Puerto Rico: Holdridge 192 (A), Guadeloupe: Adrien Questel 1088 (US), Guatemala: Izabal: Steyermark 39705 (F), Jones & Facey 3161. El Salvador: Carlson 1132 (F), 1133 (F); La Libertad: Carlson 298 (F), Allen 1762 (US); La Paz: Allen 7210 (EAP), Honduras: Cortes: L. O. Williams & Molina s.n., (EAP); Camayagua: Valerio Rodriguez 2215 (F), Cox 11601 (EAP); Chanchi: Standley 17714 (EAP); El Paraíso: Standley 16551 (F), Molina 5088 (GH), Molina et al. 15696 (F), Carlson 2520 (HG); Nicaragua: Greenman & Greenman 5765 (H); Zelaya: Long 252 (F), Molina 170 (F), Salas & Taylor 2660 (EAP), Matagalpa: L. O. Williams et al. 21801 (F); Segovia: Salas & Taylor 2275 (EAP), Costa Rica: Guanacaste: Tarcoles, costa del Pacifico, Mus. Nac. Costa Rica 23387 (CH); Puntarenas: A. Jimenez M. 1676 (F); Heredia: Jorge Leon 11596 (TURIA); Cartago: Córdoba 10 (TURIA), s.n. (Jan. 5, 1952) (EAP), Jorge Leon 1151 (EAP); Panama: Bro. Paul 382 (US), Cotterman & Klave F-11 (US); Canal Zone: Graham 305 (GH), Stern et al. 2 (GH), Johnston 2555 (GH), Covson 2632 (M); Colon; Allen 1181 (M), 1155 (M); Colombia: Choco: Duke 9285, 10977; Atlantic: Dugand & Jaramillo 2751, L. E. Mora 1395 (COL), Dugand & Garcia-Barriga 02128 (COL), Dugand & Jaramillo 2751, Bolivar: Molina & Parkley 19 Bol 71 (COL), Dugand & Jaramillo 2751; Antioquia: Metcal & Cuatrecasas 30068 (M); Valle: Cuatrecasas 22955 (F), R. van Sneedem 1162 (US); Cundinamarca: Garcia-Barriga 13103 (US); Pinto et al. 379 (COL), Garcia-Barriga 13103, Huila: Cordill. Oriental, alt. 3500 ft., E. L. Little, Jr. 566 (COL); Amazonas: Fernandez-Perez 6681 (COL) (Rio Loretoyacu), Black 16-8, Ecuador: Quayas: A. J. Gillmartin 816 (US), Camp E-3621, Eaplund 7705 (S), 16675 (LL); Los Rios: E. L. Little, Jr. 687 (F); Peru: Loreto: Antonio Aroestegui 129 (F), 61 (F), Venemuela: Croizat 222, Tania 1703 (VEN) (Marina), J. Velez 2627 (VEN) (Las Piedras et al. Pto Paza); Zulia: Lasser 2619 (VEN); Lara: Steyermark 5595 (F), Merida: Humbert 2683 (US), Ereteler 3213 (RB), E. L. Little, Jr. 15171 (VEN); Carabobo: Alston 5633, L. Williams 12835 (VEN); Aragua: L. Williams 12310 (F), Anzoategui: Foster D. Smith 27 (US); Federal District: Herb. Nac. Ven. 50891 (VEN) and 50895 (VEN) (L. Chorros), Tanayo 128 (VEN), Aristigueta 1998 (VEN) (Caracas - Antimano); Monagas: Wurdack & Monachino 39115, Steyermark 61766 (F), 62016 (F), 52114 (F); Bolivar: L. Williams 12560 (VEN); Amazonas: basin of the Courante River, Forest Dept. 5398, Surinam: Stahl 622 (US), Landeboh 182, 190, Brazil: Territory Amapa: Ecler & Irwin 16961 (IAN) (basin of Rio Jari), Irwin 17882 (LAN) (basin of Rio Opique), J. E. R. J. 57611 (RB) (Macapa), Pires & Black 27646 (IAN) (basin of Rio Arawairi). Para: Ledoux 223 (IAN) (Marajo), Pires 609 (Belem, Utinga), Black 28950 (LAN) (Igarape Pixauna, Antonio Lemon). Dusk e. s.n. (Aug. 19, 1913) (PS) (Collares, Para), L. E. J. 11961 (RB) (Ila Mexicana), M. Goeldi s.n. (Oct. 11, 1901) (PG), Kuben s.n. (June 12, 1908) (PG) (Hort. Bot. Belem), Sigueria s.n. (Aug. 13, 1903) (PS); Amazonas: basin of Rio Madeira, J. E. J. 117038 (RB); basin of Rio Solimoes, Dusk e. s.n. (Sept. 10, 1901) (PS); Territory Guaporé: Herb. Breadeanum 27110 (HB), Duarte 7210 (INPA), Pinaul: Parnaiba, Lima 12 (IAN); Ceara: cult.; Dusk e. s.n. (July 3, 1908) (PG), Pernambuco: Dusk e. & Lins 76 (PEKUW); Bahia: Belem et al. 1373 (UB), 1375 (UB), 1371 (UB), and 1277 (UB) (Ilheus); H. Veloso 1 (US), 5 (US), Inst. Bot., Sao Paulo 34381 (SP), H. T. Silva 37926 (UB); Minas Gerais: Herb. Vicosa 1592 (VIC); Espirito Santo: basin of Rio Doce: cult. (shade for cacao), J. E. R. J. 63901 (RB); Rio de Janeiro and Guanabara: cult. J. E. R. J. 867 (RB), 7191 (RB), 1132 (RB), 11928 (RB); Sao Paulo: cult. Inst. Bot., Sao Paulo 18509 (SP) (Campanas).
Local names: Amapola (Dominican Republic); Cambulo (Valle, Colombia); Amaiza (Loreto, Peru).

Distribution: The second most frequently collected species of the genus in the Americas and one of two (the other being E. berteroana) which occurs both in the West Indies and in Central and South America. In the West Indies it has been collected in Cuba (Pinar del Rio, Habana, Las Villas and Oriente), Jamaica, Dominican Republic, Puerto Rico, Guadeloupe, Martinique, St. Vincent, Tobago and Trinidad.

In Central America it has been collected in Guatemala (Izabal and Jutiapa), El Salvador (La Libertad, La Paz), Honduras (Cortes, Comayagua, Yoro, Cholango and El Paraíso), Nicaragua (Zelaya, Segovia, Matagalpa, Granada and Rivas), Costa Rica (Guanacaste, Alajuela, Puntarenas, Heredia, Cartago and San Jose) and Panama (Bocas del Toro, Canal Zone, Colon and Panama).

In South America it has been collected in Colombia (Magdalena, Atlántico, Bolívar, Antioquia, Valle, Cundinamarca, Cauca, Huila and Amazonas), Venezuela (Zulia, Lara, Mérida, Carabobo, Apure, Aragua, Federal District, Guarico, Anzoátegui, Monagas, Delta Amacuro and Bolivar), the three Guianas, Ecuador (Guayas and Los Ríos), Peru (Loreto), Brazil (Amapa, Para, Amazonas, Guaporé, Piauí, Bahia, Pernambuco and Minas Geraes) and Bolivia (El Beni).

In summing up its distribution this species is found in the West Indies and on the continent from Guatemala south into Peruvian, Brazilian and Bolivian Amazonia.

The species is used extensively as a shade for cacao and coffee and its range has been greatly extended by this use. As a result it is often difficult to ascertain whether the tree is indigenous to certain localities or escaped from cultivation. It is a lowland species, although some specimens from Colombia, Venezuela, and Guatemala are said to have been collected at altitudes of 800 to 1200 meters.

Specimens from trees in cultivation were seen from Belize, Guatemala (Escuintla), Brazil (Ceará, Bahia, Espírito Santo, Rio de Janeiro, Guanabara and São Paulo), Ceylon and the Camerouns (West Africa).

II. Cristae-galli

2. *Stryphrpa cristagalli* L. Kant., 1677.

Chromosome numbers: 2n = 40, 44 (Tschechow, W. and Kartaschowa, CytoLOGIA 3:221-249, 1932); 2n = 52, voucher: Rawitscher s.n. (Krukov Herb. 8952) from Brazil, São Paulo; 2n = 62, voucher not seen: McClintock from a plant cultivated in California (I accept the identification of this plant by McClintock without any reservations as she knew this species, as evidenced by her paper (14, 57); 2n = 62, voucher not seen: Service Forestal s.n. (USDA plant introduction number 15C389) from Brazil; 2n = 12, voucher not seen: Henry A. Dreer s.n. (BEF 1196-25); 2n = 12, voucher not seen: BEF 7-38 from Montevideo, Uruguay (G4108).

U.S.: California: Bracelin 1106 (F), 1185, 1186 (F) (Berkeley), Klave 1572 (US) (San Diego); Illinois: Chicago, Garfield Park, Ohlendorf s.n. (July, 1890) (F); Pennsylvania: Philadelphia, Killington s.n. (US); Washington, J. C., Botanical Garden, Rose 1150 (US); Missouri: Kammerer s.n. (Oct. 2, 1926); South Carolina: Clemson College, Anderson 1526 (US); Georgia: Savannah: Bachus s.n. (May 16, 1927) (F), Bisset s.n. (May 16, 1927) (US), Mississippi: Clarkson s.n. (1937) (F); Cuba: Habana: Bro. Leon 1694 (GH); Dominican Republic: J. J. Jimenez 3050 (US); Guatemala: Alta Verapaz: Kolina & Molina 12357 (F). Costa Rica: J. Leon 100 (F), Solis Rodas 179 (M), Mus. Nac. Costa Rica 21696 (F); San Jose: Mus. Nac. Costa Rica 217552.
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(CR) and 26868 (CR) (Desamparados), 3L1219 (CR) (Escazu), 25L83 (CR); Alajuela: Mus. Nac. Costa Rica 25236 (CR). Brazil: Minas Gerais: Harrington 3536 (UB), 7127 (HE), Inst. Bot. Sao Paulo 16L85 (SP) (Pocos de Caldas), 19560 (SP) (Lagoa Dourada); Rio de Janeiro and Guanabara: Goes & Constantino 238, J. B. R. J. 12L185 (RB) (Passo Fundo), Pabst 7131 (RB) (entre Flaviano y Guatist), J. F. R. J. 112779 (RB) and 112871 (RB) (Horto Florestal, cult.), L11613 (RB) and 77922 (RB) (cult.); Sao Paulo: Rodriguez 3356 (M), de Paiva Coelho 2383 (M), J. B. R. J. 13378 (RB), 69956 (RB) (Rio Bracicaiba), 17255 (RB) (Lorera), Inst. Bot. Sao Paulo 28129 (SP) (Rio Jaguary), 51750 (SP) (Salto), 19317 (SP) (Paaso Alegre), 13211 (SP) (Jundiahy), Inst. Bot. Sao Paulo 65866 (SP), Pickel 5005 (PERN) (cult.), Parana: J. B. R. J. 29174 (RB) and 55109 (RB) (Palmyra), 29175 (RB) (Sao Matheus), Inst. Bot. Sao Paulo 58212 (SP) (Piraquara), Hatschbach 12023 (F), Gurgel 19; Santa Catalina: J. B. R. J. 53914 (RB) (Nova Tautonia), 73103 (RB) (prope Laguna), L. B. Smith & Klein 8112 (US), Reitz & Klein 9397 (US); Rio Grande do Sul: Pereira 8680 (NB), Janbo 35181 (M), 111550 (M), 119355 (D), Inst. Bot. Sao Paulo 18571 (SP) (Sao Leonoldo). Paraguay: Hassler 1054, 2335. Argentina: Jujuy: Araujo & Barkley s.n. (Nov. 28, 1919); Tucuman: Schreiter 775, 61206 (US); Santiago del Estero: Russet 103 (GH); Misiones: Spegazzini s.n. (Jan. 10, 1907) (A); Corrientes: Federzoni 3008 (M), 1798, Loureiro 1220, Ybarrola 2928 (M); Buenos Aires: Rodriguez V. 525.

Distribution: The fourth most frequently collected species of the genus in the Americas and by far the most frequently cultivated outside of its natural range.

Attention is called to the fact that all specimens from the West Indies, North and Central America and Peru are from cultivated plants, the species not being indigenous to these countries.

Known native from eastern Brazil, eastern Bolivia, Paraguay, northern Argentina and Uruguay. The specimens seen from the following states and provinces: Brazil (Maranhao, Minas Gerais, Rio de Janeiro, Guanabara, Sao Paulo, Paraiba, Santa Catalina and Rio Grande do Sul), Bolivia, Paraguay, Argentina (Jujuy, Tucuman, Santiago del Estero, Chaco, Santa Fe, Misiones, Corrientes, Entre Rios and Buenos Aires) and Uruguay.

Specimens from trees in cultivation were seen from U.S.A. (California, Missouri, Kentucky, Mississippi, Georgia and Florida), Bermuda, Cuba, Jamaica, Guadeloupe, Martinique, Trinidad, Guatemala, Costa Rica, Peru, Guiana, Africa and Australia. The species is also often grown in greenhouses in Europe and in the U.S.A. and in botanical gardens in the tropics.

In one of my previous papers I discuss E. x bidwillii (E. herbacea x E. cristasegalli) (1:232). Three additional specimens of this hybrid were examined: China: Canton: Dalstrom 512 (1/2-1951) (G), Levine s.n. (Herb. Canton Christian College 1761 (A); Honolulu: coll. undesign. s.n. (June 1927) (G).

On December 28, 1912 E. cristasegalli was declared a National Flower of Argentina, and in 1967 "Erythrina" the Coral tree" was dedicated as the official tree for the City of Los Angeles.

Gavio published a paper (I2) dealing with "anomalias en el androceo" in this species particularly in the number of stamens, and in another arrangement and structure. He mentions that more or less similar anomalies were reported for E. herbacea (Penzig, O. Pflanzen-teratologie systematisch geordnet, Berlin 1921-1922). In the monograph, under E. americana, I stated: E. senecandra was described on the basis of a plant of unknown origin cultivated in Hort. Bot. Nonsp. I have seen the type and it manifestly belongs
with E. americana. The absence of the tenth stamen in flowers on the species in my opinion has no consequence. I have seen obviously abnormal flowers in specimens of at least two species of Erythrina with 9 and 11 stamens.


Chromosome numbers: 2n = 16, vouchered: Silva s.n. (Krukoff Herb. 15062) from Brazil; 2n = 32, vouchered not seen: Servicio Forestal s.n. (USDA plant introduction number 15062) from Brazil (61006).

Peru: Cook & Gilbert 768 (US); Cuzco: Uribamba: Ellenberg 879 (U); Junin: Soukup 2255 (cf); Madre de Dios, C. Vargas c. 110172 (US); Brazil: Bertha Lutz 10 (US), 1599 (A); Minas Gerais: Duarte 251, Kello Barrete 11205 (BBG), Herringer 3036 (BBG), Boncini 1015 (A); Herb. Vicosa 2228 (V10), J.B.R.J. 111902 (RB), 111903 (BBG) and J. G. Kuhlmann 2228 (US) (Vicosa); Inst. Bot. Sao Paulo 27146 (SP) and 27152 (SP) (Sao Horizonte); Inst. Bot. Sao Paulo 15876 (SP) and J. A. L. 2553 (RA) (Estac. Exper. Coronel Pacheco); Inst. Bot. Sao Paulo 37553 (SP) and 37558 (SP) (Torbae); Mendes Magalhaes 855 (BBG), s.n. (Sept. 27, 1961) (Lan) (munic. Santa Luzia), J.B.R.J. 88694 (RB) (Faz do Maogo, Pararapeba), Duarte & Castellanos 251 (RA); Rio de Janeiro and Guanabara: J.B.R.J. 13232 (RA) and 105752 (BBG) (Serra dos Orgãos); J.B.R.J. 50172 (RB) (Petropolis), Dionisio & Octavio 01, Brade 161/06. J.B.R.J. 13513 (RB) and 77292 (RB) (cult.);


Local names: Suinan and Mochoco (Sao Paulo, Brazil).

Distribution: Subandean southern Peru (Junin, Cuzco and Madre de Dios) and Bolivia (La Paz and Cochabamba), eastern Brazil (Maranhao, Minas Gerais, Rio de Janeiro, Guanabara, Sao Paulo, Parana, Santa Catarina and Rio Grande do Sul), Paraguay and northern Argentina (Jujuy, Salta, Tucuman, Santa Fe and Misiones).

Cultivated in Argentina (Buenos Aires) and a favorite street tree in Sorata, Province of Larecaja, Dept. of La Paz, Bolivia.

III. Vernae


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(alt. 1000 m), 11°56'3 (US), 161°36' (F), 280°18' (US) (alt. 950 m); Cundinamarca: Duque-Jarandilla 3217 (COL) (1790-2080 m), Garcia-Barriga 11906 (US) (alt. 1660 m); Meta: Allen 3328 (M) (alt. 600 m); Cauca: Idrobo-Fernandez 207 (US) (alt. 1110 m); Huila: Schultes & Villarreal 5100 (COL) (1300 m), E. L. Little, Jr. 7456 (US) (alt. ± 1000 m); Maracay: J. A. Ewan 1956 (US); Putumayo: T. A. Sprague 369 (US), Schultes & Smith 2060 (GH), Quatrescasas 11013 (US) (alt. 1000 m). Ecuador: Santiago-Zamora: Harling 1132 (G) (alt. 600 m); Esmeraldas: Aslund 16556; Los Rios: Acosta Solis 10753 (F), E. L. Little, Jr. 98257 (F); El Oro: Stevermark 53780 (M); Napo-Pastaza: Aslund 10218 (US). Peru: Woytkowski 31393 (F); San Martin: Ronan Ferreira 1598 (US); Loreto: Woytkowski 31388 (G), Ronan Ferreira s.n. (1955) (US). Venezuela: Saers 839 (VEN); Bernardi s.n., Tanayo s.n. (F), Bro. Elias 139h (F), L. Williams 2968 (US); Lara: Stevermark 55580 (F); Trujillo: Stevermark 55922 (F) (alt. 1065-1220 m); Tachira: Alston 7066; Yaraquy: Curtar 229, Kurkert 16390 (VEN); Miranda: Bernardi s.n. (Nov. 21, 1956), Aritigueta 1935 (VEN); Amazonas: Stevermark 61882 (F), 61502 (F); Monagas: Stevermark 52169 (F) (alt. 850 m), Foster D. Smith 2211 (US); Zulia: Lesser 2522 (VEN); Sucre: cult. in cocoa plantation, Stevermark 25322 (VEN); Kerida: E. L. Little, Jr. 15984 (VEN), 15987 (VEN) (cult.), 15792 (VEN) (alt. 1800 m), Aritigueta 5776 (VEN); Federal District: Pittier 1132 (VEN); Brazil: Amazonas: Boca do Acre, Barranca et al. 2355; Territory of Roraima: Rio Branco, Vasconcellos D. Coelho s.n. (JPPA 10950); Bahia: cult., H. Veloso 2 (US); Sao Paulo: J. P. E. P. 22117 (F) (Fazenda Santa Eliza, cult.), 30665 (SP) (Jard. Bot. Sao Paulo, cult.). Bolivar: Tunas: Kelly 1023 (M). Local names: Cachingo (Huila, Colombia); Pu-ru-to-kaspi (a "bean tree") by Indians in Putumayo, Colombia; Chucho or Rajojo or Pemina (Colombia). Distribution: This is the fifth most frequently collected species of the genus in the Americas and by far the most frequently grown as a shade for coffee and cacao.

Attention is called to the fact that E. poepigiana is not indigenous to the West Indies or to Central America. All specimens from these regions are either from cultivated plants or from escapes.

Known native in western South America from Venezuela and Panama (southern Darien) in the north throughout subandesan Colombia, Ecuador, Peru and Bolivia, and in western portions of Peruvian, Brazilian and Bolivian Amazonia.

Specimens were seen from the following countries: Cuba (Havana, Santiago, Las Villas and Oriente), Jamaica, Haiti, Dominican Republic, Puerto Rico, Guadeloupe, Martinique, Trinidad and Tobago, Guatamala (Alta Verapaz and Santa Rosa), El Salvador (Juanachap, Santa Ana and San Salvador), Honduras (Atlantida and Morazan), Nicaragua (Managua), Costa Rica (Lizon, San Jose and Cartago), Panama (Canal Zone), Colombia (Norte de Santander, Boyaca, Caldas, Valle, Tolima, Cundinamarca, Meta, Cauca, Huila, Maro, Putumayo and Caqueta), Venezuela (Zulia, Falcon, Lara, Merida, Trujillo, Tachira, Yaraquy, Carabobo, Federal District, Miranda, Sucre, Anzoategui, Monagas and Bolivar), Ecuador (Esmeraldas, Los Rios, El Oro, Napo-Pastaza and Santiago-Zamora), Peru (San Martin, Loreto, Huancayo and Cuzco), Surinam (cultivated), Brazil (Territory of Acre) and Bolivia (El Beni and La Paz).
Distribution: Peru (Loreto, Huamucu, Junin and Cuzco), Colombia, Ecuador (Napo-Pastaza), Bolivia (La Paz and Cochabamba) and Brazil (Amazonas, Para and Maranhao). Specimens from Bolivia were obtained at elevations of 500-1600 m.


Bolivia: La Paz: cult. in Coroico, Isabel Kelly 1039 (F), Paraguay: Pavetti Morin 1516 (KILCH), Argentina: Salta: Schreiter 5025 (F); Jujuy: Ledesma, Cabrera & Pabius 15970 (MIN).

Distribution: Western central Brazil (Mato Grosso), eastern Bolivia (Santa Cruz), Paraguay and northern Argentina (Jujuy, Salta, Formosa and Chaco).

A specimen was seen from a tree cultivated at Sao Paulo, Brazil.


Brazil: Bahia: Cruz das Almas (cult.), J. B. R. J. 132228 (RB); Minas Geraes: J. B. R. J. 77958, Macedo 1111 (M), J. Evangelista de Oliveira 1095 (IIN), Inst. Bot. Sao Paulo l712l (SP) (Plau.), 15977 (SP) (Estac. Exper. Coronel Facheco), J. B. R. J. 15983 (RB) (Estac. Exper. Coronel Facheco), Herringer 7698 (UB), J. Evangelista de Oliveira 603 (MBN) (cult.); Goias: Duarte 10578 (HB), Sidney 193 (US); Rio de Janeiro and Guanabara: J. B. R. J., 15971 (RB) (Sta Maria Magdalena), 39067 (RB), also 15379 (RB), 15969 (RB) and 11199 (RB) from cultivated plants; Sao Paulo (cult.): Pickel 2133 (M), 5000 (PERN).

Distribution: Central and southern Brazil (Maranhao, Bahia, Territory of Acre, Goias, Minas Geraes, Rio de Janeiro, Guanabara and Sao Paulo). Doubtless occurs also in Mato Grosso, Brazil, also in Peru and Bolivia adjacent to the Territory of Acre.

On the label of Inst. Bot. Sao Paulo l712l is stated: "Mulungu de flor branca. Flores quase brancas".

The local name "Munungu" has been recorded for 6 of 12 species of Erythrina which are found in Brazil, (E. poenipigiana, E. ulei, E. verna, E. speciosa, E. amazonica and E. velutina). In this connection it is interesting to note that according to E. G. Baker the local name for E. excelsa Baker (= E. barshawei Bak. fil.), native to Uganda, East Africa is "Munungu" (39:369).


Bolivia: Santa Cruz (Buena Vista): Herzog 72 (Z, type).

Herzog states on the label: "Haufiger Baum in der Waldem bei Buena Vista, ca. 800 m, Oct. 1907". This species is known from 6 collections and additional ones would be of considerable interest.

Distribution: Eastern Bolivia (Santa Cruz) and adjacent Brazil (Mato Grosso).

IV. Speciosae


Brazil: Bahia: Voloso 2 (US), Balem & Marahaes 1092 (UB) (rodovia Rio Branco-Itabuna, plantacao de cacao), M. T. Silva 59269 (UB); Minas Geraes:
1969 Krukoff, American species of Erythrina

Belem 1612 (UB), Mendes Magalhaes 690 (UB), Herb. Vicos 1566 (VIO); Munic. Belo Horizonte (cult.), J. Evangelista de Oliveira 1091 (IAN); Distrito Federal: Irvin et al. 1838 (UB), Herringer s.n. (UB); Espirito Santo: Belem 1572 (UB); Rio de Janeiro and Guanabara: restinga de Tijuca, J.B.R.J. 7573 (RB); Petropolis, J.B.R.J. 50171 (RB) and 62329 (RB); Jacarepagua, J.B.R.J. 49980 (RB), 100721 (RB) and 100767 (RB); Horro Florestal (cult.), J.B.R.J. 31127 (RB) and 111900 (RB); Jard Bot. (cult.), J.B.R.J. 17959 (RB) and 90187 (RB); Horro Museu Nac. (cult.), J.B.R.J. 111215 (RB); pr. Passe Tres, Herb. Braedeanum 21712 (RB); Sao Paulo: Pickel 6892 (PEN); Jorena, J.B.R.J. 17256 (RB); Parque do Estado, Inst. Bot., Sao Paulo 64858 (SP); Campinas, Fazenda Santa Elisa (cult.), Inst. Bot. Sao Paulo 17533 (SP); Inst. Bot. Sao Paulo 29235 (SP) (cult.); Parana: J. Hatschbach 6212 (US); coastal plain, Lindeman & de Raas 2633 (U); Santa Catarina: Heitz & Klein 3533, 9870.

**Distribution:** Southeastern Brazil (Bahia, Minas Gerais, Distrito Federal, Espirito Santo, Rio de Janeiro, Guanabara, Sao Paulo, Parana and Santa Catarina).

Specimens were seen taken from trees in cultivation in Costa Rica (Turrialba) and Peru.

**A striking small tree and a good addition to tropical arboretum.**


**Distribution:** Known only from 4 collections from central Ecuador (Los Rios, Bolivar and Chimborazo). Specimens were obtained at an elevation of 1800-3000 m.

Fruits and seeds of this species not seen, presumably resembling those of the related species, E. edulis and E. schimpffii. Additional collections of this species, especially in fruit, would be of interest.

11. Erythrina schimpffii Diels, Bibl. Bot. 116:95. 1937. Ecuador: Guayas: Camp E-3716 (alt. 333-1000 m); Bolivar: Acosta Solis 6368 (F) (alt. 800-1100 m), 6198 (alt. 800 m) (F); Los Rios: Asplund 5533 (S), Faverland & Wibom 2613 (S), Harling 287 (S); Cotopaxi: Sparre 17110 (S).

**Distribution:** Known only from central Ecuador (Guayas, Pichincha, Tungurahua, Los Rios, Oroya, Bolivar and Chimborazo). Specimens were obtained at an elevation of 270-1600 m. 

V. **Edules**

12. Erythrina edulis Triana; M. Michel, Jour. de Bot. 6:115. 1892. Venezuela: Tachira: Stevemark & Dunsterville 101,274 (alt. 2000-2400 m), Colombia: Karsten s.n., E. L. Little, Jr. 7121; Magdalena: Kean 108 (US) (alt. 1180 m); Norte de Santander: Cuatrecasas 12878 (US) (alt. 1200-1500 m); Antioquia: Bro. Daniel 933 (US), J. Araque & F. A. Barkley s.n. (Jan. 21, 1918) (US) (alt. 2700 m), Hodge CH86 (US); Medellin, Sandeman 5534. A (COL) (alt. 2333 m); Hno Daniel s.n. (COL); Valle: Dryander 122 (M) (1100 m), Cuatrecasas 15129 (US) (alt. 1250-1400 m); Cordinamarca: Garcia-Barriga 12195 (US) (alt. 1250-1400 m), Fernandez & Mora 1145 (US) (alt. 2030 m); K. E. Schultes 6599A (US), Duque 182 (COL) (alt. 1800 m); Duque-Jaramillo 2362 (COL) (alt. 2600 m); Garcia-Barriga 12414 (COL) (alt. 1150-1400 m), Cuatrecasas 13357 (COL) (alt. 2230-2300 m); Cauc: Dryander 217 (US) (alt. 2300 m), Fosberg 20177 (US) (alt. 1800 m), Kjell von Sneltem 5620 (US), Cuatrecasas 1950A (alt. 1780-1900 m), H. G. Barclay 5200.
Erythrina breviflora De Candolle, Prodr. 2:143, 1825.

Mexico: Lyomnet 880 (US) (valle de Tepeite); Jalisco: Keith Roe et al. 2151 (WIS) (alt. 1800 m), Barcena 617 (MEXU), MoVaugh 13366 (US) (alt. 2100-2200 m), 13582 (MEXU) (alt. 2000-2250 m), 111 351 (MIC) (Sierra de Caule, alt. 2100 m); Colima: Barcena 659 (MEXU); Michoacan: Ugent & Flores 1712, 6127, Barkerly et al. 2703, E. L. Little, Jr. 11101, MoVaugh 13210 (MEXU) (alt. 1800 m), Manning & Manning 5310 (GH), King & Soderstron 5000, 5128; Mexico: Keith Roe et al. 1667 (WIS) (alt. 2000 m), 1764 (WIS) (alt. 1950 m), Matuda et al. 26949 (alt. 1500 m), 31551 (US) (alt. 1500-1900 m), Hinton 527 (US), Miranda 350 (MEXU), Rzedowski & n. (Sept. 3, 1965) (ENCB) (alt. 2000 m); Morelos: L. Parry 1623 (ENCB), J. Espinosa 361 (ENCB), R. Palacios & n. (Sept. 4, 1966) (ENCB) (alt. 1900 m), s.n. (Aug. 22, 1966) (ENCB) (alt. 2100 m); Federal District: Miranda 591 (ENCB); Hidalgo: Hinton 11513 (GH), McCorclle & Howell, Jr. 3 bH5t (MIC), Howell, Jr. 3273 (MIC).
**Distribution:** At higher elevations from Jalisco and Guanajuato in the north, throughout Michoacan, Morelos and Mexico to and including Oaxaca in the south (Jalisco, Guanajuato, Colima, Michoacan, Mexico, Morelos, Federal District, Hidalgo and Oaxaca). The range apparently does not overlap those of either *E. petraea* or *E. oaxacana*.

King & Soderstrom 5606 is the first specimen in fruit seen by me. Seeds are black and fruits and seeds resemble those described for *E. breviflora* fma. *petraea* (1:255).


Distribution: Known only from 5 collections of C. A. Purpus from the State of Puebla, Mexico, where it is confined to higher elevations. Its range apparently is distinct from those of typical *E. breviflora* and *E. breviflora* fma. *oaxacana*.

Additional collections of this form would be of considerable interest.


Distribution: Known only from 3 collections of the State of Oaxaca, Mexico, where it is confined to higher elevations (>1800 m). Its range apparently is distinct from those of typical *E. breviflora* and *E. breviflora* fma. *petraea*. Fruits and seeds of this form were not seen but presumably resemble those of *E. breviflora* and *E. breviflora* fma. *petraea*.

Additional collections of this form would be of considerable interest.

14. **Erythrina leontorhiza** De Candolle, Prodr. 2:413. 1825.

Mexico: Herb. L. Urbina s.n. (March 1883) (MEXU) (Cerro de Cuatepec); San Luis Potosi: McVaugh 12205 (US) (alt. 2350 m); Jalisco: Gregory & Etten 219 (H), Weintraub & Fuller 116 (MICH); Guanajuato: Billy 136 (MICH); Hidalgo: West H-8 (WIS) (alt. 2550 m), C-17 (WIS) (alt. 2500-2900 m), Matuda 2154 (MEXU); Michoacan: Dressler 1156 (H), E. L. Little, Jr. 11012 (MICH); Mexico: F. Takaki s.n. (May 11, 1935) (ENCB) (alt. 2300 m), Hitchcock & Stanford 7011 (US) (alt. 2833 m), Martinez 15059 (H), Matuda 21094 (MEXU), 26279 (US) (alt. 2400 m), 28275 (US) (alt. 290 m), Hinton 15402 (MICH), Beamian 3360 (US) (alt. 3500 m); Federal District: Lyonett 2816 (US), Salazar s.n. (Ray) (MEXU), s.n. (June) (MEXU); Morelos: J. Espinosa s.n. (Nov. 13, 1960) (alt. 2270 m), Carlos Dios & Dilo Fuentes s.n. (May 16, 1957) (ENCB); Tlaxcala: R. Galicia 6 (ENCB) (alt. 2200 m), Hzedowski 11 (ENCB), Balls 1826 (US) (alt. 2600 m); Puebla: Sharp 114567 (MICH), Miranda 2762 (MEXU), C. E. Smith, Jr. et al. 3016 (alt. 1600-2200 m).

Distribution: At higher elevations from the States of Jalisco, Guanajuato and Hidalgo in the north to and including Michoacan and Puebla in the south (San Luis Potosi, Jalisco, Guanajuato, Hidalgo, Michoacan, Mexico, Federal District, Morelos, Tlaxcala and Puebla). It appears that its range does not overlap the much more restricted ones of two related species, *E. horrida* and *E. montana*.

15. **Erythrina horrida** De Candolle Prodr. 2:413. 1825.

Local names: Somantla (district Ixtlan, Oaxaca, Mexico).

Distribution: Endemic to Oaxaca, Mexico, where its range apparently does not overlap those of the two related species, *E. leontorhiza* and *E. montana*.


Mexico: Durango: H. S. Irwin 1216, Johnston 2675 (MICH), Maysilles 7001 (MICH), 8194 (MICH), Waterfall & Wallis 13357 (F) (Aug.); Aguas Calientes: McVaugh 18259 (MICH); Nayarit: McVaugh 16411 (MICH), 16454 (MICH),

Ecuador: Santiago-Zamora: Mathias & Taylor 5231 (US) (fl. July, no leaves), Sparre 19203 (S) (alt. 800 m); Napo-Pastaza: Asplund 896/ (S) (fl. & fr.).

This is the first collection in fruit. Pods subligneous, ± 21 cm long, deeply constricted between seeds, many-seeded; seeds scarlet (some with small indistinct blackish markings) without a black line near the hilum. Mathias & Taylor state on the label: "small tree with pink flowers", whereas Sparre's label reads: "flowers deep yellow". Additional collections of this species would be of considerable interest.

Distribution: Known only from 4 collections; one from Peru (Loreto) and three from Ecuador.


Chromosome numbers: 2n = 42, voucher: Wortley s.n. (Krukoff Herb. 9257) from Trinidad (6:409).


Distribution: St. Vincent, Tobago, Trinidad, Margarita and probably other neighboring islands (?Martinique); also Venezuela (Falcon, Lara, Miranda).


Distribution: Venezuela (Trujillo, Yaracuy, Carabobo, Miranda, Federal District and Bolivar).


Chromosome numbers: 2n = 42, voucher not seen;Holdridge s.n. from Haiti. I accept the identification by Holdridge without reservation as he knew this very distinctive species and collected specimens of it (Holdridge 9/7) (6:408).

Haiti: Gros Cheval (alt. 1500 m), Holdridge 9/7.

Distribution: Endemic to Haiti (Massif de La Selle) where it is rather
common at elevations of about 1200 m and is also planted for living fence posts.


Distribution: Endemic to Haiti (Massif de la Selle) where it is common above 700 m and is also planted for living fence posts.


Cuba: Las Villas: R. Howard et al. 377 (A, type, NY, IAN) ("Rocky hill slope 4 mile west of Rio San Juan which is crossing road to Trinidad"), Howard 5336 (Trinidad Mus., limestone).

Distribution: Known from 2 collections from Las Villas, Cuba.

The original description is ample. This is one of the most distinctive species in the genus and can be immediately recognized on the vegetative characters (leaves). Although flowers are not yet known I am tentatively placing it in the group Coralloidendra. It is doubtless endemic to Cuba. The collectors describe the species as a tree 30 ft. high which has a trunk with spines or corky growths.

Additional collections of this species, especially in flower, would be of considerable interest.


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Additional collections of this species, especially in flower, would be of considerable interest.


From Brazil, Maranhao, island of Sao Luiz (6:168).

French Guiana: Lettland 198 (1792) (0). Guiana: basin of the Rorununi River, Forest Dept. 3660; Surinam: Tresaling 3780 (U), Kramer & Hecking 2665 (U). Brazil: Para: Zuco 1655 (F) (flor rosas) (near Fajard, 1960 (RB) (Rio Branco de Obidos), s.n. (Aug. 5, 1912) (U) (Rio Branco de Obidos, Matta, Uaussuzal), Pires 1395 (IAN) (Vigia), Silva 170 (IAN) (Vigia, beira do Rio Vigia); Maranhao: Black et al. 51.16575 (IAN) (arbusto; flores roscas), Zucce s.n. (Sept. 25, 1903) (U) (Alcantara, capuia), J.B.R. s.n. 1758 (RB) (Canamponu), Colombia: La Serrania (entre los rios Ariari y Mata, 270 m alt.), Quatracanas 7816 (US); Vichada: Cano Sama: Nicolinco Kattar s.n. (July 1917).

Distribution: At low elevations in Colombia (Putumayo), Peru (Loreto), French Guiana, Surinam, Guiana, and Brazil (Amazonas, Para and Maranhao).

All collections in fruit have bicolored seeds (red and black) except for Zucce 5515 (from the basin of Rio Fidade, Maranhao) which has seeds uniformly red.

Zucce gives an excellent description of the occurrence of this species in the Brazilian Amazonia: "Arvore pequena, aculeada, com bellas flores cor de corale e entao desfolhada; em estado indubitavelmente espontaneo no "uaussuza" (matta com predominio da palmeira "uaussua"; Orbignya spicata) do pequeno Rio Branco ao nordeste de Obidos. Cultivada em Belém e muitas outras partes do Brazil tropical (chamada "mulungu", como as demais especies de flor rubras)."


Distribution: Known only from 3 collections, one each from Brazil (Mato Grosso), Bolivia and Paraguay.

Fruits and seeds not seen. Additional collections of this species would be of interest.

*Distribution:* Jamaica, Haiti and St. John.

Planted in Jamaica as a fence-post.


*Chromosome numbers:* 2n = 42, voucher Ward s.n. (Krukoff Herb. 15202) from St. Lucia (61088).


*Distribution:* St. Kitts, Antigua, Montserrat, Guadeloupe, Marie Galante, Dominica, Martinique, St. Lucia, St. Vincent and Grenada.

Additional collections of this entity would be of considerable interest. They may help to demonstrate whether or not it is best treated as a form rather than a variety.


*St. Thomas:* Orsted s.n. (1845-46) (US).

*Distribution:* St. Thomas, St. Croix and probably other neighboring islands.

**Fruits and seeds of this species not seen.**

Additional collections are needed to verify whether or not this variety has a distinct geographical range and to check whether or not the color of the seeds is correlated with characters in flowers (connate keel-petals, etc.).

VIII. **Cubenses**


*Distribution:* Endemic to Cuba (Pinar del Rio, Isla de Pinos, Las Villas and Oriente).

26a. **Erythrina olivae** Krukoff, sp. nov. inter congeneres calycis campanulati tubo de latere ad medium fisco bilabiatm, vexillo late elliptico, carinacea petalis alicie acuminatis praestans.

*Arbores mediores ad anthesin saepissime foliatae, trunco spinis armato, ramulis robustis saepe aculeatis; petoeli juniores pubescentes mox glabrati 5.5-11 cm longi espinosis; petoeli 3-7 mm longi 0.5-1 mm diam, ut petoei demum glabrati; foliis orbiculatis terniiter chartaceae juniores ut petoeli pubescentes mox glabres subus nec spinosis nec eriferae; foliolum terminal late ovatum vel subrotundum 3.5-6.5 cm longum 3.7-8 cm latum, apice rotundatum vel emarginatum basi late cuneatum vel truncatum, venis secundariis utroque latere saepissime 5 percursum; inflorescentia rachis pedicellisque floriferi non visi; calyx fere 2 cm longus 1.3 cm diam, junior breviter puberulus demum glabratum vel glaberrimum, calyptrae paullo antrorsus curvatus bilabatus, tubo utroque latere ad medium fere fissus (nonnumquam uno latere integro) labis integerrinis subaequilongis truncato-rotundatis; vexillum arcuato-recurvum elliptico-obovatum vel obstate obtusum hau'd stipitatum 6 cm longum 2.5 cm latum, ad anthesin (fide collectoris) vivide aurantiaco-bubalinum saturatus lineolatus; alae ob lanceolatae.
Erythrina oliviae Krukoff

A. Flower
B. Standard
C, D. Calyces
E, F. Wings & keel-petals
leviter falcatae fere 2 cm longae 8 mm latae, basi angustatae, apice valde obtusae ultra medium concavae vel involutae carinae paulo longiores; carinae petala 5.8 cm longa 6.5 cm lata inter se secus margines exteriores rectae coadunatae, basi in unguiculum 2 mm longum angustata, lamina semi-oblata apice acutiuscula acuminato-caudata; androeci fere 8 cm longi filamenta per 3 cm inter se libera, antherae linearis 6.5 mm longae; pistillum ad 7.2 cm usque longum, pilis pallidis dense cinereo-pubescent; pedicelli fructiferi 9 mm longi, 2 mm diam.; legumen 20-22 cm longum 1.7 cm diam., basi in stipiten 3.5 cm longum, apice in rostrum gracile 2 cm longum contractum, inter semina compluria inaequaliter paulloque constrictum; semina 18 mm longa 6 mm lata, immatura aurantiaco-lutea dein saturate rubra, ventre linea lata nigra de hilo chalazam versus 3 mm longa notata.

Type locality: El Papayo, Hinoj. de Ahuizotla, Puebla, Mexico.

Distribution: Known only from the type locality.


The collector's label on Converse 13L1 reads: "collected from a line of 8 trees, evidently grown from stakes placed for a fence, trees about 10 m high; trunks about 50 cm...the largest leaflets 5.1 x 5.8 cm...inflorescences 18 to 30 cm...standard 9 cm long x 3 cm wide when open, a soft yet vivid orange-buff color, with marked veins...keel-petals and wings 2.5 cm, bright reddish-orange...fruits 20-21 cm long, very unevenly constricted...seeds 15 x 7 mm, very variable in their shades of buff."

The collector's label on Converse s.n. reads: "there are many more trees of the same species in the "monte", including one growing by the dry river on opposite side of road from those collected." The species appears to be in flower in April/June.

This is a strongly marked species, without close relatives in the genus, best placed in the species-group Cubenses. The combination of small leaflets, irregularly cleft calyx, broad banner, and apically acuminate keel-petals is an unique one. In the material examined the majority of calyces are cleft on one side only, but one calyx is cleft half-way on both sides, becoming 2-lipped in consequence. Examined rapidly, the calyx cleft on only one side suggests the spathaceous calyx of E. velutina but there the calyx is situated behind the standard and the orifice of the calyx is strongly oblique. The calyx cleft on both sides suggests that of E. cubensis, which also has a rather broad standard, but obtuse, apically unappended keel-petals. Keel-petals more or less acute at apex occur in several subgroups of the species-group Herbaceae as defined in the monograph (1), but always associated with a narrower standard and a campanulate or tubular-campanulate calyx entire or minutely undulate-toothed around the orifice. The oblanceolate, obtuse, distally involute wings which are a trifle longer than the keel are suggestive of the Herbaceae, a group highly differentiated in Mexico and Central America, and it seems likely that E. oliviae represents a specialized offshoot from this large species-group.

IX. Herbaceae


Chromosome numbers: n = 21, 2n = 42 (Senn, H.A. Bibliographica Genetica 12:375-380, 1930); 2n = 42, voucher not seen: Servicio Forestal s.n. (399...).
plant introduction number 150391 (this identification should be verified as I have not seen any specimens of this species cultivated in Brazil); 2n = 32, voucher: White s.n. from Myrtle Beach, South Carolina; 2n = 62, voucher: White s.n. from Holden Beach, North Carolina; 2n = 62, voucher not seen: Lewis & Oliver 523h from Texas, Macogdoches Co. (Lewis, Walter H. et al., Rhodora 61:191, 1962) (6:103, 109).

U.S.: about 80 collections were examined and annotated. They are not cited here as the distribution of this species in the U.S. is well known.

Mexico: Toll 226 (MNH); Tamaulipas: "Hill's 13352 (D), Kenoyer & Grun 3315 (A), R. Kerrick King 1500, Vierack 214 (US), Dressier 1878 (MICH), Johnston 2228 (MICH), P.21.2 (MICH), Barkley & Smith s.n. (Apr. 21, 1947) (P); San Luis Potosi: Rzedowski 6925 (IACB), Barkley s.n. (Apr. 13, 1917): Hidalgo: Moore 2882 (MO); Veracruz: Mario Souza 2377 (RENU), Dressier & Jones 11, A. Gomez 5. & R. Riba 22 (RENU); Puebla: Miranda 8380 (RENU); Oaxaca: Alexander 135, L. Gonzalez s. s.n. (March 3, 1961) (MICH).

Distribution: Southeastern U.S. (Texas, Louisiana, Mississippi, Alabama, Georgia, South Carolina and Florida) and eastern Mexico (Tamaulipas, San Luis Potosi, Hidalgo, Veracruz, Puebla and Oaxaca).

I have not seen any specimens of this species from North Carolina. However, a specimen is cited (6:109) as collected by Dr. O. E. White at Holden Beach, Brunswick County.

Specimens from plants in cultivation were seen from Bermuda and Cuba. This is the third most frequently collected species of the genus in the Americas.

In a summary of her paper Atchison (6:113) states: "E. herbacea, contains both herbaceous perennial and arboreous forms. These growth habits are apparently hereditary and at least merit separation into varieties". She discusses the species also elsewhere in her paper (6:10-111): "Herbaceous plants transferred to a greenhouse at the Blandy Experimental Farm have kept their normal habit. Perennial and arboreous characters in E. herbacea are probably hereditary and not merely the result of response to climate conditions. Further investigation may prove the two forms worthy of varietal, if not specific separation."

I already discussed the above matter at length back in 1939 in the monograph (1:281): "In the northern portion of its range the species is a perennial herb with a very thick fleshy root, which sends up several stems to about 1 meter high which die every year; the long leafless rachises commonly proceed directly from the root. In tropical Florida and Mexico it becomes a shrub or a small tree up to 6 meters, often with a single stem. I am in agreement with Standley that the shrubby form seems to differ from the typical E. herbacea only in habit and in heavier pubescence of rachises and pedicels and therefore does not merit any taxonomic designation. In this connection it is noteworthy that E. cristata-galli, a large tree in its native habitat in South America, dies back to the root every year if grown outdoors in England."

I am not prepared to recognize the arboreous form even as a geographical variety as in Texas and elsewhere occur forms intermediate between the extremes mentioned by Atchison. Furthermore, I do not find any characters for separating any forms treated here as E. herbacea.

Incidentally, as I stated in the monograph (1:281), the first specific name proposed for the shrub form of E. herbacea appears to be E. rubicunda. Recently I examined the type of it (Herb. Jacq. s.n. (1806), (W).

For information on the more or less similar situation in E. flabelli-
forms, see under that species. On rocky ground and mountain slopes in
Arizona the plants are with large roots which send up several shoots, thus
forming shrubs about 1 meter high with several stems. In the southern
portion of its range in Mexico it becomes a tree.


Mexico: Martin 007 (MICH); Nuevo Leon: Meyer & Rogers 2895 (U) (1900 m);
San Luis Potosi: Nzedowski 2763 (ENCB), 8737 (ENCB) (alt. 2100 m), 8767
(ENCB) (alt. 1150 m); Guanajuato: Kenoyer 1797 (A), Gillly 137 (MICH); Hidal-
go: L. Gonzalez Quintero 2286 (ENCB) (alt. 1900 m); Mexico: Dodds & Simpson
28 (MICH), Bourgeau 1188 (FI), Legro 115 (FI); Federal District: Natuda
21035, Espinosa 668 (ENCB) (cult.); Morelos: Miranda: 2315 (MEXU); Puebla:
Marrill King 2280 (MICH), Bro. Arsen. s.n. (Aug. 1907) (US), 128a (US) (alt.
2160 m), 2372 (US); Oaxaca: Cox 1623 (EAP).

All specimens of Bro. Arsen are from the vicinity of Puebla.

Distribution: Eastern Mexico (throughout Nuevo Leon, Tamaulipas, San
Luis Potosi, Guanajuato, Queretaro, Hidalgo, and in eastern Jalisco, Mich-
cacan, Guerrero, Mexico, Federal District, Morelos, Puebla and Oaxaca.

McClintock (1843) states: "E. coralloides has been known in California as E. poianthes. This error may perhaps be traced to a color plate in Cur-
tis' Botanical Magazine (Vol. 323, published in 1833) labelled E. poianthes.
This plate is an excellent representation of the tree, grown in California, and
also, surely of E. coralloides, although it apparently has not been as-
signed to this species. Erythrina, in his revision of the American species of
Erythrina (Brittonia 3:205-237. 1939) referred to this plate in his treat-
ment of E. speciosa (=E. poianthes) and did not accept it as representing
this species. He however, did not further identify the plate."

My statement to which McClintock refers reads as follows: "I cannot accept
the plate (Curtis' Bot. Mag. 60: pl. 323B, 1833), said to be of E.
poianthes, as of E. speciosa, as the seeds are shown on the plate as red,
and as keel-petals are separate and smaller than wings. It is quite obvious
that the plate in question is an excellent representation of E. coralloides
except that the keel-petals in this species are connate whereas they are
shown to be separate on the plate.


Chromosome numbers: 2n = 12, voucher: Jones s.n. (Krukoff Herb. 91485)
from Arizona; 2n = 12, voucher not seen: BIF 1136-36 (USDA plant introduc-
tion number 123562) (inasmuch as these seeds bear the USDA plant introduc-
tion number, they must come from a foreign country, probably Mexico where
E. flabelliformis is found; if this is the case then the identification
should be verified, as this species is often confused with E. coralloides and
other species) (61408).

U.S.: about 15 collections were examined and annotated. They are not cited
here as the distribution of this species in the U.S. is well known.

Mexico: Lower California: Wiggins 5571 (MICH), J.H. Thomas 7863 (US), Gen-
try & Fox 11868 (IL), Carter & Ferris 3111 (D), 3137 (D); Sonora: Wiggins
1351 (D), White 507 (MICH), 2761 (MICH), 2813 (MICH), L097 (MICH), Miller
3651 (MICH), Martin 56077 (MICH), Straw & Forman 1600 (MICH); Chihuahua:
Knobloch 1130 (MICH), G. Forja L. E-366 (ENCB); Durango: Lundell 13033 (MICH);
Jalisco: Pringle L011 (TEXU), Gentry & Gillly 10825 (MEXU), McVaugh 16891
(MICH) (fr. June) (ca 10km. SW of Lagos de Moreno, alt. 2000-2100 m), 15093
(MICH), 16811 (MICH) (fr. Aug.) (near Cerro La Campana, alt. 2100-2300 m);
Zacatecas: 5 miles NE of Jalpa, alt. 1500 m, McVaugh 161486 (MICH) (fr. Aug.).

Local names: Zumpantla (Jalisco).
Distribution: In southeastern Arizona (counties Pinal, Pima and Cochise) and in southwestern New Mexico (Grant county), U.S., and in western Mexico (throughout Lower California and Sonora, in northern Sinaloa, western Chihuahua, Durango, Zacatecas, central Jalisco and northwestern Michoacan). This species is a small shrub in Arizona and a tree 5 - 8 m high in the southwestern part of its range in Mexico (see for example annotations on Carter & Ferris' specimens from Lower California). The plant occurs in Arizona at an elevation of up to 5000 ft.


Mexico: Sinaloa: Gonzalez Ortega 22 (MEXU), 1191 (MEXU), 5116 (ENCB); Nayarit: Mason 1787 (Tres Marias) (D), Chavez & Villamar s.n. (fl. Jan.), (Isla Maria Madre) (ENCB), Pedema 1049 (MICH), Gentry & Gilly 10717 (IL), McVaugh 12068 (US), Jalisco: Wilbur & Wilbur 1373 (MICH); Colima: Gilly et al. 7 (MICH), McVaugh 15782 (MICH), McVaugh & Koelz 11553 (MICH), 1699 (MICH), Miranda 9083 (MEXU) (fl. Dec.); Mexico: Hinton 10030, H. Bravo 337 (MEXU) (fl. July); Guerrero: Miranda 1322 (MEXU) (fl. March), Kruse 218 (fl. March), Oaxaca: McVaugh 22117 (MICH); Chiapas: Ocozocuautla, Moore 2512 (GH).

Local names: Colorin or Chilicote or Peonia (Sinaloa).

Distribution: Western central and southern Mexico (Sinaloa, Jalisco, Colima, Michoacan, Mexico, Nayarit, Guerrero, Oaxaca and Chiapas). In the monograph I stated: "E. occidentalis perhaps should not be regarded as specifically distinct from E. lanata. I have retained the name for the time being because the majority of specimens of E. lanata are quite incomplete and were obtained from several widely separated localities, and it is therefore difficult to form a clear concept of the species. The specimens from the State of Sinaloa and Tres Marias Islands, here treated as E. occidentalis, form a compact group with fairly uniform large pods, large seeds, and small thin calyces."

Abundant new collections (including specimens from Sinaloa and Tres Marias Islands) examined and cited in this paper show that E. occidentalis cannot be maintained as a distinct species.


Chromosome numbers: 2n = 42, voucher: Petersen s.n. (Krukoff Herb. 9705) from Guatemala, Escuintla; 2n = 42, voucher: Owen Smith s.n. (Krukoff Herb. 2617) from Guatemala, Solola; 2n = 42, voucher not seen: Walsingham s.n., from Cuba, Atkins Gard. & Research Lab. I accept the identification of this plant by Walsingham without any reservations as he knew this species and he sent me seeds and specimens of it - Krukoff Herb. 9133 (Walsingham s.n.) (61408); 2n = 42, voucher: coll. undesigned. 25f. from Central America (under the name "E. neglecta Krukoff") (6a:516).

Cuba: Isla de Pinos: Morton 10111 (US); Las Villas: Gonzales 173; Howard 1888h (M). Dominican Republic: Allard 1373 (US). Puerto Rico: E. L. Little, Jr. 13771. Mexico: Veracruz: Sierra de Tuxtla, E. F. Andre 3 (US); Chiapas: Esperanza, Escuintla, Matuda 17001, Guatemala: Alta Verapaz: Steyermark 16720; Zacapa: Steyermark 13322 (P); Retahileu: Standley 88031 (F); Suchitepec: Krukoff 67-3, Steyermark 17951 (P); Sacatepequez: Breedlove 11407 (US); Escuintla: Standley 88273 (P), 99007 (F); Santa Rosa: Standley 7851h (F); El Salvador: Allen & Armour 6133 (EAP); Ahuachapan: Standley & Padilla 2511 (P); La Libertad: Carlson 23; Morazan: Tucker 799 (F). Honduras: Cortes: Molina 3569; Comayagua: Valero Rodriguez 2510 (F); Morazan: Peifer 1689 (US) (alt. 1000 ft), Glassman 1716, Molina 231 (GH),...
Standley 16168 (F), Standley & Padilla 1037 (F), 1953 (F), L. O. Williams & Molina 11926 (EAP) (alt. 1100 m); Olancho: Standley 18155 (EAP) (alt. 1350-1500 m); El Paraíso: Valerio Rodríguez 1996 (F), Molina 558 (F), Standley 16669 (EAP) (alt. 700-800 m), 2578 (EAP) (alt. 930 m). Nicaragua: Estelí: Standley 20319 (EAP) (alt. 680 m); Jinotega: Standley 9519 (F), 10583 (F), Costa Rica: Porcher 755 (G) (near Coyolar, alt. 150 m), Cufodontis 311 (G), (Irazú, alt. 3000 m); Guanacaste: Obramas 822 (F), Dodge & Thomas 6165 (F), Núñez: Cuesta Rica 36976 (CR) (Stevens & Allman), Paul Shinn s.n. (CR) (Aug. 7, 500 m); Alajuela: Narrojo, alt. 1150 m, Austin Smith 10006 (F); Pacuare, alt. 1000 ft., Oton Jimenez & Lankaster s.n. (CR), Castaneda & Krukoff (CR), Jorge-Leon 2315 (CR) (alt. 1500 m); San José: Herb. Pittier 3056 (CR) (alt. 1200 m), Mus: Nac., Costa Rica 26010 (CR) (La Uruca), 36676 (CR) (San Antonio de Bulen, Fuente de Nulas), 5297 (CR) (Hacienda La Trinidad, Monte de Oro); Puntarenas: Palmar 33 (alt. = 900 m); Cortes: Forbes 216 (F) (alt. = 2000 m); Panama: Ricken 520 (US), Stern et al. 590 (F), Allen 1511 (US), Chiriqui: Stern et al. 1116, Woodson & Schwartz 151 (SH), Allen 3263 (K), Davidson 725 (US), Fournier King 5122 (US); Veraguas: Blas & Trues 592 (F); Los Santos: Butler 2760 (F); Canal Zone: Usher 11337, Harvey 2321 (F), 2225 (F), 1327 (F), Usher 1327 (F), Blum 562 (F), Stern et al. 348 (F); Darien: Usher 10366. Colombia: Choco: munic. Risuciu, Romano-Casteneda 6109 (COL) (alt. 200 m); Oscar Haught 5162 (US) (alt. 100 m); Magdalena: Romano-Casteneda 612 (COL), 936 (COL), 140 (COL), Magdalena: Haught 1460 (F), Escheverria 331, Rafael Romero 2, 813 (US); Cauca: Uresti Casas & A. Acuña 1, 2577 (US, Atlantico: Durán & Jaramillo 616 (COL) (alt. 200-250 m). Venezuela: Zulia: Lasser 2529 (VEN), Aristigueta & Montoya 2057 (VEN) (Machiques).

Distribution: The most frequently collected species of the genus in the Americas and one of two (the other being E. glauca) which occur both in the West Indies and also in Central and South America.

In the West Indies it has been collected in Cuba (Pinar del Río, Isla de Pinos, Habana, Matanzas, Las Villas, Camaguey and Oriente), Haiti, Dominican Republic and Puerto Rico.

On the continent it has been collected in Mexico (Veracruz, Chiapas), Guatemala (Huehuetenango, Alta Verapaz, Cuzcatlán, Zacapa, Retalhuleu, Suchitepéquez, Solola, Sacatepéquez, Chiquimula, Escuintla, Guatemala, Santa Rosa and Jutiapa), El Salvador (Ahuachapan, Santa Ana, Sonsonate, La Libertad, San Salvador and Morazán), Honduras (Cortes, Morazán, El Paraíso, Olancho and Comayagua), Nicaragua (Segovia, Jinotega, Matagalpa, Leon, Managua and Granada), Costa Rica (Guanacaste, Puntarenas, Alajuela, Heredia, San José and Cartago), Panama (Chiriqui, Veraguas, Los Santos, Cocle, Canal Zone, Darien and Panama), Colombia (Choco, Magdalena, Guajira, Atlántico and Bolivar) and Venezuela (Zulia).

Specimens from trees in cultivation were seen from Mexico, Colombia (Antioquia) and Africa (Tanganyika).


Chromosome numbers: 2n = 12, voucher: “Rosengarten s.n. (Krukoff Herb. 2799)” (my files show that Krukoff Herb. 2799 (Crawford s.n.) is of E. egresii; the identification cited by Atchison (6:1263) therefore needs verification).

Guatemala: Alta Verapaz: Standley 20263 (F), Williams et al. 10396 (F); El Progreso: Stevermark 15613 (F); Zacapa: Stevermark 15360 (F). Honduras: Morazán: L. O. Williams & Molina 13723 (F), L. O. Williams 17315 (EAP).

All specimens cited above were collected at the elevation of ± 1100-2700 meters.
Distribution: Confined to the highlands of Guatemala (Alta Verapaz, Baja Verapaz, El Progreso and Zacapa) and Honduras (Morazan).

In Guatemala often planted in hedges.


**Chromosome numbers:** $2n = 12$, voucher: Krukoff la from Mexico, Morelos (6/180).


Local names: Cosquilete (Tamaulipas); Pemuche, Colorín (Veracruz).

**Distribution:** Central-eastern and central Mexico (Tamaulipas, San Luis Potosí, Hidalgo, Veracruz, Colima, Mexico, Federal District, Morelos, Puebla, Guerrero and Oaxaca). Specimens from plants in cultivation were seen from U.S. (Alabama and Texas), Europe, Cuba, Hawaii and Africa (Kenya and Natal).


**Chromosome numbers:** $2n = 12$, voucher Atchison 265 (8/30-l/h) (US), from a plant cultivated at the Atkins Garden & Research Laboratory, Soledad, Cienfuegos, Cuba (6/15-1/h). Mexico: Yucatan: Lundell & Lundell 7453 (MICH), 8045 (MICH), Klawe 42-2B (US).

**Distribution:** Western Cuba (Pinar del Rio and Isla de Finos), southwestern Mexico (Campeche and Yucatan), Belize and northeastern Guatemala (Petén). Constrained to the lowlands.

Specimens from plants in cultivation were seen from Cuba. In Mexico it is planted in hedges. This species is represented from Guatemala by a single collection and additional ones would be of interest.


**Distribution:** Mexico (Veracruz and Chiapas) and Guatemala (Huehuetenango). Breedlove's specimens were collected at elevations of 1170-1900-2333 meters. Standley 65712 was previously identified as *E. berteroana*.


**Chromosome numbers:** $2n = 12$, voucher Atchison 257 (3/27-l/h) (US) from a plant cultivated at the Atkins Garden & Research Laboratory, Soledad, Cienfuegos, Cuba (6/15-1/h).

**Distribution:** Mexico: Chiapas: M. Chiconuselo, Miranda 7079 (MEXU) (fl. March); munic.
Tuxtla, Breedlove & Raven 13511 (US) (alt. ± 733 m) (fl, Oct.); muni. La Trinitaria, Breedlove & Raven 364/7 (US) (alt. ± 1,000 m) (fl, Jan.).

Distribution: Known only from the State of Chiapas, Mexico.


Chromosome numbers: 2n = 12, voucher not seen: Lindsay s.n. (SFE S-8811-64) from Panama, Canal Zone, (this identification should be verified as this species is not found in Panama); 2n = 12, voucher: Jaramillo s.n. (Krukoff Herb. 2181) from Colombia (6.10).

Venezuela: Merida (alt. 2,000-2,600 m), Arstiguista 3237 (US), Breteler 3115 (RB), Bernardi 6859; Tachira: Steyermark & Dunsterville 10053; Lara: Tersayo 3335 (VEN). Colombia: Magdalena: Foster & Carlo Smith 3123 (COL) (alt. 2,370 m); Antioquia: Duque 1182 (US) (alt. 1,500 m); Santander: Cuatrecasas & Garcia-Barriga 9272 (US) (alt. 2,300 m); Boyaca: Rangel Calindo 135 (COL); Caldas: Arbelaez & Cuatrecasas 6163 (US) (alt. 1,800-1,900 m); Cundinamarca: Cuatrecasas 13558 (US) (alt. 2,330-2,350 m); 13597 (US) (alt. 1,600-1,700 m); Martín Sant Quintín (COL) (US), Garcia-Barriga 11055 (US) (alt. 1,550-1,590 m); 11735 (COL) (alt. 1,170 m); 12322 (COL) (alt. 1,100-1,220 m), 12352 (COL) (alt. 1,170-1,200 m), 1751 (COL) (alt. 2,050-3,100 m); Duque-Jaramillo 3227 (COL) (alt. 1,750-2,200 m); 3258 (COL) (alt. 1,750-2,080 m), van der Hammen 94 (COL), Arbelaez s.n. (192) (COL), Fernandes & Morales 1321 (COL) (alt. 1,300 m); Fernandes & Perez-Arbelaez 151 (COL) (alt. 1,300-1,350 m); Idrobo & Hernandez 51 (COL) (alt. 1,900-2,150 m); Valle: Duque 992 (US) (alt. 1,500 m); Cauca: Karsten s.n. (US), Jaramillo 992 (F) (alt. 1,500 m); Tolima: Garcia-Barriga 1215 (US) (alt. 1,600-1,620 m); T. A. Sprague 271 (US); Huila: E. L. Little, Jr. 7294 (US), 8469 (US), Ecuador: Jose Marreiro & E. L. Little, Jr. 6139 (US); Peru: San Martin: L. Williams 7882 (F); Cuzco: Zarazas 41051 (US); Puno: Wetcaif 26336 (A) (alt. 1,000-1,050 m). Bolivia: Santa Cruz: Cardenas 105% (F) (Plaza Archa, upper Rio Ichillo-Villagrande, alt. 1,300 m), 1575 (US) (Cocotal-Chiapare, alt. 1,800 m).

Local names: Chocho or Rojizo or Peonía (Colombia), Surigay (Boyaca, Colombia).

Distribution: This species has a very extensive range at the higher elevations (mostly 1,500-2,000 m) in South America: Venezuela (Merida, Tachira and Lara); Colombia (Magdalena, Norte de Santander, Antioquia, Santander, Caldas, Valle, Cundinamarca, Boyaca, Cauca, Tolima and Huila); Ecuador (Imbabura); Peru (San Martin, Cuzco and Puno) and Bolivia (La Paz, and Santa Cruz).

A specimen from a tree in cultivation was seen from Perereniya, Ceylon.


Chromosome numbers: 2n = 12, voucher: Thiessen s.n. (Krukoff Herb. 15129) from Guatemala (6.10).

Mexico: Guerrero: Hinko 11708; Veracruz: Mario Souza 2850 (MEXU), Ross 209 (US); Oaxaca: Schultes & Reko 587 (Tuxtepec), 525 (Choapan). Carlson 2757 (F); Nativa 32217 (US); Chiapas: Nativa 17601, 7217 (MEXU). Guatemala: Quezaltenango: Steyermark 52127 (alt. 2,550 m); Suchitepequez: Krukoff 67-2 (near Chicaco, Finca Naranco), Steyermark 56733 (Volcan Santa Clara, 1250-2560 m); Solola: above Finca Moca (alt. 1,250-1,100 m); Steyermark 28032.

Local names: Colorin (by the Tzapotecs in Oaxaca), Betusna-gus (by the Zapotecs in Oaxaca), Simpante (Chiapas), Ermitche (San Marcos, Guatemala).

Distribution: Mexico (San Luis Potosi, Mexico, Guerrero, Veracruz, Oaxaca and Chiapas), Guatemala (Alta Verapaz, San Marcos, Quezaltenango, Suchi-
tepequez and Solola) and Nicaragua (Granada).

According to Schultes this species is the commonest species of the genus in the districts of Tuxtpec and Choaamp in Oaxaca.


Chromosome numbers: 2n = 12, voucher: Lancaster s.n. (Krukoff Herb. 15377) from Costa Rica (6:1409).

Country undesigned. ; Converzeron s.n. (F), U.S.: California: Los Angeles (cult.), Westcott 210 (F). Honduras: Santa Barbara: L.O. Williams & Molina 14511 (EAP); Morazan: Molina 2956 (F); El Paraíso: Juvenal Valerio 1800 (EAP) (alt. 1100 m). Nicaragua: Matagalpa: Cordill. Central de Nicaragua (alt. 1300 m), L.O. Williams 23670 (F) (fl. Jan.). Costa Rica: Pittier 6933 (BR), G.C. Worthen s.n. (M); Guanacaste: L.O. Williams et al. 26627 (F) (fl. Jan.) (alt. 300 m); Alajuela: Bremes 826 (W) 12182b; San Jose: J.A. Echeverría 365 (CR) (Tablazo), Mus. Nat. Costa Rica 31220 (CR) (San Cristobal de Candalaria); Cartago: Jorge Leon 1576 (EAP) (alt. 1330 m).

Distribution: This species has a rather extensive range at higher elevations (mostly 1000-1800 m) in Central America. In Honduras it is known from Santa Barbara, Cortes, Comayagua, Yoro, Morazan, and El Paraíso; in Nicaragua from Matagalpa; in Costa Rica from Guanacaste, Puntarenas, Alajuela, San Jose and Cartago.


Guatemala: Izabal: Steyermark 39080 (F) (Montejo del Oro, alt. 35-150 m), 1776 (F) along Rio Tamaya, alt. 50 m, Raven & Gregory 606 (US). Honduras: Atlantida: Molina 10337 (EAP) (alt. 100 m); Cortes: L.O. Williams 17381 (EAP) (alt. 550 m); Nicaragua: Jelaya: Long 160 (F).

Distribution: Guatemala (Izabal), Honduras (Atlantida and Cortes) and Nicaragua (Jelaya). This is a lowland species.


Honduras: Olancho: vicin. Catacumas (150-500 m), Standley 18386 (F). Costa Rica: Alajuela: Mus. Nat. Costa Rica 17699 (CR) (San Ramon, alt. 1100-1600 m), Quirós 286 (CR) (La Palma de San Ramon), Justin Smith 2771 (F) (Alfaro Ruiz, alt. 1700 m), Bremes 828 (W), 1514h (F), 9767 (near San Ramon); Cartago: Hearne 610 (EAP) (alt. 1100 m), Jorge Leon 1576 (TURIA), (Las Concavas, alt. 330 m); Limon: Shark & Molina 12189 (EAP) (alt. 0 m). Panama: Bocas del Toro: H. von Vedel 1196 (US) (fl. Oct.); Colon: Dryer 1394A (US), Allen 2711 (M) (El Valle de Anton, alt. 1000 m), 3622 (GH), Duke 13232 (alt. 700 m).

Local names: Guatiquen (Honduras), Poro de la montana (Costa Rica).

Distribution: At moderately high elevations in Honduras (Olancho), Costa Rica (Alajuela, Limon, San Jose and Cartago) and Panama (bocas del Toro, Chiriqui and Colon).

The collector notes on the label (Allen 2711: "the common Erythrina of the entire El Valle de Anton region.


Erythrina colombiana Krukoff, Brittonia 3:325. 1939.

Costa Rica: Guanacaste: Herb. Pittier 6781 (Col) (Punta Mala, litoral de Pacifico), Oton Jimenez 1224 (CR) (Golfo de Nicoya); San Jose: Stark 3112 (MICH), Jorge Leon 1048 (CR) (Valle del General, alt. 600-700 m), Kohlkenper 692 (EAP); Puntarenas: Molina et al. 16175 (F) (fr. March) (vicin. San Isidro del General), L.O. Williams et al. 28762 (F) (along Rio Sonador, alt. 600 m), Manuel Valerio 173 (CR) (Golfo Dulce), Allen 5722 (F) (Falmar Norte de Osa);
Cartago: Cordoba 267 (H), Krukoff 67-1, 67-3 (near Torralba in Panches); Limon: Talamancas Anta.: Paul Shack 2 (EAP) (alt. 300 m). Panama: Bocas del Toro: Kirkbride & Duke 165 (US), Lewis et al. 872 (H); Canal Zone: Tyson 1117 (W), Blum & Tyson 2001 (H), Stemppark & Allen s.n. (EAP) (alt. 70-80 m), Hillig 29375 (US) (alt. 200-300 m), 20036 (US), Frost s.n. (March 20, 1925) (F), Duke 1392 (W), Harvey 501 (F) (fl. nov.), Corea & Haines 189 (F), Copenhagen 1765 (H), Gross 8976 (W), 6716 (W), 6725 (W). Panama: Duke 2998, 2653; Bocas: Skura et al. 622 (H), Krukoff & Duke 1120 (H). Colombia: Valle: Quinteros 15893 (US); Antioquia: Ulloa-Ulloa 8162 (alt. 500 m) (COL), Paredes 5711 (alt. 100 m) (US), Lopez & Sanchez 19 (alt. 150 m) (US); Boyaca: M. Humke, H. Lawrence 619 (type coll. of B. colombiana). Distribution: Costa Rica (Guaraques, Puntarenas, San Jose, Cartago and Limon); Panama (Chiriqui, Bocas del Toro, Canal Zone, Panana and Darien); and Colombia (Choco, Antioquia, Valle and Boyaca).

Abundant new collections cited in this paper show that B. colombiana cannot be maintained as a distinct species. On an examination of a sheet of the type collection of B. colombiana deposited with Arnold Arboretum, which consists of flowers as well as leaves, it became evident that it also cannot be maintained as a distinct species. In 1936 when B. colombiana was described, only the sheets deposited at U.S. National Herbarium and the New York Botanical Garden were available and they consist of flowers only.

B. costaricensis is rather uniform in its characters as it occurs in Panama and in the valley of the general (provinces San Jose and Puntarenas.) in Costa Rica. It shows considerable variations in its characters in other parts of Costa Rica. In some of these regions also occurs the related B. berteroana, perhaps the most variable Brythrina in America. The two may be easily separated if the characteristic pubescence of mature or almost mature leaflet blades beneath (pubescent, often lanate, with long villous whitish deciduous hairs) of B. costaricensis is not lost. Otherwise their separation becomes difficult and it is often necessary to use a combination of several characters. The following characters should be observed. Terminal leaflet-blades of B. costaricensis are usually longer than broad and are acuminate at the apex (they are often broader than long and usually acute at the apex in B. berteroana). Calyces of B. costaricensis are usually about as long on the calyx as on the vexillary side and irregularly lobed at margin (they are usually much longer on the calyx than on the vexillary side in B. berteroana). and the flower-buds are broader and round at the apex. Pods of B. costaricensis are moniliform and usually densely pubescent, remnants of pubescence remaining in part toward maturity, and the seeds are uniformly scarlet (those of B. berteroana usually have a black line extending from the hilum for approximately 1 mm toward the calycal end).

Chromosomal number: 2n = 12, voucher: Gen. Forests s.n. (tree #10) from Belize (this voucher was identified by me) (B.H.C.B.).

Mexico: Veracruz: Gomez & Aiba 238 (VENU); Gonzalez C. 201 (XVCB) (fl. March, no leaves), Vera Santos 2777 (HACH) (Fl. Mex.); Oxaca: Martinez-Caldero 51 (A); Guatemala: Alta Verapaz: vicinity of Cubiliguita, Steyermark 16011 (alt. 350-450 m).

Distribution: Southern Mexico (basin of Coatzacoalcos River) and throughout in eastern Guatemala (departments of Alta Verapaz and Izabal). This is a lowland species.

According to Ll. Williams, often grown in Mexico for fence posts and as a shade for cacao and coffee.
Erythrina macrophylla De Candolle, Prodr. 2:411. 1825.

Chromosome numbers: 2n = 12, voucher: Armstrong 18 from Guatemala, Quezaltenango (this voucher was identified by me) (6:10).

Guatemala: Huehuetenango: Steyermark 15971 (F) (alt. 1500-1600 m), 14978 (F) (alt. 2500 m), 14977 (F) (alt. 1500-2500 m), Breedlove 1670 (US) (alt. 3000 m), Quiche: west of Chichicastenango, Molina et al. 16137; Quezaltenango: Standley 83921 (F) (alt. 2150-2300 m), 15002 (F) (alt. 2250-2100 m), Chimaltenango: Molina et al. 16137 (Tecpan, alt. 2550 m), Barbara Spreads 1 (F), Standley 80139 (F), 80144 (F) (alt. 2250-2100 m), 83173 (F) (alt. 2250 m); Guatemala: Standley 80516 (F) (alt. 1800-2300 m).

El Salvador: San Salvador: Carlson L200 (F) (alt. 1680-1890 m), Uilen 7193 (F) (alt. 1500-2000 m), Honduras: Intibuca: Standley 25321 (EAP).

Local names: 'Niche (Huehuetenango, Quiché), Pito de montana or Ajuijote (El Salvador).

Distribution: At higher elevations in Guatemala (Huehuetenango, Quezaltenango, Solola, Quiche, Chimaltenango, Guatemala and Sacatepequez), El Salvador (San Salvador) and Honduras (Intibuca).


Costa Rica: Alajuela: San Carlos, Quebrada de Palo, alt. 625 m, Austin Smith 1910 (H), Cartago: Anastasio Alfaro 5 (F), 6 (CR), 7 (F), (La Puente Feralta, alt. 1300 m), Jorge Leon 1522 (TURIA) (Turrialba, La Isabel) (alt. 650 m).

Anastasio Alfaro's specimens were collected near the divide between the Pacific and Atlantic watersheds.

Distribution: Known only from eastern Costa Rica (Alajuela, Cartago and Limon) and central Colombia (Caldas). Further collections are needed to establish its range.


Costa Rica: Cartago: Nina Las Quinas, San Antonio, Turrialba, Krukoff 7a, Panama: Chiriqui: Tyson 872 (H) (alt. 2100 m), Stern & Chambers 81 (M), Allen 8171 (vicin. of Cerro Punta, alt. 2000 m), L77 (GH), Butcher s.n. (March 10, 1968) (alt. 6000 ft.).

Distribution: At higher elevations in Costa Rica (Cartago) and Panama (Chiriqui).

Erythrina smithiana Krukoff, Brittonia 3:322, 1939.

Ecuador: Guayas (alt. 100 m): Camp E-3623, Carlos Jativa & Carl Epling 925 (US)(fl. Aug.), Fagerlind & Wilson s.n. (27/9-1932) (S), 2L3 (S); Los Rios: E.L. Little, Jn. 61-89 (US), Acosta Solis 10833 (F), Carlos Jativa & Carl Epling 923 (US)(12. July)(alt. 70 m), Harling 260 (S)(alt. 30 m), 561 (S)(alt. 30 m)(fl. red), Sparre 179280 (S)(alt. 20 m)(fl. flame red); Bolivar: Acosta Solis 6025 (F)(1270 m), Chimonborazo: Acosta Solis 5225 (as to fl.),(F), Harling 60147 (S)(fl. red), Asplund 15505 (S)(alt. 1100 m); El Oro: E.L. Little, Jm. 6717 (US), 6727 (US), A.J. Gilmartin 758 (US); Loja: Steyermark 91359 (F)(alt. 1520 m); Peru: Pavon s.n. (G), 716 (G).

Local names: Vonotillo (Los Rios, Loja).

Distribution: Ecuador (Guayas, Los Rios, Bolivar, Chimborazo, El Oro and Loja). Specimens from Colombia (El Valle) and Peru were placed here with doubts.

Apparently cultivated for live hedges in Bolivar, Ecuador (Acosta Solis 6025). Flowers are described as "rojas" (Acosta Solis 6025), "deep scarlet-red" (Steyermark 91359), "crimson" (Camp E-3623), and "flame red" (Sparre 179280).

Chromosome numbers: 2n = 14, voucher: Sobrinho s.n. (Krukoff Herb. 1263); 2n = 12, voucher not seen: Servicio Forestal s.n. (USDA plant introduction number 150394) from Brazil (6.4.09).


Local names: Pionia (Guajira, Colombia).

Distribution: Apparently confined to the drier tropics in the West Indies, northern Venezuela and northern Colombia, reappearing on the Pacific coast of South America in Ecuador (incl. the Galapagos Islands) and Peru, and on the Atlantic coast in Brazil from Piaui to Sao Paulo.

In the West Indies it has been collected in Cuba (Havana), Jamaica, Gran Cayman, Haiti, Dominican Republic, St. Thomas, Antigua, Grenada, Tobago, Trinidad, Curacao and Aruba.

In South America it has been collected in Colombia (Guajira, Magdalena), Venezuela (Falcon, Carabobo, Araque, Federal District, Guarico, Miranda, Sucre and Anzoategui), Ecuador (Manabi, Guayas and the Galapagos Islands), Peru (Lambayeque) and Brazil (Piaui, Ceara, Paraiba, Pernambuco, Bahia, Minas Geraes, Rio de Janeiro, Guanabara and Sao Paulo).

Specimens from trees in cultivation were seen from Bermuda, Bahamas, Martinique, Guatemala, Surinam, Brazil (Amazonas) and Paraguay.

Of the American species only *E. glauca* has a more extensive range than *E. velutina*. These two species and *E. berteroniana* are the only ones which occur both in the West Indies and in South America.
1969  
Krukoff, American species of Erythrina

The collector notes on the label (Box 1110 from Antigua): "There are probably less than half a dozen of these trees in the Island growing apparently wild in the higher parts of the central region." This specimen approaches E. grisebachii, as does Luiz Egrosio 2133 from Rio de Janeiro.


Brazil: Fernando de Noronha: Lima 55-2255 (PIN).

Distribution: Fernando de Noronha and State of Ceara, Brazil.

Altogether I have studied more than 133 collections of E. velutina and 27 collections of E. grisebachii, many of which have seeds. All seeds examined are uniformly red. E. velutina fma. aurantiaca (with seeds blackish except for a red band around hilum) apparently is rare as it has been collected only on three occasions on the island of Fernando Noronha, and on four occasions in Ceara, Brazil. This statement is backed by the observations of Lima who collected typical E. velutina as well as E. velutina fma. aurantiaca on the island of Fernando Noronha in November, 1955. According to Lima, E. velutina fma. aurantiaca is rare on the island, whereas typical E. velutina is frequent.


Chromosome numbers: 2n = 1h2, voucher not seen: Walsingham s.n. from Cuba, Atkins Gard. Research Lab. I accept the identification by Walsingham without reservations as he knew this species and sent me seeds and specimens of it on several occasions (Krukoff Herb. 212l, 2316, 2h39 and 9068 (6:108).


Distribution: Endemic to Cuba (Pinar del Rio, Habana, Matanzas, Las Villas and Oriente).

In 1939 I stated: "I retain Urban's species for the time being, but field studies may prove that it is better regarded as a variety or an ecological form of E. velutina" (1:331). Since then no progress has been made on the problem, and a trip to Cuba to examine these two entities in the field presently is out of question.

Doubtful species and species excluded from the genus

Twenty-five species either doubtful or excluded from the genus were discussed in the monograph (1:331-336). Subsequently my disposal of three of these, all based originally on cultivated plants of unknown geographic origin, have been confirmed:

3. Erythrina constantiana Micheli, Rev. Hortic. 68:52h. 1896.

In 1939 I stated that this was obviously an African plant, probably conspecific with E. caffra Thunb. It has since been placed in synonymy under this species by McClinton in 1953 (1h1:56).


In 1939 I stated (1:333): "It is obviously a South African plant". Collett (1h0:223) placed it in synonymy under E. caffra Thunb, in 1941.

25. Erythrina viarum Todaro, Nuovi Gen. 92, 1861.

In 1939 I suggested that this was a South African plant (1:336) and in 1941 Collett placed it in synonymy under E. caffra Thunb, (1h0:223).
Asiatic-Polynesian species cultivated in America

Asiatic-Polynesian species

1. Erythrina variegata L.
   This species is widely grown in America, especially in the West Indies. I have seen specimens from the U.S. (Florida and California), Cuba, Jamaica, Hispaniola (Haiti and Dominican Republic), Puerto Rico, Tortola, St. Croix, St. Martin, Guadeloupe, Martinique, Canouan, Balize, Guiana, and Brazil (Rio de Janeiro and Sao Paulo). It was introduced to America before 1823 as shown by the fact that it was described by Alph. De Candolle under the name *E. divaricata* (2:226).

2. Erythrina subumbra (*Hasskarl*) Herrill is grown in Surinam.

3. Erythrina arborescens Roxburgh

4. Erythrina fusca Loureiro (=Erythrina ovalifolia Roxb.)

5. Erythrina tahuensis Nadeau (=Erythrina indic Lam.)

6. Erythrina vespertilio Bentham

African species

I have seen botanical specimens or actual plants of the following species which are in cultivation in California:

7. Erythrina acanthocarpa L. Meyer

8. Erythrina caffra Thunberg (also in Bermuda)

9. Erythrina humeana Sprengel
   also *Erythrina humeana* var. *raja* (Keissn.) Harvey

10. Erythrina latissima L. Meyer

11. Erythrina twistelten Hutchinson

12. Erythrina ruberri Harvey

Of these the most commonly cultivated are Erythrina caffra and *Erythrina humeana*.

13. Erythrina abyssinica Lam. or De Candolle is grown in Cuba (Habana).

14. Erythrina senegalensis De Candolle is grown in Cuba (Habana and Las Villas) and in Brazil (Rio de Janeiro and Granabara, Sao Paulo and Carinaes).
In Appendix I are listed species as they are presently recognized by me; also species which were described as new, and/or reduced to synonym, since my monograph appeared in 1939. This list will be helpful to a future monographer of the genus and in identification of specimens.

In Appendix II species are grouped under the authors of the species.

In Appendix III species are grouped under the collectors of the type specimens.

In Appendix IV species are grouped under the countries of origin of the type specimens.

In Appendix V species are grouped by the countries where they are found. This information will be helpful for regional floras and as a short-cut in identifications.

In Appendix VI are given statistical data on distribution of the species in various countries.

In Appendix VII are listed species of which leaves and/or flowers and/or fruits are still unknown. This will be helpful to collectors and a future monographer of the genus.

In Appendix VIII are listed references to illustrations which are very helpful in identification of specimens. In the genus Erythrina they are much better than descriptions.

In Appendix IX are listed chromosome numbers published for American species of Erythrina. More detailed information on this is given under respective species. An effort was made to trace, as far as possible, the real identity and the origin of plants from which chromosome numbers were determined. This applies to Erythrina species listed in Appendix IX as well as in Appendix X.

In Appendix X are listed chromosome numbers published for Asiatic-Polynesian and Australian species of Erythrina.

In Appendix XI are listed chromosome numbers published for African species of Erythrina.

In Appendix XII are given statistical data on the specimens which were examined and cited in the monograph and its
supplements. These data give information at a glance as to which species are poorly collected and require further collecting.

In Appendix XIII are given changes in the identifications of specimens.

In Appendix XIV are given citations of places of deposit of specimens in this and other serial papers on Erythrina.

Appendix I

List of Known American Species of Erythrina

I. Fuscae
   1. glauca

II. Cristae-galli
   2. crista-galli
   3. falcata

III. Vernae
   4. poeppigiana
   5. ulei
   6. dominguezi
   7. verna
   8. flammea

IV. Speciosae
   9. speciosa

V. Edules
   10. polychaeta
   11. schimpffii
   12. edulis

VI. Leptorhizae
   13. breviflora
   13a. " fma. petraea
   13b. " fma. oaxacana
   14. leptorrhiza
   15. horrida
1969  Krukoff, American species of *Erythrina* 145

16. montana  

VII.  Corallodendra  
17. peruviana  
18. pallida  
19. mitis  
20. buchii  
21. leptopoda  
21a. elenae (reviewed in 3rd. suppl.)  
22. eggersii  
23. amazonica  
24. similis  
25. corallodendrum var. corallodendrum  
25a. " var. bicolor  
25b. " var. connata  

VIII.  Cubenses  
26. cubensis  
26a. oliviae (described in 3rd suppl.)  

IX.  Herbaceae  
27. herbacea  
28. coralloides  
29. flabelliformis  
30. lanata  
32. berteroana  
32a. guatemalensis (described in 1st. suppl.; 2:688)  
33. americana  
34. standleyana  
35. chiapasana  
36. goldmanii  
37. rubrinervia  
38. mexicana  
39. lanceolata  
40. hondurensis  
41. gibbosa  
43. costaricensis  
44. folkersii
Species reduced to synonymy since the monograph (1939).

E. occidentalis Standley was reduced to synonymy under E. lanata Rose whereas E. panamensis Standley and E. colombiana Krukoff - under E. costaricensis W. Micheli, all in 3rd supplement.

Appendix II

Authors of the species

Andrews, H. - speciosa (1).
Bentham, G. - falcata (1).
Britton, N.L. & J.N. Rose - pallida (1).
Cook, O.F. (orig. described - poepigiana (1).
by W.G. Walpers)
Cufodontis, G. - gibbosa (1).
De Candolle, Alph. - breviflora, leptomahiza, horrida
coralloides, macrophylla (5).
Diels, L. - schimpffii (1).
Harms, H. - ulei, polychaeta (2).
Hassler, E. - dominguezii (1).
Herzog, Th. - flammea (1).
Howard, K.A. & W. Briggs - elenae (1).
Bonpland & C.S. Kunth
Jacquin, N.J. von - mitis
Kearney, T.H. - flabelliformis (1).
Krukoff, B.A.

Krukoff, B.A. & H.N. Moldenke

Linnaeus, C.

Miller, P.

Micheli, M.

Rose, J.N.

Rose, J.N. & P.C. Standley

Standley, P.C.

Triana, J.J.

Urban, I.

Urban, I. & E.L. Ekman

Velloso, J.M.

Willdenow, C.L.

Wright, C.

- breviflora fma. petraea, breviflora fma. oaxacana, peruviana, amazonica, similis, coralloidendrum var. bicolor, coralloidendrum var. connata, oliviae, guatemalensis, standleyana, chiapasana, mexicana, chiquirensis, smithiana, velutina fma. aurantiaca (orig. described by H.N. Ridley). (10 + 5)
- eggersii, folkersii (2).
- cristata-galli, coralloidendrum var. coralloidendrum, herbacea (3).
- americana (1).
- costaricensis (1).
- lanata (1).
- montana (1).
- goldmanii, lanceolata, hondurensis, cochleata (4).
- edulis (1).
- buchii, berteroana, griesebachii (3).
- leptopoda (1).
- verna (1).
- glauca, velutina (2).
- cubensis (1).

Appendix III

Collectors of the type specimens

Bartlett, H.H. - folkersii (1).
Bertero, C.G. - berteroana (1).
Bredemeyer, F. - glauca, velutina (2).
Brenes, A.M.  -  gibbosa (1).
Britton, N.L.  -  pallida (1).
Britton, N.L. & E.G.  -  corallodendrum var. connata (0+1).
Britton & A.D. Selby
Buch, W.  -  buchii (1).
Converse, O.L.  -  oliviae (1).
Ekman, E.L.  -  leptopoda, grisebachii (2).
Goldman, E.A.  -  chiapasana, goldmanii (2).
Hassler, E.  -  similis (1).
Herzog, Th.  -  flammea (1).
Hinton, G.B.  -  mexicana (1).
Houstoun, W.  -  americana (1).
Howard, R.A. et al.  -  elenae (1).
Humboldt, F.H.A. & A.J.A. Bonpland
Jorgensen, P.  -  dominguezii (cotype) (1).
Krukoff, B.A.  -  amazonica (1).
Lampert, A.B.  -  speciosa (1).
Martius, C.F.P. von Palmer, E.  -  falcata (1)
Pittier, H.  -  lanata (1).
Poeppig, E.F.  -  poeppigiana (1).
Purpus, C.A.  -  breviflora fma. petrea (0+1).
Ridley, H.N., Lea & Ramage  -  velutina fma. aurantiaca (0+1).
Rimbach, A.  -  polychaeta (1).
Rojas, T.  -  dominguezii (cotype) (1).
Rose, J.N.  -  montana (1).
Rose, J.N. & G. Rose  -  smithiana (1).
Schimpff, H.J.P.  -  schimpffii (1).
Sesse, M. & J.M. Mocino  -  breviflora, leptorhiza, horrida, coralloides (4).
Shafer, J.A.  -  corallodendrum var. bicolor (0+1).
Smith, L.C.  -  breviflora fma. oaxacana (0+1).
Standley, P.C.  -  guatemalensis, hondurensis (2).
Krukoff, American species of *Erythrina*

Tessman, G. - *peruviana* (1).
Tonduz, A. - *cochleata* (1).
Triana, J.J. - *edulis* (1).
Ule, E.H.G. - *ulei* (1).
Werkle, C. - *lanceolata* (1).
White, W. & P. White - *chiriquensis* (1).
Wilcox, T.E. - *flabelliformis* (1).
Wright, C. - *cubensis* (1).
collector undesignated - *crista-galli, verna, mitis, eggersii, corallodendrum var. coralloides, herbacea, macrophylla* (7).

Note: Types probably do not exist and/or were not designated for 14 species: *glauc*a, *crista-galli, verna, speciosa, breviflora, leptorhiza, horrida, mitis, eggersii, corallodendrum var. coralloides, herbacea, cubensis, and velutina.

**Appendix IV**

*Countries of origin of the type specimens*

<table>
<thead>
<tr>
<th>Country</th>
<th>Specimens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cuba</td>
<td>: <em>elenae, cubensis, standleyana, grisebachii</em> (4).</td>
</tr>
<tr>
<td>Jamaica</td>
<td>: <em>corallodendrum var. corallodendrum</em> (1).</td>
</tr>
<tr>
<td>Haiti</td>
<td>: <em>buchii, leptopoda</em> (2).</td>
</tr>
<tr>
<td>St. Thomas</td>
<td>: <em>corallodendrum var. connata</em> (0+1).</td>
</tr>
<tr>
<td>St. Croix</td>
<td>: <em>eggersii</em> (1).</td>
</tr>
<tr>
<td>Montserrat</td>
<td>: <em>corallodendrum var. bicolor</em> (0+1).</td>
</tr>
<tr>
<td>Trinidad</td>
<td>: <em>pallida</em> (1).</td>
</tr>
<tr>
<td>Mexico</td>
<td>: <em>breviflora, breviflora fma. petraea, breviflora fma. oaxacana, leptorhiza, horrida, montana, oliviae, coralloides, lanata, americana, chiapasana, goldmanii, mexicana</em> (12+2).</td>
</tr>
</tbody>
</table>
Appendix V

List of species which are known to occur in various countries

U.S.A.: herbacea, flabelliformis (2). (crista-galli, falcata, americana cult.).

Bermuda: (crista-galli, corallo dendrum var. corallo dendrum, herbacea cult.).

Bahamas: (velutina cult.).

Cuba: glauca, elenae, cubensis, berteroana, standleyana, velutina, grisebachii (7). (crista-galli, poeppigiana, herbacea cult.).

Jamaica: glauca, corallo dendrum var. corallo dendrum, velutina (3). (crista-galli, poeppigiana cult.).

Haiti: buchii, leptopoda, corallo dendrum var. corallo dendrum, berteroana, velutina (5). (poeppigiana cult.).

Dominican Republic: glauca, berteroana (2). (poeppigiana cult.).
Puerto Rico: glauca, eggersii, berteroana (3). (poeppigiana
cult.).
St. Thomas: eggersii, coralloidendrum var. connata,
velutina (2+1).
Vieques: eggersii (1).
St. Croix: coralloidendrum var. connata (0+1).
Montserrat: coralloidendrum var. bicolor (0+1).
Antigua: coralloidendrum var. connata (?), velutina
(1+1).
Guadeloupe: glauca, coralloidendrum var. bicolor (1+1).
(poeppigiana cult.).
Martinique: glauca, pallida (?), coralloidendrum var.
bicolor (2+1). (crista-galli, poeppigiana,
velutina cult.).
Sta Lucia: coralloidendrum var. coralloidendrum (?),
coralloidendrum var. bicolor (1+1).
St. Vincent: glauca, pallida, coralloidendrum var. bicolor
(2+1).
Grenada: coralloidendrum var. bicolor, velutina (1+1).
Trinidad and Tobago: glauca, pallida, velutina (3).
(crista-galli, poeppigiana cult.).
Aruba: velutina (1).
Curacao: velutina (1). (coralloidendrum var. coralloidendrum
cult.).
Mexico: breviflora, breviflora fma. petraea, breviflora
fma. oaxacana, leptorrhiza, horrida, montana,
oliviae, herbacea, coralloides, flabelliformis,
lanata, berteroana, americana, standleyana,
chiapasana, goldmanii, mexicana, folkersii,
macrophylla (17+2).
Central America:
Belize: standleyana, folkersii (2). (glauca cult.).
Guatemala: glauca, berteroana, guatemalensis, standleyana,
chiapasana, mexicana, hondurensis, folkersii,
macrophylla (9). (crista-galli, poeppigiana
and velutina cult.).
El Salvador: glauca, berteroana, macrophylla (3). (poeppigiana cult.).

Honduras: glauca, berteroana, guatemalensis, lanceolata, hondurensis, gibbosa, macrophylla (7). (poeppigiana cult.).

Nicaragua: glauca, berteroana, mexicana, lanceolata, hondurensis, costaricensis (6). (poeppigiana cult.).

Costa Rica: glauca, berteroana, lanceolata, gibbosa, costaricensis, cochleata, chiriquensis, (7). (crista-galli and poeppigiana cult.).

Panama: glauca, poeppigiana, berteroana, gibbosa, costaricensis, chiriquensis (6).

South America:
Venezuela: glauca, poeppigiana, edulis, pallida, mitis, berteroana, rubrinervia, velutina (8).

Guiana: glauca, amazonica (2). (crista-galli cult.).

Surinam: glauca, amazonica (2). (poeppigiana, velutina cult.).

French Guiana: glauca, amazonica (2).

Colombia: glauca, poeppigiana, ulei, edulis, amazonica, berteroana, rubrinervia, cochleata, smithiana (?), velutina, (10).

Peru: glauca, falcata, poeppigiana, ulei, edulis, peruviana, amazonica, rubrinervia, smithiana (?), velutina (10). (crista-galli, speciosa cult.).

Ecuador: glauca, poeppigiana, ulei, polychaetá, schimpffii, edulis, peruviana, rubrinervia, smithiana, velutina (10).

Brazil: glauca, crista-galli, falcata, poeppigiana, ulei, dominguezii, verna, flammea, speciosa, amazonica, similis, velutina, velutina fma. aurantiaca (12+1).

Bolivia: glauca, crista-galli, falcata, poeppigiana, ulei, dominguezii, flammea, similis, rubrinervia (9).
1969 Krukoff, American species of Erythrina

Paraguay: crista-galli, falcata, dominguezii, similis (4).
     (velutina cult.).
Uruguay: crista-galli (1).
Argentina: crista-galli, falcata, dominguezii (3).

On a recent trip I have seen botanical specimens or actual plants of the following species which are in cultivation in California: E. poeppigiana (Walpers) O.P. Cook, E. speciosa Andrews, E. coralloides De Candolle, E. berteroana Urban, E. macrophylla De Candolle.

Appendix VI

Statistical data on species (and varieties and forms) known to occur in various countries

<table>
<thead>
<tr>
<th></th>
<th>Collected</th>
<th>Endemic</th>
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<tbody>
<tr>
<td>U.S.A.</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>West Indies</td>
<td>12 + 2</td>
<td></td>
</tr>
<tr>
<td>Cuba</td>
<td>7</td>
<td>3</td>
</tr>
<tr>
<td>Jamaica</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Haiti</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Lesser Antilles</td>
<td>4 + 2</td>
<td>0 - 1</td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Aruba and Curacao</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Mexico</td>
<td>17 + 2</td>
<td>8 + 2</td>
</tr>
<tr>
<td>Central America</td>
<td>14</td>
<td>-</td>
</tr>
<tr>
<td>Belize</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Guatemala</td>
<td>9</td>
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<td>El Salvador</td>
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<td>Honduras</td>
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<td>Nicaragua</td>
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<td>-</td>
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<tr>
<td>Costa Rica</td>
<td>7</td>
<td>-</td>
</tr>
<tr>
<td>Panama</td>
<td>6</td>
<td>-</td>
</tr>
</tbody>
</table>
### Appendix VII

**List of species of which leaves and/or flowers and/or fruits are still unknown**

<table>
<thead>
<tr>
<th></th>
<th>lvs.</th>
<th>flrs.</th>
<th>ffrts.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>I. Fuscæ</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. <em>glaucæ</em></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>II. Cristae-galli</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. <em>crista-galli</em></td>
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<td>3. <em>falcata</em></td>
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<td>4. <em>poeppigiana</em></td>
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<td>5. <em>ulei</em></td>
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<td>6. <em>dominguezii</em></td>
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<td>7. <em>verna</em></td>
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<td>+</td>
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<td>8. <em>flammea</em></td>
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<td>9. <em>speciosa</em></td>
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<td>10. <em>polychaeta</em></td>
<td>+</td>
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<td>-</td>
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<td>11. <em>schimpffii</em></td>
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Krukoff, American species of Erythrina

12. edulis

VI. Leptorhizae
13. breviflora
13a. " fma. petraea
13b. " oaxacana
14. leptorhiza
15. horrida
16. montana

VII. Corallodendra
17. peruviana
18. pallida
19. mitis
20. buchii
21. leptopoda
21a. elenae
22. eggersii
23. amazonica
24. similis
25. corallodendrum var. corallodendrum
25a. " var. bicolor
25b. " connata

VIII. Cubenses
26. cubensis
26a. oliviae

IX. Herbaceae
27. herbacea
28. coralloides
29. flabelliformis
30. lanata
32. berteriana
32a. guatemalensis
33. americana
34. standleyana
As seen from the above table, leaves and/or flowers and/or fruits of comparatively few species remain uncollected and unknown by comparison with other genera of more or less similar size and with a center of the distribution in the tropics.

Of 51 species (plus 2 varieties and 3 forms) known to date, flowers are not yet known of 1 species (E. elenae) and fruits and/or seeds of 4 species (and 1 variety and 1 form) (E. verna, E. polychaeta, E. breviflora forma oaxacana, E. montana, E. similis, and E. coralloendrum var. connata).

Appendix VIII

Illustrations

(To find the illustrations see a given reference, mostly the Monograph and/or Suppl. 1.)
I. Fuscae
   1. glauca 1:225; 2:684

II. Crista-galli
   2. cristala-galli 1:229; 2:684
   3. falcata ---

III. Verna
   4. poeppigiana 1:236
   5. ulei 2:684
   6. dominguezii ---
   7. verna 1:241
   8. flammea ---

IV. Speciosae
   9. speciosa 1:244; 2:684

V. Edules
   10. polychaeta ---
   11. schimpffii 2:684
   12. edulis 1:249

VI. Leptorhizae
   13. breviflora 1:255
   13a. " forma petraea ---
   13b. " oaxacana ---
   14. leptonhiza 1:257
   15. horrida 1:259; 2:684
   16. montana 1:260

VII. Coralloodendra
   17. peruviana ---
   18. pallida ---
   19. mitis 1:265; 2:684
   20. buchii ---
   21. leptopoda ---
   21a. elenae ---
   22. eggersii 1:269
   23. amazonica ---
   24. similis ---
   25. coralloodendrum var. coralloodendrum 1:273
   25a. " var. bicolor 1:276
As seen from the above table the American species of *Erythrina* are well illustrated when compared with other genera of plants of more or less similar size and with a center of the distribution in the tropics.
Of 51 species (plus 2 varieties and 3 forms) known to date, 26 species (plus 1 variety and 1 form) were illustrated. The most frequently illustrated species are *E. crista-galli*, *E. herbacea*, *E. speciosa*, *E. corallodendrum* and *E. americana*.

Appendix IX

Chromosome numbers in American species of Erythrina

(Numbers (2,3,4, and 5) in parenthesis indicate the number of determinations of chromosome numbers in different individual plants).

I. Fuscae
   1. glauca
      2n = 42 (3)

II. Cristae-galli
   2. crista-galli
      2n = 42 (5); (2n=40;44)
   3. falcata
      2n = 42 (2)

III. Verna
   4. poeppigiana
      ---
   5. ulei
      ---
   6. dominguezii
      2n = 42
   7. verna
      ---
   8. flammea
      ---

IV. Speciosae
   9. speciosa
      2n = 42

V. Edulis
   10. polychaeta
      ---
   11. schimpffii
      ---
   12. edulis
      ---

VI. Leptorrhizae
   13. breviflora
      ---
   13a. " fma. petraea
       ---
   13b. " " oaxacana
       ---
   14. leptorrhiza
      ---
   15. horrida
      ---
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16. montana

VII. Corallodendrea

17. peruviana

18. pallida 2n = 42

19. mitis

20. buchii 2n = 42

21. leptopoda

21a. elenae

22. eggersii 2n = 42

23. amazonica 2n = 84

24. similis

25. corallodendrum var. corallodendrum

25a. " var. bicolor 2n = 42

25b. " var. connata

VIII. Cubenses

26. cubensis

26a. oliviae

IX. Herbaceae

27. herbacea 2n = 42 (4); (2n=42)(2)

28. coralloides

29. flabelliformis 2n = 42 (2)

30. lanata

32. berteroana 2n = 42 (3); 2n=42

32a. guatemalensis 2n = 42

33. americana 2n = 42

34. standleyana 2n = 42

35. chiapasana

36. goldmanii 2n = 42

37. rubrinervia 2n = 42 (2)

38. mexicana 2n = 42

39. lanceolata 2n = 42

40. hondurensis

41. gibbosa

43. costaricensis

44. folksii 2n = 42
45. macrophylla  $2n = 42$
46. cochleata  
47. chiriquensis  
48. smithiana  

X. Variegatae
50. velutina  $2n = 42$ (2)
50a. velutina fma. aurantiaca  
51. grisebachii  $2n = 42$

Notes

Out of 51 species (plus 2 varieties and 3 forms) known to date, as shown by the above table, chromosome counts have been published for 23 (and 1 variety). Out of 10 species-groups the chromosome numbers are known for one or more species from 7 groups. No chromosome counts have been published for any species of the groups Edules, Leptorhizae and Cubenses.

A $2n$ number of 42 chromosomes was found in all sampled American species (21 species and 1 form) except *E. amazonica* which is tetraploid with $2n = 84$. Three other species and one variety in the group Corallodendra, to which *E. amazonica* belongs, have $2n = 42$, and it would be interesting to learn the numbers for 6 other species (and 1 variety) of this group.

The chromosome numbers of 8 species were determined two or more times from different individual plants. These determinations not only substantiate the original counts but also emphasize the absence of polyploid races within the species. The constancy of chromosome numbers in the genus seems to indicate that gene mutation rather than polyploidy is responsible for the diversity of species in *Erythrina*.

Appendix X

Chromosome numbers in Asiatic-Polynesian and Australian species of *Erythrina*
Asiatic – Polynesian species

I. Variegatae

1. E. variegata L. (= E. rostrata Ridley)
   Sundar Rao, Y., Jour. Indian Bot. Soc. 24: n-21; 2n=42
   42-44. 1945 (under the name "E. indica Lam").
   (Krukoff Herb. s.n.) (6:408).
   Nanda, P.C. Jour. Indian Bot. Soc. 41: 2n = 42
   271-277. 1962 (under the name "E. indica Lam").

2. E. merilliana Krukoff

3. E. euodiphylla Hasskark

4. E. boninensis Tuyama

5. E. tahitensis Nadeaud (= E. sandwicensis Degener)

II. Subumbrantes

6. E. subumbrans (Hasskarl) Merrill

III. Fuscae

7. E. fusca Loureiro
   (Krukoff Herb. 9308 from Siam) (6:408).
   Mehra, P.N. & A.C. Hans, Taxon 18(3):
   314. 1969.

IV. Arborescentes

8. E. arborescens Roxburgh
   Mehra, P.N. & A.C. Hans, Taxon 18(3):
   314. 1969.

V. Suberosae

9. E. suberosa Roxburgh
   (Kermode s.n. (Krukoff Herb. 9862 from
   Maymyo, Burma) (6:408).
   Nanda, P.C. Jour. Indian Bot. Soc. 41:
   Mehra, P.N. & A.C. Hans, Taxon 18(3):
   314. 1969.
10. E. microcarpa Koorders & Valeton (=E. stipitata Merrill)

11. E. resupinata Roxburgh

12. E. stricta Roxburgh

13. E. mysorensis Gamble

    (coll. undesign. 253 from India) (6a:544).

    **Australian species**

14. E. vespertilio Bentham

    (Trist s.n. (Krukoff 15004) from Australia (6:408).

15. E. insularis P.M. Bailey

VI. Phlebocarpae

16. E. phlebocarpa P.M. Bailey

**Notes**

Of 16 species known to date the chromosome numbers were published for 6 species belonging to 4 species-groups. No counts have been published for any species of groups Subumbrantes and Phlebocarpae.

A 2n number of 42 chromosomes was found in all sampled Asiatic-Polynesian and Australian species (6 species).

It would be important to determine the chromosome numbers for some species of groups Subumbrantes and Phlebocarpae for which no counts are available.

**Appendix XI**

**Chromosome numbers in African species of Erythrina**

**Tropical African species**

1. E. abyssinica Lamarck ex De Candolle

    (Gardner s.n. (Krukoff Herb. 9359) from Kenya 2n=42 (6:408).

2. E. burtii Baker fil.

    (coll. undesign. 250 from Tanganyika) (6a:544). 2n=cal26
3. *E. mildbraedii* Harms (=*E. altissima* Chev.)

4. *E. senegalensis* De Candolle
   *(Belime s.n. (Krukoff Herb. 9350) from French West Africa)* (6:408)
   Miege, J., Rev. Cytol. & Biol. Veg. 24: 149-164. 1962 *(Macina s.n. from Mali and Pont s.n. from Senegal)*.

5. *E. vogelii* Hooker (=*E. bancoensis* Aubr. & Pell.)

South African species

6. *E. acanthocarpa* E. Meyer
   *(Everitt s.n. (Krukoff Herb. 15156) from South Africa)* (6:408)

7. *E. caffra* Thunberg
   *(Martley s.n. (Krukoff Herb. 9348) from South Africa)* (6:408).

8. *E. humeana* Sprengel *(BEF. 10795-44)*
   *(coll. undesigned; from Kruger National Park)*.

9. *E. lysistemnon* Hutchinson

Notes

Of approximately 32 known African species, the chromosome numbers have been published for 9 species. Atchison (6) in 1947 published counts for 5 species. From 1947 to 1966 the chromosome numbers of 4 additional species were published.

A 2n number of 42 chromosomes was found in all sampled African species (7 species) except *E. acanthocarpa* which is tetraploid with 2n = 84 and *E. burtii* which is hexaploid with 2n = ca 126. Additional determinations in African species would be of considerable interest.
## Appendix XII

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<td>80</td>
<td>293</td>
</tr>
<tr>
<td>32a</td>
<td>guatemalensis</td>
<td>--</td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>33</td>
<td>americana (7 with doubts)</td>
<td>45</td>
<td>11</td>
<td>6</td>
<td>62</td>
<td>20</td>
<td>82</td>
</tr>
<tr>
<td>34</td>
<td>standleyana</td>
<td>26</td>
<td>10</td>
<td>1</td>
<td>37</td>
<td>3</td>
<td>40</td>
</tr>
</tbody>
</table>
From this appendix we arrive at the following statistics. At the time when the monograph was published in 1939 the average number of collections per entity amounted to 24.9 collections. It increased to 33 collections in 1943 at the time when Supplement II was published and to 54.3 collections in 1968.

Five species, namely *E. berteroana*, *E. glauca*, *E. poeppigiana*, *E. herbacea* and *E. cristagalli* are much more frequently collected than all others. Excluding these
five from our calculations, we arrive at the following statistics. The average number of collections per entity in 1939 amounted to 14.4 collections, in 1943 - to 19.3 collections and in 1968 - to 32.7 collections.

Due to the showy flowers and the fact that many species of *Erythrina* are grown in hedges for living fence-posts or for ornamental purposes, American *Erythrina* are better collected than many other groups of plants from the tropics. We may also conclude that satisfactory progress in the collections of *Erythrina* was made since 1939. Among collections made since 1943, particularly notable are the extensive ones from Central America by Standley, Steyermark, Molina, and others connected with the Field Museum of Natural History, Chicago, and those from western middle Mexico by McVaugh and others connected with the University of Michigan.

### Appendix XIII
**Changes in the Identifications**

<table>
<thead>
<tr>
<th>Cited originally as</th>
<th>Cited later as</th>
</tr>
</thead>
</table>
| Cook & Griggs 407 (?)
    macrophylla (1:320)       | guatemalensis (4:689)   |
| Krukoff 7a                  | costaricensis (5:637)    |
| Standley 65712              | berteroana (4:688)      |

It should be noted also that inasmuch as *E. occidentalis* was reduced to synonymy under *E. lanata*, and *E. panamensis* and *E. colombiana* were reduced to synonymy under *E. costaricensis*, all specimens originally cited under the above referred to three names, were renamed.
Citations of places of deposit of specimens

The place of deposit of specimens is shown in this and my other papers on *Erythrina* by the following abbreviations:

- **A:** Arnold Arboretum, Harvard University, Cambridge.***+
- **B:** Botanisches Museum, Berlin-Dahlem. *
- **BHMG:** Instituto Agronomico, Belo Horizonte. **+**
- **BL:** Bailey Hortorium, Cornell University, Ithaca.*
- **BM:** British Museum (Natural History), London. ***+
- **BRX:** Jardin Botanique de l'Etat, Brussels. ***+
- **C:** University of California, Berkeley. *
- **CAMP:** Herbario do Instituto Agronomico do Estado de Sao Paulo, Campinas, Brazil. *
- **CAS:** California Academy of Sciences, San Francisco.*
- **COL:** Herbario Nacional Colombiano, Bogota. ***+
- **CR:** Museo Nacional de Costa Rica, San Jose. ***+
- **CUZ:** Universidad del Cuzco, Cuzco. *
- **D:** Dudley Herbarium, Stanford University, Stanford.*
- **EAP:** Escuela Agricola Panamericana, Honduras. **+
- **EM:** Escola Nacional Minas e Metal., Ouro Preto. **+
- **ENC:** Instituto Politecnico Nacional, Mexico. **+
- **ES:** Estacion Experimental Agronomica, Habana. *
- **F:** Field Museum of Natural History, Chicago. ***+
- **FI:** Herbarium Universitatis Florentinae, Firenze. **+
- **G:** Conservatoire et Jardin Botanique, Geneve. ***+
- **GEO:** Georgetown Botanic Garden, Guiana. *
- **GH:** Gray Herbarium, Harvard University, Cambridge. ***+
- **HAR:** Botanical Museum of Harvard University, Cambridge. ***+
- **HB:** Herbarium Bradeanum, Rio de Janeiro **+
- **IAN:** Instituto Agronomico do Norte, Para. **+
- **INPA:** Instituto Nacional de Pesquisas Amazonicas, Manaus. ***
- **K:** Royal Botanic Gardens, Kew. ***+
The abbreviation "Kr. Herb." stands for "Krukoff Herbarium". Specimens so designated are deposited at New York Botanical Garden.

No place of deposit is indicated when a particular collection is known only from New York Botanical Garden.

Photographs are cited only when the specimens were not seen.

Krukoff's collections are distributed to various herbaria. Their place of deposit is not indicated, as all are represented at New York Botanical Garden.

If the available material was inadequate for positive identification, the collection is preceded by an interrogation mark.

* Specimens examined only in connection with the preparation of the monograph and the first two supplements in 1939 to 1943 (incl.) (15 herbaria).

** Specimens examined only in connection with the preparation of Supplement III in 1964 to 1968 (incl.) (25 herbaria).

*** Specimens examined in 1939/1943 and again in 1964/1968 (19 herbaria)

+ Herbaria visited in 1964/1968 (41 herbaria).

Bibliography

List of papers published as a by-product of a project on paralyzing principles at Merck Sharp & Dohme Research Laboratories


33. Krukoff, American species of Erythrina 175

Literature cited