

SUPPLEMENTARY NOTES ON THE AMERICAN SPECIES OF ERYTHRINA. V.

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INTRODUCTION

Since the last of this series of papers was submitted for publication 562 new collections have been examined. These were from several sources:

1. specimens examined in 1969, 1970, and 1971 during visits to eight herbaria in Colombia and Brazil, eight herbaria in Europe, two herbaria in the West Indies, and five in United States,

2. specimens collected on numerous trips in Guatemala during 1969, 1970 and 1971,

and 3. specimens collected on three trips to Mexico in 1970.

The newly examined collections have extended our knowledge of some species previously known from incomplete material; extensions of ranges are noted for twenty three species, two species (E. glauca Willdenow and E. flammea Herzog) are reduced to synonymy and two species (E. barqueroana Krukoff & Barneby and E. williamsii Krukoff & Barneby) are described as new.

FIELD STUDIES IN GUATEMALA IN 1969, 1970 and 1971

Field studies of Central American species initiated in the dry season of 1968/9 and covered in Supplement IV (7) were continued in 1969, 1970 and 1971. These had special objectives and were confined to four departments in Guatemala.

DEPT. SAN MARCOS

E. florenciae and E. tajumulcensis were described from this department in 1970 (7). Mature pods and seeds of E. florenciae and the habitat of both species however were not known and we did not have sufficient seeds for chemical studies and cultural experiments. The type localities of these two species were revisited in January and April 1970, and again in January and before 1971. All objectives were accomplished except that we still need additional seeds of E. florenciae and we still were not able to find E. tajumulcensis anywhere in Guatemala except for the type locality. These two species are usually in flower in January and in fruit toward the end of March.

DEPT. ALTO VERAPAZ

E. williamsii was collected in the season of 1968/69. I delayed describing it until this paper however as I wanted to collect additional material and to study it further in the field. E. folkersii was previously known from Coban from unsatisfactory material -- inflorescences with flowers (without leaves and fruits) and complete material of this species was obtained. The objective with E. cobanensis was to obtain a collection with

leaves, flowers and mature fruits from a single tree, and this objective was also achieved. Previous collections were of inflorescences with flowers (without any leaves) or of leaves with mature fruits or of immature leaves with inflorescences in flower. However we still lack a sufficient amount of seeds of E. cobanensis and E. williamsii for chemical studies and cultural experiments.

We are now able to give a preliminary account of the distribution of Erythrina spp. in the Dept. of Alto Verapaz.

Of six species known to occur in Alta Verapaz, three occur on "coffee elevations". E. cobanensis is the most common species in and around Coban and along the road from San Pedro Carcha to Chapultapac. E. williamsii occurs in the same general region but is much more rare, whereas E. guatemalensis is especially common along the streams from Tactic to Tucuru. From Tucuru toward Panzós (on "tierra caliente") it is replaced by E. berte-roana, whereas from Panzós toward El Estor (Department Iza-bal) on fertile silt soils where "Cohune" palm (Orbignya cohune (Martius) Dahlgren ex Standley) abounds E. folkersii makes its appearance. The latter species was found also on "tierra caliente" near Lanquin. The distribution of E. mexicana in Alta Verapaz is poorly known.

DEPT. HUEHUETENANGO

E. barqueroana is described in this paper and with this the finding of novelties on limestone soils in the municipality of Barillas seems to have come to an end. Five species (E. berte-roana, E. castillejiflora, E. barqueroana, E. huehuetenangensis and E. guatemalensis) are found in this region. The first three species are found on "tierra caliente" and of these E. barqueroana is the most common. The last two are found on high elevations (1200-1800 m). The pods and seeds of E. castillejiflora are still not known.

DEPT. PETEN

The field work in this department was conducted as a part of my first trip to Mexico in 1970. For the results see under Field Studies in Mexico in 1970.

FIELD STUDIES IN MEXICO IN 1970

During the dry season of 1970, in February and March, I made three trips to Mexico for the purpose of studying Erythrina in the field.

The objective of the first trip was to investigate the Erythrina flora of Yucatán Peninsula and Petén, an area of tropical lowland with limestone bedrock. Only four collections of the

genus were known previously from this area, two from Yucatan, one from Campeche, and one from Petén, all representing E. standleyana. The itinerary (Feb. 17--24; 2764 road kilometers), disregarding side-excursions, was as follows: Huehuetenango (Guatemala), Ocotul (border of Guatemala and Mexico), Cristobal de las Casas (Chiapas), Villahermosa (Tabasco), Tenosique (Tabasco), Escarcega (Campeche), Chetumal (Quintano Roo), Belize (Belize), Flores (Peten, Guatemala), Puerto Mendes (Peten), Rio Dulce crossing and Guatemala City.

It was learned that three species of Erythrina occur in the region: in addition to E. standleyana already known, E. folkersii and E. berteroana. Of the three, E. folkersii is most common throughout the area on better soils and along water courses. Outside of northwestern Peten, a relatively inaccessible region as yet unstudied, it seems unlikely that any other Erythrina occurs in the area.

On this trip I saw for the first time living plants of E. standleyana, a small Erythrina with beautiful flowers, the pale pink standards contrasting with almost black calyces. The sympatric E. berteroana is known to hybridize freely where in contact with other members of the genus and it was not surprising to find that it is represented in the range of E. standleyana by a form with flowers of a delicate pink color. Hitherto there has been no record of Erythrina from Tabasco, but I found there the same three species as in Yucatán, with E. folkersii again the commonest. In Belize and in Guatemala E. folkersii is extremely uniform in its characters, but is represented in Tabasco by numerous races. I refer to these as "races", as they deviate from the norm in only one or two characters, for example in shape of leaflets and in pubescence or form of the calyx, but in no other particular.

The state of Chiapas yielded five species: E. chiapasana, E. goldmanii, E. berteroana, E. folkersii, and E. mexicana. In Chiapas E. chiapasana is confined to chaparral formations, often on steep slopes with unstable gravelly soil.

Altogether on this trip I obtained 28 herbarium sets representing six species, as well as substantial collections of seeds of E. standleyana and E. chiapasana for propagation and chemical assay.

The primary objectives of my second trip (March 3--11, + 2900 road kilometers) were three: 1) to collect for the second time E. oliviae in Oaxaca Desert; 2) to seed Mexican stations in western Chiapas for E. tajumulcensis and E. florenciae, described recently from adjacent Guatemala; and 3) to study the species native to Veracruz. As I returned to Veracruz on my third trip, the results of that segment of the second will be mentioned further below. My second itinerary, disregarding side-excursions, was as follows: Tapachula (border of Guatemala with Mexico),

Arriaga (Chiapas), Las Cruces (Chiapas), Tuxtla Gutierrez (Chiapas), Matias Romero (near the border of Chiapas and Oaxaca, on the Atlantic slope), Veracruz (Veracruz), Jalapa (Veracruz), Puebla (Puebla), Oaxaca (Oaxaca), Arriaga (Chiapas) and Tapachula.

My first objective was realized by the discovery of the tree from which E. oliviae was described. Two local Mexican women well remembered Olivia Converse, the discoverer of this unique species. In western Chiapas, near the Guatemala boundary, I found (as expected) E. tajumulcensis on rich volcanic soils at the moderately high elevations suitable for cultivation of coffee. In Chiapas also, at moderately high elevations of the Pacific slope, from the border north to Arriaga and again in the central highlands north of Tuxtla Gutierrez, E. goldmanii was very common. Even in the context of its genus, this is an exceptionally spiny tree. I had the good fortune to happen on two individuals of E. lanata, small shrubs growing on a poor dry site in chaparral. The flowers are lanate and pink, the lower at full anthesis tending to reflex against the rachis of the raceme as in E. folkersii, in the African A. lysistemon Hutchison, and in one form of E. coralloides mentioned below.

My collection amounted to 56 numbers representing 10 species: E. oliviae, E. coralloides, E. lanata, E. berteriana, E. americana, E. standleyana, E. goldmanii, E. mexicana, E. folkersii and E. tajumulcensis. In addition I obtained substantial quantities of seed of six species for chemical studies and propagation.

The objectives of my third trip (March 17--22; 2808 road kilometers) were the Erythras of the Gulf slope from Veracruz northward (already sampled in my second trip), those of the Transverse Volcanic belt west to the Pacific, and the western Sierra Madre del Sur. I was particularly anxious to determine the northern distribution limit of E. standleyana and E. folkersii on the Gulf coastal plain, where they are the major representatives of the genus. Hitherto E. standleyana was known from Yucatán, Campeche, Petén, and Cuba, but I followed this species north in Mexico almost to Ciudad Victoria (Tamaulipas), at which point it is replaced by E. herbacea. It was learned that E. folkersii extends north in Veracruz almost to Tampico.

My itinerary, disregarding side excursions, was as follows: Mexico City, Necaxa (Puebla), María Andra (Puebla), Poza Rica (Puebla), Tuxpan (Veracruz), Tampico (Veracruz), Ciudad Mante (Tamaulipas), thence across San Luis Potosí to Guadalajara (Jalisco), Barra de Navidad (Jalisco), Tepic, Jalisco, Jiquilpan (Michoacán), Quiroga (Michoacán) and Mexico City.

E. coralloides emerged as the major Erythrina of south-central Mexico, extending from Ciudad Mexico and Puebla west to Guadalajara, and seen also between Guadalajara and Barra de

Navidad on the Pacific coast. A race of this species with fine pink flowers was collected at + 2700 m between Jiquilpán and Quiroga in Michoacán and is now being tested horticulturally in Los Angeles and elsewhere. As in E. folkersii and E. lanata, the lower flowers of the raceme tend to reflex at full anthesis against the rachis.

On this trip I secured 18 numbers representing the five species: E. coralloides, E. americana, E. standleyana, E. folkersii and E. mexicana, as well as seed samples for propagation and chemical study.

During the season I collected altogether all but four of the fourteen species of sect. Xyphanthus and sect. Cubenses known to occur in Mexico. The range of E. herbacea and E. flabelliformis lie beyond the northern limit of my travels; and E. florenciae and E. huehuetenangensis inhabit cloud forest at great elevations in Veracruz (Jalapa), Oaxaca, and Chiapas, at levels that I did not reach. The four members of sect. Leptorhizae native to Mexico flower and fruit from July to September in the pine-oak belt at elevations of (1200) 1600-2700 m, and can only be collected much later in the year.

No discussion of E. coralloides or E. americana is attempted in this paper. These species, still under study, require further observation in the field.

SUBGENUS ERYTHRINA

SECTION DUCHASSAINGIA (WALPERS) KRUKOFF

1. Erythrina fusca Loureiro, Fl. Cochinch. 427. 1790.

Erythrina glauca Willdenow, Ges. Nat. Freunde, Berlin, Neue Schr. 3:428. 1801.

Jamaica: Proctor 16451 (IJ), 26834 (IJ), Howard et al. 14810 (IJ). Puerto Rico: Wagner 463 (IJ). Trinidad: Howard 10391 (IJ). Belize: Dwyer et al. 558 (Punta Gorda) (MO), 589 (Toledo) (MO). Guatemala: Escuintla: Krukoff 1970-136. Nicaragua: Bunting & Licht 369; Matagalpa: L. O. Williams et al. 24801 (G). Costa Rica: Guanacaste: Daubenmire 798 (F); Heredia: Jorge León 424 (US). Panama: Canal Zone: Blum 2212 (MO); Panama: Dwyer 3105 (MO). Venezuela: Mérida: L. Ruiz Terán 493 (G); Monagas: Pursell et al. 8304 (US), 8704 (US). Colombia: Cuatrecasas 27260 (US), 27515 (US); Amazonas: Schultes et al. 24045 (US). Ecuador: Guayas: Dodson & Thien 1258 (MO). Brazil: Rondônia: basin of Rio Madeira, France et al. 5900; Bahia: Ilheus, Belem et al. 1373, 1375, 1377. Bolivia: Pando: Rio Madeira, 6 km above Abuña, France et al. 5846.

About 25 collections were examined on my trip to Europe in 1969, mostly in Muséum d'Histoire Naturelle, Paris. They are not cited here as the distribution of this species in the New

World is well known. The specimens were from Puerto Rico, Nicaragua, Panama, Venezuela, Colombia, Ecuador, French Guiana and Brazil.

Among the specimens cited above are the first records of the species from Belize, from Esteli, Nicaragua and Pando, Bolivia. Previous collection from Belize were from cultivated plants.

I did not place E. glauca in synonymy in my monograph of the American species (1:224) as before doing this I wanted to see E. fusca, as it appears in the Old World, in the field. There are no differences between E. fusca as it occurs in Asia, Polynesia, Africa and the New World, in fact even its habitat is everywhere the same. The pods of this species are carried by the ocean currents.

SECTION CRISTAE-GALLI (KRUKOFF) KRUKOFF

2. Erythrina crista-galli L. Mant. 99. 1767.

Colombia: Antioquia: cult., Soejarto & Latz 2515 (COL). Brazil: São Paulo: cult., Sendulsky s.n. (11/9-1969); Santa Catarina: munic. Irani, L.B. Smith and R.M. Klein 14001. Paraguay: Woolston 891, Krapovickas & Cristobal 13238 (MO). Argentina: Corrientes: Ibarrola 1272. Chile: Santiago: Quinta Normal (cult.) M. Muñoz S. 275. Japan: Nagashima Bot. Garden (cult.), Hiroyaki Murata 1, 2.

About 40 collections were examined on my trip to Europe in 1969, mostly in Muséum d'Histoire Naturelle, Paris. They are not cited here as the distribution of this species is well known. The specimens were from Brazil, Bolivia, Paraguay, Argentina and Uruguay.

A photograph of a single flower and of a drawing of a flowering branch labelled "Erythrina crista-galli" and deposited in the Linnaean Herbarium, London, (Catalogue No. 888.4, p. 123 - Savage, S., A Catalogue of the Linnaean Herbarium. 1945) was examined and it is clear that this name is correctly interpreted.

This is the first record of the species from Chile and Japan where this species is cultivated.

In my previous papers I discuss E. x bidwillii (E. herbacea x E. crista-galli). One additional specimen of this hybrid was examined: Japan: Nagashima Bot. Garden (cult.), Hiroyaki Murata 3.

Chromosome number of this hybrid: $2n=42$, voucher Lewis 7614 (GH, MO, NY) cultivated at Missouri Bot. Gard: from unrooted cutting sent by Dr. Austin Griffiths, Jr., Dept. of Arbor. & Bot. Gard., County of Los Angeles (45:474).

3. *Erythrina falcata* Benthām in Mart. Fl. Bras. 15(1):172. 1859.

Peru: M. Cl. Gay 1995 (1839-1840) (P); La Libertad: A. Lopez 1096 (US). Brazil: Minas Gerais: St. Hilaire s.n. (P), M. Clausen 936 (P); Federal District: Brasília (cult.), Heringer 11715; Rio de Janeiro: A.P. Duarte 6303 (RB), M. Guillemin 929 (1839) (P), Glaziou 2906 (P), 19874 (P), Pabst et al. 7384; São Paulo: São Paulo, parque de Estado, C.P. Zoechio s.n. (SP), Sendulsky s.n.; Parana: Pabst 6709; Santa Catarina: Lourteig 2119 (P). Argentina: Venturi 3889 (MO); Salta: Humbert 21124 (P). Bolivia: D'Orbigny 497 (P). Chile: Santiago: Quinta Normal (cult.), M. Muñoz S. 274.

This is the first record of the species from Department La Libertad (Peru), and Chile where it is cultivated.

SECTION MICROPTERYX (WALPERS) KRUKOFF

4. *Erythrina poeppigiana* (Walpers) O.F. Cook, Bull. U.S. Dept. Agr. Bot. 25:57. 1901.

Montserrat: Proctor 18889 (MICH). Jamaica: Proctor 24685 (IJ). Haiti: Ekman H-3248 (IJ). Trinidad: Howard 10442 (IJ). Panama: Darien: Isla Saboga, Duke 10366 (MO). Guatemala: Suchitepequez, cult., Krukoff 1971-10. Venezuela: Monagas, Pursell et al. 8424 (US), Merida: L. Ruiz Teran 494 (G), 495 (G). Ecuador: San Jose de Tagua, Rio Santiago, Jativa & Epling 1161 (US). Colombia: Cundinamarca: Pacho, Garcia-Barriga & Jaramillo-Mejia 20113. Peru: Pavon 36 (1868) (P), Martinet 22 (1878) (P), San Martin: Ch. Belshawe 3254 (F). Bolivia: D'Orbigny 781 (P).

This is the first record of the species from Montserrat where apparently it was introduced and from Suchitepequez, Guatemala.

5. *Erythrina ulei* Harms, Verh. Bot. Ver. Brand. 48:172. 1907.

Ecuador: Napo-Pastaza: Erik Asplund 9258 (R). Brazil: Pará: basin of Rio Tocantins, Murça Pires 12851 (IAN), Rondonia: basin of Rio Madeira, France et al. 6188, 6285.

This is the first record of the species from Territory of Rondonia.

6. *Erythrina dominguezii* Hassler, Physis 6:123. 1922.

Brazil: Goias: Sidney 193 (UB) (Olaria), E.P. Heringer 10509 (perto do Rio Samambaia, cerrado), 11712 (Samambaia); Distr. Federal: Brasília, D. Coelho s.n. (INPA 16692) (INPA). Bolivia: Weddell 3464b ("prov. de Chiquitos") (P). Argentina: Salta: Schreiter 11438.

7. Erythrina verna Velloso, Fl. Flum. 304. 1825.

Erythrina flammea Herzog, Repert. Nov. Sp. 7:57. 1909.

Brazil: Distr. Federal: cult., E.P. Heringer 10519; Minas Gerais: Vasco Gomes s.n. (10/6-1969) (UB); Rio de Janeiro: road from Rio de Janeiro to Sao Paulo, Luis Emygdio 2034 (R); Sao Paulo: cult. Sendulsky s.n. (11/9-1969).

At the time when I was working on the monograph (1) the type of E. flammea was not available to me and I placed four Steinbach's collections from Bolivia, and one very poor Kuntze' specimen from Mato Grosso under E. flammea by the protologue. E. verna was also known from insufficient material and its pods and seeds were unknown. Since that time I examined abundant material from Brazil and the holotype of E. flammea and I concluded that E. flammea cannot be maintained as a distinct species. As reinterpreted E. verna is now known from central and southern Brazil (Maranhão, Bahia, Minas Gerais, Rio de Janeiro, Guanabara, São Paulo, Mato Grosso and Acre) and eastern Bolivia (Santa Cruz).

SECTION STENOTROPIS (HASSKARL) KRUKOFF

8. Erythrina speciosa Andrews, Bot. Repos. 7: pl. 443. 1806.

Brazil: A. St. Hilaire s.n. (1816-21) (P); Bahia: Froes 12664, Blanchet 3089 (P); Distr. Fed., cult., E.P. Heringer 10524, 11692 (UB); Espírito Santo: Belem 1572; Rio de Janeiro: Gaudichaud 903 (1831/33) (P); Z.A. Trinta 852 (R); Guanabara: cult., Krukoff 1971-12, 1971-13; São Paulo: Tatiana Sendulsky s.n. (12/8-1969) (flrs red), s.n. (12/8-1969) (flrs yellowish); Parana: Rio Cambara, plan. litoraneo, Hatschbach 16798 (F, US).

SECTION EDULES (KRUKOFF) KRUKOFF

10. Erythrina schimpffii Diels, Bibl. Bot. 116:96. 1937.

Ecuador: Canar: Paramo Tambo, Amy Jean Gilmartin 161 (MO).

This is the first record of the species from the province of Canar.

11. Erythrina edulis Triana, M. Micheli, Jour. de Bot. 6:145. 1892.

Chromosome number: $2n=42$, voucher: Garcia-Barriga & Jaramillo-Mejia 20112 (NY) from Colombia: Cundinamarca (46:382).

Panama: Canal Zone: cult. Blum & Dwyer 2530A. Colombia: Justin Goudot s.n. (1844) (P), J. Linden 1220 (Velez, Jan. 1843) (P); Tolima: Mariquita, Triana s.n. (1851-1857) (P); Cundinamarca: Garcia-Barriga 17517, 20112; Huila: L. Marulanda Caicedo 39 (COL). Ecuador: Benoist 2648 (P), Gilmartin 16 (MO) (Cota-

paxi); Loja: Dodson & Thien 651 (MO), 1396 (MO), Mathias & Taylor 5276 (LA), 5285 (LA); Quito: Remy s.n. (Oct. 1856) (P).
Peru: M. Cl. Gay 1699 (P).

SECTION LEPTORHIZAE (KRUKOFF) KRUKOFF

12. *Erythrina breviflora* A. DeCandolle, Prodr. 2:413. 1825.

Mexico: Ghiesbreght 331 (P); Jalisco: W.R. Anderson & C.W. Laskowski 3825; Michoacan: Martinez 164 (US), F. Ventura A. 2462 (Uruapan, alt. + 1325 m); Mexico: Rzedowski 20772 (alt. + 1800 m) (MEXI); Morelos: J.M. Diaz Moreno 160 (alt. 2250 m), Ghiesbreght 160 (P), Martinez 137 (US) (near Cuernavaca), Lyonnet 2407 (US); Guerrero: Tillett 637-147 (RSA), Mario Souza 3140 (alt. 1710 m); Oaxaca: Ghiesbreght s.n. (1842) (P).

This is the first record of the species from Guerrero. Diaz Moreno's specimen is a voucher for sample of seeds for chemical studies.

13. *Erythrina leptorhiza* A. DeCandolle, Prodr. 2:413. 1825.

Mexico: G.L. Webster et al. 11364 (1½ km east of Chalco + 2100 m); Mexico: Rzedowski 23969 (MICH) (Cerro del Pino, + 2350 m), Hitchcock 7011 (POM) (+ 49 km east of Mexico City on way to Puebla), Javier Peñalosa 715 (CAS); Morelos: J.M. Diaz s.n.; Puebla: Frere Arsene 2372 (P).

15. *Erythrina montana* Rose & Standley, Contr. U.S. Nat. Herb. 20: 179. 1919.

Mexico: Durango: Hendricks 467 (MO); Nayarit: Sierra del Nayarit, M.L. Diguët s.n. (P).

Diguët's specimen has unusually long wings.

SECTION ERYTHRINA

16. *Erythrina peruviana* Krukoff, Brittonia 3:262. 1939.

Ecuador: Napo-Pastaza: alt. + 880 m, Erik Asplund 19524.

This is the first record of the species from Napo-Pastaza.

17. *Erythrina pallida* Britton & Rose, Bull. Torrey Club 48:332. 1922.

Venezuela: Merida: Breteler 4586 (EAP).

This is the first record of the species from Merida.

18. Erythrina mitis Jacquin, Hort. Schoenb. 2:47. 1797.

Venezuela: Merida: J. de Bruijn 1282.

This is the first record of the species from Merida.

19. Erythrina buchii Urban, Repert. Sp. Nov. 17:157. 1921.

Dominican Republic: Las Abejas, Baoruco Mts., alt. 1080-1260 m, Alain H. Liogier 14170.

This is the first record of the species from Dominican Republic.

23. Erythrina amazonica Krukoff, Brittonia 3:270. 1939.

Brazil: Para: Jobert 381 (P) (Marajo), N.T. Silva 170 (UC) ("beira do Rio Tuxa, arbol media, flor rosea").

25. Erythrina corallodendrum L. var. corallodendrum.

Jamaica: Adams 8550 (UCWI), 10973 (UCWI), 12287 (UCWI) and Proctor 11718 (IJ) (all from parish Westmoreland); Dulcie Powell 979 (IJ) and Proctor 16473 (IJ) (parish St. Ann); Proctor 16184 (IJ) (parish Manchester); Proctor 27779 (IJ) (parish Clarendon); Hunter 928 (UCWI) (parish St. Catherine).

Amy M. Barry s.n. (IJ) and Proctor 16151 (IJ) cultivated in Kingston, Jamaica represent a horticultural form of the species.

- 25a. Erythrina corallodendrum var. bicolor Krukoff, Brittonia 3:275. 1939.

St. Vincent: parish St. George, Proctor 25876 (IJ).

SECTION CUBENSES (KRUKOFF) KRUKOFF

26. Erythrina cubensis C. Wright, Sauv. Anal. Acad. Ci. Habana 5:336. 1869.

Cuba: Herb. Richard 615 (P).

27. Erythrina oliviae Krukoff, Phytologia 19(3):128. 1969.

Chromosome number: $2n=42$, voucher: Krukoff 1970-108 (46:383).

Mexico: Puebla: km. 230/231 of the Mexico-Oaxaca highway, bank of a dry stream: Krukoff 1970-108.

This collection is from the tree from which the type collection was made. The type locality as given in the protologue is based on the collector's notes and is not accurate.

SECTION XYPHANTHUS (RAFINESQUE) KRUKOFF

28. Erythrina herbacea L. Sp. Pl. 706. 1753.

U.S.: about 27 collections were examined in Museum d'Histoire Naturelle, Paris. They are not cited here as the distribution of this species in the U.S. is well known.

Mexico: Veracruz: Gouin s.n. (1867) (P).

A photograph of the specimen deposited in the Linnaean Herbarium, London and labelled "Erythrina herbacea" was examined (Catalogue #888.1, p. 123 - Savage, S., A. Catalogue of the Linnaean Herbarium. 1945) and it is clear that this specimen is correctly named. This specimen is not the holotype of the species as it was not in the herbarium in 1753 or in 1755, and it was first recorded in 1767. The valid publication of the species was made in 1753. (B.D. Jackson, in the Index to the Linnaean Herbarium; Proc. Linn. Soc. 124. Suppl. 73. 1912).

As a result of extensive field studies in Mexico many collections, formerly cited under E. herbacea have been renamed. For details see under E. standleyana.

29. Erythrina coralloides A. DeCandolle, Prodr. 2:413. 1825.

Chromosome number: $2n=42$, voucher: Krukoff 1970-132 (NY) from Mexico: Michoacan: between Jiquilpan and Quiroga (46:382).

30. Erythrina flabelliformis Kearney, Trans. N.Y. Acad. 14:32. 1894.

Mexico: Sonora: Arguelles 204 (US), Henrickson 1576 (MICH); Chihuahua: Mexia 2632 (BM).

31. Erythrina lanata Rose, U.S. Dept. Agr. N. Am. Fauna 14:81. 1899.

Chromosome number: $2n=42$, voucher: McVaugh 15782 (MICH) from Mexico: Sinaloa (46:383).

Mexico: Guerrero: Mexia 2632 (CAS); Chiapas: between Ocozocoatlá and Cintalapa, on a dry mountain slope in chaparral, Krukoff 1970-79, 1970-80.

32. Erythrina berteriana Urban, Symb. Ant. 5:370. 1908.

Cuba: E.H. Day 381; Isla de Pinos: Killip 44813 (US). Mexico: Veracruz, Krukoff 1970-88 and 1970-89 (Acayucan to Minutitlan), 1970-92 (near Soleapan), Andrle 3 (US) (Sierra de Tuxtla), J.V. Santos 2777 (US) (El Palmar); Tabasco: Krukoff

1970-47 and 1970-48 (between Villahermosa and Chable), 1970-50 (Tenosique); Chiapas: Krukoff 1970-40 and 1970-41 (near Tapilula), 1970-63 (near Unión Juárez), 1970-115 (between Tapachula and Huistla), 1970-65; Campeche: between Escarcega and Chetumal, Krukoff 1970-53. Guatemala: Peten: near Poptun, Krukoff 1970-58; Huehuetenango: Barillas: finca San Isidro: Krukoff 1969-281, 1969-282; Alta Verapaz: between La Tinta and Panzos, Krukoff 1970-19, 1970-22; El Progreso: Sanarate, alt. + 800 m, Krukoff 1970-1. Nicaragua: Matagalpa: Maguire 61409; Chontales: Bunting & Licht 710, 1015 (US), 1102 (US), Standley 9373 (F); Grenada: Levy 372 (1885) (P). Costa Rica: Guanacaste: Daubenmire 76 (F); Cartago: McKee 11114 (P). Panama: Duchassaing s.n. (1851) (P); Chiriqui: Dwyer & Hayden 7758A (MO); Veraguas: Dwyer & Kirkbride Jr. 7402 (MO); Los Santos: Corina Wendelhake 28 (MO); Canal Zone: Correa & Stimson 31 (MO), Lewis et al. 31 (MO), Blum 2056 (MO), 2238 (MO), Ebinger 854 (MO), Dwyer 7212 (MO), Dwyer & Hayden 7541 (MO); Panama: Mireya C. Correa A. 513 (MO), Dwyer 2103 (MO), 3097 (MO), 5017 (MO), Lewis et al. 776 (MO), Duke 5694 (MO). Colombia: Bolivar: Arno Beuther 81 (COL).

This is the first record of the species from Chontales in Nicaragua and Tabasco and Campeche in Mexico.

33. Erythrina castillejiflora Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(2):165. 1970.

Guatemala: Huehuetenango: munic. Barillas, Finca San Isidro, Krukoff 1969-248, 1969-250, 1969-276, 1969-277, 1969-278, 1969-279, 1969-280.

This species is still known from a single locality and we still were unable to collect pods or seeds. Insects and birds often damage the flowers before fruits are set.

35. Erythrina standleyana Krukoff, Brittonia 3:301. 1939.

Chromosome number: $2n=42$, voucher: Krukoff 1970-54 (NY) from Mexico: Campeche: between Escarcega and Chetumal (46:382).

Mexico: J.A. Duke M3671 (MO) (vicinity of falls of El Salto), Virlet 1100 (P), Krukoff Herb. 9519, 9520, Herb. Prince Paul s.n. (M), C. Troll 229 (M) (Tecolotea-Nautla); Tamaulipas: between Tampico and Ciudad Mante, Krukoff 1970-125, Palmer 119, 130, 328 and 544, Pringle 7687 (US), Runyon 972 (US), Cottam 10564 (UT), Wiggins 13352 (DS), Kenoyer & Crum 3315 (A), R. Merrill King 4509, Viereck 754 (US), Dressler 1878 (MICH), Johnston 5228 (MICH), 5342 (MICH), Barkley & Smith s.n. (Apr. 4, 1947) (F). San Luiz Potosi: Rose & Hough 4869 (US), Palmer 219 (A, GH, NY, US), Pringle 5124 (A, F, GH, US), Kenoyer A. 188 (F), Edwards 606 (F), Rzedowski 6959 (MEXI), Barkley s.n. (Apr. 13, 1947); Hidalgo: Moore 2889 (GH); Puebla: Krukoff 1970-120 and 1970-121 (near Poza Rica), Miranda 8380 (MEXU); Veracruz Krukoff 1970-87, 1970-90, 1970-91, 1970-93, 1970-94, 1970-98, 1970-99, 1970-123, M. le Dr Gouin

s.n. (1867) (P), C.R. Orcutt 3398 (F, GH, US) (Jalapa), Dressler & Jones 14 (GH, US) (San Andres Tuxtla), Nevling & Gomez-Pompa 446 (MEXU) (Tampico-Tuxpan), G. Martínez-Calderón 1383 (MEXU) (Tres Valles-Las Maravillas); Müller 86 (K, NY), Greenman 67 (F), Purpus 6078 (UC), Seler & Seler 244 (B), LeSueur 209 (F), 210 (F), Mario Souza 2377 (MEXU), Gomez-Pompa & Riba 72 (MEXU); Oaxaca: Krukoff 1970-83 (near Matias Romero in Atlantic drainage, soon after passing a divide; Krukoff 1970-84 (near the border with the State of Veracruz); Y. Mexia 9302 (US, GH, F), Alexander 135, Rovirosa 696 (K, PH, US), L. Gonzales Q. s.n. (March 3, 1964 (MEXI); Tabasco: + 10 km. from Villahermosa toward Chable, Krukoff 1970-46; Campeche: between Escarcega and Chetumal, Krukoff 1970-52, 1970-54 and 1970-55, E. Hernández X. et al. ES-260 (MEXU) (Escarcega-Candelaria); Yucatan: A.P. Covich 6713 (MEXU) (Laguna Chichancanab).

Previous to 1970 this species was known from 19 collections from Pinar de Rio, Cuba, 15 from Yucatan, one each from Campeche and the Island of Cozumel, Mexico, three from Belize and one collection from Peten, Guatemala.

As a result of my field studies of 1970 it emerged as one of the two major species of eastern Mexico extending north into the State of Tamaulipas (farther northward it is replaced by E. herbacea). The second major species of eastern Mexico is E. folkersii.

This species is a small shrub, the smallest member of Sect. Xyphanthus except for E. herbacea and E. flabelliformis. It is well marked by the black calyx and pink standard. Usually it is a very spiny plant but it includes also nearly spineless forms (Krukoff 1970-46, 1970-52 and 1970-56). It reproduces readily by seeds and old plants often have a colony of young plants in the neighborhood. It is almost never used for live hedges.

This is the first record of E. standleyana from Tamaulipas, Veracruz, Hidalgo, San Luis Potosi, Puebla, Tabasco, and Oaxaca. I am citing here all collections except those from Cuba, Belize, and the State of Yucatan and Campeche in Mexico. Many were previously wrongly placed with E. herbacea.

36. Erythrina atitlanensis Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(2):162. 1970.

Chromosome number: $2n=42$, voucher Krukoff 1969/166 (NY) from Guatemala cited in 5b:163; count based on seedlings (45:473).

Guatemala: Solola: Krukoff 1967-1, 1969-242 and 1969-244 (near Atitlán); Krukoff 1969-241 (near San Juan La Laguna).

37. Erythrina cobanensis Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(2):164. 1970.

Chromosome number: $2n=42$, voucher Krukoff 1969-195 (NY) cited in 5b:164; count based on seedlings (45:474).

Guatemala: Alta Verapaz: Krukoff 1970-6 (near Cobán, alt. + 1190 m); Krukoff 1970-7 (near San Pedro Carcha, alt. + 1150 m); Krukoff 1970-8 and 1970-11 (near Caxux, along the road from Cobán to Sebol); Krukoff 1970-12 and 1970-138 (near Bancab, along the road from Cobán to Sebol, alt. + 1140 m).

For the second year my efforts to collect substantial quantities of seeds were unsuccessful. On Jan. 25 and 26, 1970, a search was made for trees in flower which could provide seeds 2 1/2 months later. Especially promising were + 30 very old trees planted as boundary markers near Bancab. In April 1970 they were visited again and it was found that during the flowering a very strong wind blew most of flowers down before the fruits were set.

38. Erythrina chiapasana Krukoff, Brittonia 3:304. 1939.

Chromosome number: $2n=42$, voucher Krukoff 1969-211 (NY) from Guatemala cited in 5b:165; count based on seedlings (45:474).

Mexico: Chiapas: Elias Guillén P. 1970/1 (Finca Las Margaritas), 1970/2 (Finca El Milagro) and 1970/3 (Finca Nuevo Mundo) (all on the way from Comitán to the Guatemalan border; Rafael Hernandez M. 395 (MEXU) (cerca del (Ocotal) Ciudad Cuauhtemoc); Krukoff 1970-35, 1970-36, 1970-37, 1970-38 and 1970-39 (between Cristobal de las Casas and Buchil); R.M. Laughlin 360 (munic. Zinacantan); Ida K. Langman 3795 (near Comitán) (US); Alush Shilom Tom 1854 (munic. Amatenango del Valle); Oscar F. Clarke 415 (munic. Pueblo Nuevo Solistahuacán). Guatemala: Huehuetenango: Steyermark 50499 (above the town) (F); van Schrenck s.n. (MO); Krukoff 1970-31 (+ 7 km. from the town); Standley 72790 (near Zaculeu); Williams et al. 22026 (south of the town) (F); Krukoff 1970-24 (near Aguacatan); Standley 82554 (north of Chiantla) (F); Krukoff 1971-14 (on way to Quiche); Steyermark 51777 (between Chacula and Canquintic, Sierra de los Cuchumatanes); Krukoff 1970-32 and 1970-33 (along the road from Huehuetenango and the border of Mexico, 10-20 kms. from the border).

Seven collections, for which the altitude of the places of collections are recorded, were collected between 1620 and 2010 m.

This species is very spiny even in context of its genus and is usually leafless when in flower.

39. Erythrina goldmanii Standley, Contr. U.S. Nat. Herb. 20:181. 1919.

Chromosome number: $2n=42$, voucher: Krukoff 1970-72 (NY) from Mexico: Chiapas: between Tapachula and Tonela (46:383).

Mexico: Chiapas: Alush Shilom Tom 3728 and Laughlin 1999 (CAS) (munic. Venustiano Carranza); Krukoff 1970-34 and 1970-81 (San Gregorio, + 23 km. from the Guatemalan border); Krukoff 1970-66, 1970-67, 1970-68, 1970-69 and 1970-70 (near Motozintzo); Krukoff 1970-71, 1970-72 and 1970-114 (between Tapachula and Tonela); Krukoff 1970-112 and 1970-113 (between Tonela and Arriaga); Krukoff 1970-73, 1970-74 (between Arriaga and Las Cruces); Krukoff 1970-75 and 1970-76 (near Tultepec, above Las Cruces); Krukoff 1970-77 and 1970-78 (between Las Cruces and Tuxtla Gutiérrez); Oaxaca: Miranda 5495 (MEXU) ("al N.N.O. de Tuxtla G., alt. + 685 m, selva baja decidua"), Krukoff 1970-82 (near the border with Chiapas, between Las Cruces and Matias Romero).

This is the first record of the species from Oaxaca.

In 1939 when I was working on my monograph the species was known from 4 collections from the State of Chiapas; three additional collections were listed in the 3rd supplement in 1969 and one more in the 4th supplement in 1970.

During my field studies in Mexico in 1970 this species was found to be very common at moderately high elevations on the Pacific Coast area from the Guatemalan border to Arriaga and in the central part of the State of Chiapas north of Tuxtla Gutiérrez.

This species is very spiny, even in context of its genus. The form which is rather common in the Pacific Coast area has a black calyx.

40. Erythrina rubrinervis H. B. K. Nov. Gen. & Sp. 6:434. 1824.

Panama: Panamá: Lewis et al. 3480 (MO) (8 km. SW of Cerro Brewster, alt. + 300 m); Darién: Kirkbride & Duke 1211 (MO) (premontane rain forest, east of Tres Bocas). Venezuela: Mérida: alt. + 1620 m, Breteler 4586 (U), J. de Bruijn 1282 (U). Colombia: André 1771 (K), Cuatrecasas 26964 (US), Triana s.n. (1851/7) (P); Cundinamarca: García-Barriga 12493 (COL) and 12498 (COL) (hacienda Patasia); García-Barriga & Jaramillo-Mejía 20111 (carretera entre Pacho y Zipaquirá, alt. + 2380 m); Michele Dumont 120 (G) (alt. + 1480 m); Putumayo: M.L. Bristol 1212 (Valle de Sibunday, + 1980 m) (COL).

This is the first record of the species from Panama (Panama and Darién) and Putumayo (Colombia).

41. Erythrina mexicana Krukoff, Brittonia 3:309. 1939.

Mexico: Veracruz: Krukoff 1970-86 and 1970-95; M.A. Martinez A. 345 (MEXU), J. Chavelas et al. ES-2426 (MEXU) and ES-2842 (MEXU) (all near San Lorenzo Tenochtitlan); Mario Souza 2998 (MEXU) and 3350 (MEXU) (region de las Tuxtlas, alt. 90-180 m); Marino Rosas R. 423 (MEXU) (near Huacapan, alt. + 1205 m, muy

abundante); A. Gomez-Pompa 115 (MEXU) (Fortuno, alt. + 180 m); Tabasco: Tenosique, Krukoff 1970-51; Chiapas: Krukoff 1970-45 (between Tapilula and the boundary line of Chiapas with Tabasco). Guatemala: Suchitepequez: Rosengarten s.n. (Kr. Herb. 15124) and Krukoff 1971-8 (finca Naranjo, alt. + 1140 m).

This is the first record of the species from Tabasco.

According to Schultes, this species is the most common Erythrina in the departments of Textepec and Choapam. (See labels on Schultes & Reko 687 & 952).

42. Erythrina lanceolata Standley, Contr. U.S. Nat. Herb. 17: 432. 1914.

Honduras: Ocotepeque: Molina 22218, 24177 (F); Comayagua: Molina 8051, 8126 (F), 25462 (F), 25594 (F); La Paz: Molina 24331; Olancho: Standley 18386 (EAP).

This is the first record of the species from the departments of Ocotepeque, La Paz and Olancho in Honduras. The specimens are from elevations of (400)-1170-1350 m.

43. Erythrina hondurensis Standley, Field Mus. Publ. Bot. 4:309. 1929.

Nicaragua: Zelaya: Molina 2230 (GH). Honduras: Atlantida: vicinity of Lancetilla Exper. Sta., alt. + 90 m, Antonio Molina R. & Albertina R. Molina 25602.

44. Erythrina barqueroana Krukoff & Barneby, sp. nov.

A centrali-americanis sectionis Xyphanthi speciebus omnibus foliolo terminali longe-acuminato inferne minutim reticulato-cerifero, calyce chartaceo post vexillum profunde recesso mox glabrato, legumine elongato moniliformi, necnon seminibus coccineis immaculatis absimilis.

Arbores mediocres spinosae, foliis juventute pilis 2-cruribus debillimis parce pilosulis adultis glabratis; stipulae deciduae subchartaceae lineari-acuminatae + 1 cm longae; folii petiolus cum rachi 1--2.5 dm longus hinc inde spina conica armatus, petioluli stipella subpeltata suffulti 8--10 mm longi, sicci longitrorsus angulato-canaliculati; foliola matura chartacea superne viridia inferne reticulatim cerifera pallentia, basi late cuneata vel rarius rotundata late rhombico-ovato-acuminata, terminale (lateralibus paullo majus) + 1.5--2.5 dm longum, 7.5--14 cm latum; racemi axis 2 dm usque longus densiuscule puberulus, pedicelli ad anthesin graciles + 3 mm longi, fructiferi incrassati 8--14 mm longi; calycis primum parcissime puberuli tunc glabrati 13--16 mm longi hypanthium 1.5--2.5 mm longum, tubus campanulatus sursum ampliatus ad orem valde obliquum 5.5--6.5 mm diam, sinu dorsali post vexillum profunde (per + 5 mm) recesso, dentibus minimis in crenulas obscuras

reductis; vexillum coccineum oblanceolatum apice subcucullatum fere rectum 4.6--5 cm longum + 12 mm latum dorso glabrum; alae + 6.5--7.5 mm longae, ungue + 1 mm longo, lamina late oblique triangulari-acuminata margine adaxiali inflexa; carina alis vix brevior, laminis inter se connatis iis alarum subsimilibus nisi paullo angustioribus; androecii 10-meri vexillo paullo brevioris filamenta 9 + ad medium decimum multo brevius inter se coalita; antherae fere 2 mm longae; ovarium stipitatum lanuginosum stylo superne glabrato; legumen (1) 1.5--3.5 dm longum rectum vel arcuatum ultra stipitem 3.5--8 cm longum moniliforme inter semina (4) 5--13 valde constrictum, apice attenuatum, valvulis coriaceis maturis nigricantibus glaberrimis; semina nitide coccinea immaculata 9--13 mm longa, hilo albido 3--5.5 mm longo.

Guatemala: Huehuetenango: municipality Barillas, Krukoff 1969-252 (NY-holotype) and 1969-253 (San Ramon, Panorama); Krukoff 1969-272 (San Ramon Ojo de Agua); Krukoff 1969-260, 1969-261 and 1969-263 (zona de Cumatz); Krukoff 1969-270 (Rio Pante, below El Jordan, zona de Ixcán).

This species is distinguished from all Central American species of sect. Xyphanthus by the combination of long-acuminate terminal leaflets glabrous when adult and minutely reticulate-waxy beneath, a chartaceous, essentially glabrous, shallowly bell-shaped calyx deeply recessed behind the banner, a long regularly moniliform pod, and seeds scarlet all over except for the white hilum. The calyx resembles somewhat that of the unrelated E. mitis. The relationship of E. barqueroana is probably with E. mexicana and E. lanceolata.

All collections cited above are from "tierra caliente". Above 1200 m this species is replaced by E. huehuetenangensis. E. barqueroana is very common on the Atlantic lowlands ("tierra caliente") in the area drained by Rio Ixcán and its tributaries in the municipality of Barillas, Huehuetenango, Guatemala. Doubtless is found also on the lowlands in the eastern Chiapas, Mexico.

We dedicate this species to Sr. Humberto Barquero M. who has given valuable assistance in field studies of Erythrinas in Costa Rica in 1969.

45. Erythrina gibbosa Cufodontis, Arch. Bot. Sist. Fitog. & Genet. 10:34. 1934.

Costa Rica: Burger & Matta 4568 (F) (Rio Coton, 1280-1350 m); Puntarenas: Burger & Liesner 7209 (F) (Oca), Raven 21741 (F), 21953 (F) (6 km. south of San Vito de Java, alt. + 1200 m); Alajuela: El Muelle, alt. + 90 m, Burger & Matta 4314 (F); Cartago: La Fuente Peralta, alt. + 1170 m; Anastasio Alfaro 8 (F). Panama: Bocas del Toro: Blackwell et al. 2750 (MO); Cocle, alt. + 600 m, Dwyer & Correa 8019 (MO); Darien: Rio San Jose, Stern et al. 633 (UC).

This is the first record of the species from Puntarenas, Costa Rica and from Darién, Panama.

46. Erythrina costaricensis M. Micheli, Bull. Herb. Boiss. 2: 445. 1894.

Chromosome number: $2n=42$, voucher: Krukoff 1969-162 (NY) from Costa Rica: San Jose: near San Isidro General (46:382).

Costa Rica: Montealegre s.n. (Krukoff Herb. 9193); Puntarenas: Tonduz 6781 (US); Cartago: Turrialba: McKee 11114 (K). Panama: Colon: Howell 63. Colombia: Choco: Haught 5449 (US); Antioquia: Soejarto & Gary Latz 2511 (Medellín, alt. + 1350 m) (COL), L. Uribe-Uribe 1462 (Uraba, alt. + 450 m) (COL), Sandeman 5597 (Sigovia, alt. + 600 m) (COL); Cundinamarca: H. Garcia-Barriga & R. Jaramillo-Mejia 20134 (La Palma a Talauta, alt. + 990 m), A. Fernandez & E. Perez-Arbelaez 454 (near La Meza, 900-1170 m) (COL); H. Garcia-Barriga 11055 (entre San Francisco & Supata + 1395 m) (COL); H. Garcia-Barriga 11735 (COL), 12327 (COL) and 12359 (COL) (all near Guaduas, + 1080 m); Huila: between Suaza & Acevedo, + 1240 m, E.L. Little 8469 (COL).

This is the first record of the species from Cundinamarca and Huila.

As presently understood, this species extends from Costa Rica and Panama to Chocó on the coast, up the Cauca River valley in Antioquia and Valle and up the Magdalena River valley in Cundinamarca and Huila.

47. Erythrina folkersii Krukoff & Moldenke, Phytologia 1:286. 1938.

Mexico: Chiapas: between Tapilulu and the boundary line with the State of Tabasco, Krukoff 1970-42, 1970-43, 1970-44; Veracruz: Krukoff 1970-85, 1970-96 (near San Andrés Tuxtla), 1970-97. Belize: Cayo: Dwyer et al. 88 (MO), 160 (MO). Guatemala: Petén: Krukoff 1970-56 (between Flores and Puerto Mendes), Krukoff 1971-7 (Cansic, + 40 km. south of Poptun); Antonio Molina R. 15838 (F) (Ceibal); Izabal: Snedaker E-163 (Finca Murciélagos) (F), Krukoff 1969-240 (near Matias de Galvez), 1969-239 (at the junction of roads, one going to Puerto Barrios and another to Matias de Galvez); Alta Verapaz: Krukoff 1970-20 and 1970-21 (between Panzós and La Tinta, below 60 m), 1970-13, 1970-14, 1970-15, 1969-33, 1969-37 and 1969-251 (near Sebol, "tierra caliente"), 1969-202.

This is the first record of the species from Petén.

In the season of 1968/9 I made two collections of leaves with a few old pods near "puerto fluvial" Sebol - a terminal of the road from Coban to Sebol. It has now been ascertained that these collections represent E. folkersii. This is the most western

known point of its distribution in Guatemala where, as in the Dept. Izabal, it occurs on fertile silt soil with stands of "Cohune" palm (Orbignya cohune (Martius) Dahlgren ex Standley.

48. Erythrina macrophylla A. DeCandolle, Prodr. 2:411. 1825.

Guatemala: San Marcos: Krukoff 1969-247 (San Cristóbal Cuchu, Aldea Guaquivil), 1970-25 (near Tejutla, alt. + 2530 m); Quetzaltenango: + 3 km. from Santa Maria, Krukoff 1971-11.

49. Erythrina florenciae Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(2):171. 1970.

Mexico: Graham 167 (1830) (K), M. Souza 3464 (MEXU) (Las Tuxtlas, alt. + 1116 m); Veracruz: Jalapa: Charles L. Smith 1834 (EAP), Gilly et al. 179 (MICH); Chiapas: Miranda 9185 (MEXU) (la selva negra, alt. + 1620 m); munic. Jitotol, alt. + 1650 m, Breedlove 8986 (US); Oaxaca: 28 km. below Huautla de Jiménez, C. Earle Smith & N. Tejeda 4432 (MEXU). Guatemala: San Marcos: Louis O. Williams et al. 26239 (US, F), Steyermark 36469 (between Canjula and La Unión Juárez, near the southeast portion of Volcan Tacana, alt. 6000-9000 ft.); Krukoff 1970-26, 1970-27, 1970-135, 1971-1, 1971-2 and 1971-6 (Finca Insula, + 13 km. from San Marcos, along the road to S. Rafael Pie de la Cuesta); Krukoff 1971-3 (between San Marcos and Pajapita, above aldea Feria).

Seeds of this species are described for the first time: seeds uniformly scarlet (without a black line extending from the hilum toward the chalazal end) with snowy white hilum and often wrinkled on drying, 15-18 mm long and 9-10 mm broad.

This is the first record of this species from Mexico (Veracruz, Oaxaca and Chiapas).

After unsuccessful search at "coffee elevations" (1000-1650 m) to the south of San Marcos and on "tierra fria" to the north - in the direction of Tacana and Tutuapa - the species was finally found in a belt of the humid high forest above "coffee elevations." Some trees were more than 25 m high and about 1 m in diameter. I have not seen this species used as a live fence but found it used as boundary markers.

This species is a shy seed bearer as, although it flowers profusely, the flowers are often damaged by insects and birds.

E. florenciae as well as E. tajumulcensis are promising for cultural trials in the Los Angeles area.

50. Erythrina huehuetenangensis Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(2):172. 1970.

Chromosome number: $2n=42$, voucher: Krukoff 1969-274 (NY) from Guatemala: Huehuetenango: Barillas, Finca San Isidro (46:383).

Guatemala: Huehuetenango: munic. Barillas, Krukoff 1969-273, 1969-274, 1969-283, 1969-284, 1969-301 and 1971-4 all at Finca San Isidro; Krukoff 1969-275 (Finca Chiblac); Krukoff 1969-285 (Tziquinte); Krukoff 1969-288 (along trail to Santa Elena); Krukoff 1969-286 and 1969-287 (Yulhuitz Grande); Krukoff 1969-289 and 1969-290 (Finca Maxbal); Krukoff 1969-291 (along the trail from Maxbal to Centinela); munic. (?), Steyermark 48971 (alt. 1350-1440 m) (F).

Extensive field studies in the municipality of Barillas confirmed the fact that this species abounds at high elevations (1280-1800 m). It is replaced by E. barqueroana on the lower elevations.

51. Erythrina cochleata Standley, Contr. U.S. Nat. Herb. 20:179. 1919.

Colombia: Caldas: elev. 1350-1620 m, Pennell, Killip & Hazen 8738 (NY, PH, US); Cundinamarca: vicinity of La Palma, Rio Murca, elev. 1035-1280 m, H. Garcia-Barriga 12413 (COL, NY), Garcia-Barriga & Jaramillo-Mejia 20125 (COL, NY), 20129 (COL, NY); vicinity of El Peñon, km 74 of carretera entre Guanacas y La Palma en el Paraizo, elev. 900-990 m, Garcia-Barriga & Krukoff 20067 (COL, NY), Garcia-Barriga et al. 20149 A (COL); orillas de Rio Negro, Garcia-Barriga & Jaramillo-Mejia 20136 (COL, NY), 20115 (COL, NY).

The first collection of this species from Colombia (Pennell et al. 8738) was identified as E. cochleata in 1939 (1:322), a poorly known species, which I failed to collect on my extensive field trip in Costa Rica in 1968/9 (5b:174). In 1969 I examined the second collection of it from Colombia (Garcia-Barriga 12413) and decided that it was important to study this species, as it occurs in Colombia, in the field. In April 1970 while in Bogotá on my way to Brazil I made a special one day trip with Prof. H. Garcia-Barriga to the locality where he collected this species and we found here Garcia-Barriga and Krukoff 20067 (sterile). Late in July another trip was made at my request to the same locality by Garcia-Barriga and Jaramillo Mejia and they collected complete material (5 collections cited above). I am citing here all collections of this species made in Colombia. There are no differences between E. cochleata as it occurs in Colombia and as it is represented in Costa Rica.

Incidentally, my trip with Prof. Garcia-Barriga proved to be quite interesting. On this trip for the first time I examined E. edulis and E. rubrinervia in the field which we found on high elevations, and while searching for E. cochleata we also found E. costaricensis, the second species which occurs in Costa Rica as well as in Colombia.

This species as we observed it in Colombia is a large forest tree occurring on elevations of 900-1650 m. It is usually in flower in July.

In September 1971 at my request Sr. Humberto Barquero M. made a special trip to the type locality of E. cochleata (Hacienda La Colombiana, Limón, Costa Rica) - on "tierra caliente" and he failed to find the species. It is puzzling that the best preserved collection of it, in flower, is Lankester s.n. from Peralta (elev. + 1300 m), near Cartago which is near the divide between the Pacific and Atlantic drainage. We will try again to collect it in Costa Rica in the season of 1972.

52. Erythrina chiriquensis Krukoff, Brittonia 3:322. 1939.

Chromosome number: $2n=42$, voucher: Butcher s.n. (MO) from Panama: Chiriquí, 1800 m (46:382).

Costa Rica: Alajuela: Krukoff 1969-283 (Zapote de Alfaro Ruiz), Austin Smith A-29 (F, NY) and 2238 (UC) (Zarcero); San José: along road from Frailes to Tarvaca, alt. 1280 m, Lent 1163 (F). Panama: Chiriquí: W. & C. von Hagen 2125, Dwyer 2440 A (MO) (Cerro Punta, alt. + 2100 m).

This is the first record of the species from the province of San José, Costa Rica.

53. Erythrina globocalyx Porsch & Cufodontis, Arch. Bot. Sist. Fitog. & Genet. 10:35. pl. 1. 1934.

Costa Rica: San José: Tonduz 9715 (US), Burger & Stolze 5396 (La Palma area, NE of San Jerónimo, alt. + 1500 m) (F), F. Tristhan 824 (La Palma de San José, + 1600 m) (BR), Rowlee & Rowlee 251 (La Palma, hedge row by road) (NY, US), Roy W. Lent 1163 (along road from Frailes to Tarvaca).

54. Erythrina smithiana Krukoff, Brittonia 3:323. 1939.

Ecuador: E.F. Anderson 2516 (RSA), Benoist 3055 (P) (St. Domingo); Guayas: Játiva & Epling 925, E.F. Anderson 2467 (RSA) (village of Pomarosa).

55. Erythrina guatemalensis Krukoff, Amer. Jour. Bot. 28:688. 1941.

Guatemala: Huehuetenango: munic. Barillas near Barillas, alt. + 1280 m, Krukoff 1969-246; Alta Veracruz, near Tactic, alt. + 1310 m, Krukoff 1970-4.

Seeds of this species are uniformly scarlet (without a black line extending from the hilum toward the chalazal end) - see Standley 90463 and Steyermark 42364 (cited in 5a:134), also Krukoff 1969-38, 1969-192, 1969-193 and 1969-194 (cited in 5b:162). An error was made in the protologue as the fruits and seeds described there from Standley 69228 represent E. williamsii.

56. Erythrina steyermarkii Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(2):175. 1970.

Chromosome number: $2n=42$, voucher: Krukoff 1969-145 (NY) from Costa Rica: Alajuela: San Carlos, Finca Los Ensayos (46:383).

Nicaragua: Zelaya: Molina 2230 (GH); Chontales: Bunting & Licht 1102 (US). Costa Rica: Guanacaste: Standley & Valerio 45768 (US), 46620 (US); Alajuela: Krukoff 4a (Los Ensayos, near El Zapote), Brenes 15636 (between Tilaran & El Silencio) (F), Tonduz 10896 (BR) (Santa Clara); Cartago: Standley & Valerio 46714 (US), Krukoff 8a (Finca Las Quinas, San Antonio), Jorge León 768 (Bajos de la Gloria, alt. + 750 m) (CR, F), Burger & Ramirez 3992 (along the road from Turrialba to Moravia) (F), Lems 5063 (along road from Turrialba N to Pavones and Siquirres); Puntarenas: San Pedro M. de Oca, Orozco 947 (EAP) and 1017 (EAP).

This is the first record of the species from Nicaragua (Zelaya and Chontales) and from the provinces of Guanacaste and Puntarenas in Costa Rica.

57. Erythrina tajumulcensis Krukoff & Barneby, Mem. N.Y. Bot. Gard. 20(2):176. 1970.

Chromosome number: $2n=42$, voucher: Krukoff 1969-249 (NY) (46:383).

Mexico: Chiapas: appr. 32 km. north of asphalt road (Tapachula-Tonda), along the secondary earth road, after passing Union Juarez, Krukoff 1970-60, 1970-61 and 1970-62 (March 3, flrs). Guatemala: San Marcos: near Aldea Feria, Krukoff 1969-249, 1970-28 and 1970-134.

This is the first record of the species from Mexico (Chiapas). In spite of extensive search I was unable to find this species in Guatemala except in a single locality, near Aldea Feria, at the elevation of ± 1650 m.

58. Erythrina williamsii Krukoff & Barneby, sp. nov.

Erythrina tajumulcensi Krukoff proxima sed tubo calycino post vexillum profunde fisso statim recognita.

Chromosome number: $2n=42$, voucher: Krukoff 1969-199 (NY) from Guatemala count based on seedling and the plant cited as E. guatemalensis Krukoff (45:474).

Tree, usually leafy at anthesis, armed with spines; branchlets stout, aculeate; petioles 12-30 cm long, shortly pubescent when young, soon glabrous, usually spineless; petiolules 7-13 mm long and 0.7-1.0 mm in diam., pubescent as petioles; leaflet-blades chartaceous to subcoriaceous, pubescent with rather

short dark brown hairs when young, soon glabrous, not ceriferous beneath, paler beneath than above; terminal leaflets broadly ovate, usually about as long as broad, 11.5-15 cm long, 9-14.5 cm broad, usually shortly acuminate at apex, and rounded at base; secondaries usually 7 per side; rachis 13-32 cm long, densely and shortly pubescent with dark brown hairs, soon glabrescent proximally; pedicels up to 1 cm long, pubescent as rachis; calyx coriaceous, drying black, tubular-campanulate, up to 30 mm long on the carinal side, and 20 mm long on the vexillar side, + 6 mm broad at base, ampliate to 11 mm at apex, at margin entire or irregularly dentate or lobed, prominently calcarate on the upper carinal side, puberulent to shortly pubescent; standard narrowly elliptic, about 8 cm long and 1.6 cm broad, obtuse to rounded and often retuse at apex, cuneate at base; wings rounded and often subcucullate at apex, narrowed at base, usually longer than keel-petals, about 16 mm long and 3 mm broad; keel-petals abruptly acute dorsally at apex, irregularly dentate distally, not at all hastate or sagittate, clawed at base, about 12 mm long and 4 mm broad; stamens 4.5-6 cm long, separate for 1.5-2.5 cm; pistil about 4.5 cm long, the ovary and gynophore densely pubescent with spreading dark brown hairs, the style glabrous; fruit-pedicels + 2 cm long and about 2 mm in diam.; pods subligneous, 15-28 cm long; 1.5-1.8 cm broad, irregularly constricted between some seeds, with a stipe about 5 cm long with an acumination about 2.5 cm long, 2-many-seeded; seeds scarlet with a black line extending from the hilum toward the chalazal end, about 12 mm long and 8 mm broad.

Guatemala: Alta Verapaz: J.D. Smith 1793 (US), Cook & Griggs 407 (US), Krukoff 1969-205; Krukoff 1969-32 (near Cristóbal); Standley 69228 (F), 69321 (F), 91137 (F) and Williams et al. 40260 (F) (all near Cobán); Krukoff 1969-204 (near San Pedro Carchá); Krukoff 1969-199 (NY-holotype) and 1969-201 (aldea Bangab, + 3 km from San Pedro Carchá); Krukoff 1970-9, 1970-10 and 1970-137 (all near Caxux, along the road from Cobán to Sebol); Krukoff 1970-5, 1969-39 and 1969-40 (all near Tactic); Krukoff 1970-16, 1970-17, 1970-18 and 1970-23 (all between Tactic and Tukurú). Honduras: Morazan, alt. + 1215 m, Williams & Molina 12809 (EAP).

The new species is related to E. tajumulcensis, but is immediately distinguished by its calyx which is conspicuously shorter on the vexillar than on the carinal side.

This species is rather common near Cobán in Alta Verapaz where it is often planted as a live hedge.

This species as well as E. cobanensis had mature flowers in January at moderately high elevations along the road from Tactic to Tukurú, while they were nearly leafless and in bud only at higher elevations along the road from San Pedro Carchá to Finca Chapultepec.

All collections of this species were made at "coffee elevations" (1050-1380 m). E. williamsii is a shy seed bearer; its pods are comparatively small with few seeds.

This species is named in honour of L. O. Williams in recognition of his work on Flora of Guatemala.

SUBGENUS CHIROCALYX (MEISNER) HARVEY

SECTION VARIEGATAE (KRUKOFF) KRUKOFF

59. Erythrina velutina Willdenow, Ges. Nat. Freunde Berlin Neue Schr. 3:426. 1801.

Erythrina aculeatissima Desfontaines, Tabl. 191. nomen. 1804.

Jamaica: Proctor 28568 (IJ), Bengry s.n. (Apr. 12, 1946) (IJ). Haiti: Yaeger s.n. (1828) (P). Antigua: H. E. Box 1410 (F). Venezuela: Grosourdy 13 (P). Colombia: Goajira: C. Saravia & D. Johnson 95 (US), Cuatrecasas & Romero-Castañeda 25475 (COL). Ecuador: Gilmartin 165 (MO); Galápagos Islands: E. Yale Dawson s.n. (US), Wiggins & Porter 187 (US), Wiggins 18735 (US). Peru: Martinet s.n. (1878) (P); Lambayeque: Woytkowski 6777 (MO). Brazil: Bahia: Estrada de Joazeiro, A.P. Duarte 10594 (RB), Rio de Janeiro: Glaziou 11881 (P), Guanabara: cult. Luiz Emygdio 2028 (R), Country undesignated: "cult. in America", coll. undesign. s.n. (P - the basis of the name E. aculeatissima).

ASIATIC AND AFRICAN SPECIES CULTIVATED IN AMERICA

1. Erythrina variegata L.

In addition to the countries enumerated in the monograph (1:336) it is apparently cultivated in Barbados (Proctor 26239 (IJ), and Grenada (Howard 10940).

2. Erythrina abyssinica Lam.

This species is cultivated in Costa Rica (Krukoff 1969-133 - Cartago, Finca Aquiares, near Turrialba).

APPENDIX I

LIST OF KNOWN AMERICAN SPECIES OF ERYTHRINA

Subgenus ErythrinaSection Duchassaingia (Walpers) Krukoff

1. fusca

Section Cristae-galli (Krukoff) Krukoff

2. crista-galli
3. falcata

Section Micropteryx (Walpers) Krukoff

4. poeppigiana
5. ulei
6. dominguezii
7. verna

Section Stenotropis (Hasskarl) Krukoff

8. speciosa

Section Edules (Krukoff) Krukoff

9. polychaeta
10. schimpffii
11. edulis

Section Leptorhizae (Krukoff) Krukoff

12. breviflora
- 12a. " fma. petraea
- 12b. " fma. oaxacana
13. leptorhiza
14. horrida
15. montana

Section Erythrina

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

Section Cubenses (Krukoff) Krukoff

- 26. *cubensis*
- 27. *oliviae*

Section Xyphanthus (Rafinesque) Krukoff

- 28. *herbacea*
- 29. *coralloides*
- 30. *flabelliformis*
- 31. *lanata*
- 32. *berteroana*
- 33. *castillejiflora*
- 34. *americana*
- 35. *standleyana*
- 36. *atitlanensis*
- 37. *cobanensis*
- 38. *chiapasana*
- 39. *goldmanii*
- 40. *rubrinervia*
- 41. *mexicana*
- 42. *lanceolata*
- 43. *hondurensis*
- 44. *barqueroana*
- 45. *gibbosa*
- 46. *costaricensis*
- 47. *folkersii*
- 48. *macrophylla*
- 49. *florenciae*
- 50. *huehuetenangensis*
- 51. *cochleata*
- 52. *chiriquensis*
- 53. *globocalyx*
- 54. *smithiana*
- 55. *guatemalensis*
- 56. *steyermarkii*
- 57. *tajumulcensis*
- 58. *williamsii*

Subgenus Chirocalyx (Meisner) HarveySection Variegatae (Krukoff) Krukoff

- 59. *velutina*
- 59a. " fma. *aurantiaca*
- 60. *grisebachii*

Species reduced to synonymy since Supplement IV (1970).

E. glauca Willdenow was reduced to synonymy under *E. fusca* Loureiro and *E. flammea* Herzog under *E. verna* Velloso in Supplement V.

APPENDIX II (Supplement)

AUTHORS OF THE SPECIES

- Krukoff, B.A. & R.C. Barneby - *castillejiflora*, *atitlanensis*,
cobanensis, *barqueroana*, *florenciae*, *huehuetenangensis*, *steyer-*
markii, *tajumulcensis*, *williamsii* (9).
- Porsch, Otto & Georgio
Cufodontis - *globocalyx* (1).

APPENDIX III (Supplement)

COLLECTORS OF THE TYPE SPECIMENS

- Krukoff, B. A. - *castillejiflora*, *atitlanensis*,
cobanensis, *barqueroana*, *florenciae*, *huehuetenangensis*, *steyer-*
markii, *tajumulcensis*, *williamsii*
(9).
- Porsch, Otto - *globocalyx* (1).

APPENDIX IV (Supplement)

COUNTRIES OF ORIGIN OF THE TYPE SPECIMENS

- Guatemala - *castillejiflora*, *atitlanensis*,
cobanensis, *barqueroana*, *florenciae*, *huehuetenangensis*, *tajum-*
ulcensis, *williamsii* (8).
- Costa Rica - *globocalyx*, *steyermarkii* (2).

APPENDIX V (Supplement)

LIST OF SPECIES WHICH ARE KNOWN TO OCCUR IN VARIOUS COUNTRIES

- Dominican Republic - *buchii* (1).
- Mexico - *florenciae*, *tajumulcensis* (2).
- Belize - *fusca* (1).
- Guatemala - *castillejiflora*, *atitlanensis*,
cobanensis, *goldmanii*, *barquer-*
oana, *florenciae*, *huehuetenan-*
gensis, *tajumulcensis*, *william-*
sii (9).
- Nicaragua - *steyermarkii* (1).
- Costa Rica - *globocalyx*, *steyermarkii* (2).
- Panama - *rubrinervia* (1).
- Colombia - *costaricensis* (1).

In Appendix V (6) substitute fusca for glauca, verna for flammea, and delete macrophylla under Mexico.

APPENDIX VI

STATISTICAL DATA ON SPECIES (AND VARIETIES AND FORMS)
KNOWN TO OCCUR IN VARIOUS COUNTRIES

	<u>Collected</u>	<u>Endemic</u>
Dominican Republic	3	-
Mexico	18 + 2	8 + 2
Central America	25	
Belize	3	-
Guatemala	18	5
Nicaragua	7	-
Costa Rica	9	-
Panama	7	-
Colombia	11	
Brazil	13 + 1	2 + 1

APPENDIX VII (Supplement)

LIST OF SPECIES OF WHICH LEAVES AND/OR FLOWERS AND/OR
FRUITS ARE STILL UNKNOWN

	<u>lvs.</u>	<u>flrs.</u>	<u>frts.</u>
34. castillejiflora	+	+	-
37. atitlanensis	+	+	+
38. cobanensis	+	+	+
45. barqueroana	+	+	+
50. florenciae	+	+	+
51. huehuetenangensis	+	+	+
55. globocalyx	+	+	+
58. steyermarkii	+	+	+
59. tajumulcensis	+	+	+
60. williamsii	+	+	+

APPENDIX VIII (Supplement)

ILLUSTRATIONS

28. oliviae	5a:129
34. castillejiflora	5b:168
37. atitlanensis	5b:168
38. cobanensis	5b:168
45. barqueroana	Supplement V
50. florenciae	5b:169
51. huehuetenangensis	5b:169
55. globocalyx	5b:169
58. steyermarkii	5b:169
59. tajumulcensis	5b:168
60. williamsii	Supplement V

APPENDIX IX (Supplement)

CHROMOSOME NUMBERS IN AMERICAN SPECIES OF ERYTHRINA

12. <u>edulis</u>	2n = 42
28. <u>oliviae</u>	2n = 42
30. <u>coralloides</u>	2n = 42
32. <u>lanata</u>	2n = 42
36. <u>standleyana</u>	2n = 42
37. <u>atitlanensis</u>	2n = 42
38. <u>cobanensis</u>	2n = 42
39. <u>chiapasana</u>	2n = 42
40. <u>goldmanii</u>	2n = 42
47. <u>costaricensis</u>	2n = 42
51. <u>huehuetenangensis</u>	2n = 42
54. <u>chiriquensis</u>	2n = 42
58. <u>steyermarkii</u>	2n = 42
59. <u>tajumulcensis</u>	2n = 42
60. <u>williamsii</u>	2n = 42

With the exception of E. edulis and E. chiriquensis all other seeds used in these studies were obtained in connection with my field trips in Central America and Mexico.

APPENDIX X (Supplement)

CHROMOSOME NUMBERS IN ASIATIC-POLYNESIAN-AUSTRALIAN SPECIES OF ERYTHRINA

8. <u>E. variegata</u> L.	2n = 42
(Monsalud s.n. from Philippines; count based on seedlings and the plant cited as <u>E. subumbrans</u> (Hasskarl) Merrill) (45:474).	
9. <u>E. tahitensis</u> Nadeau	2n = 42
(Gillett s.n. (NY) and Gillett 1983 (NY) from Hawaii; count based on seedlings and the plant cited as <u>E. sandwicensis</u> Degener (45:474).	

APPENDIX XII (Supplement)

COLLECTIONS CITED IN THE MONOGRAPH AND ITS SUPPLEMENTS

	Monog. & Suppl. 1 & 2, 1939/1940	Suppl. #3, 1969	Suppl. #4, 1970	Suppl. #5, 1971	Suppl. #3, 4 & 5	Total
I. Sect. <u>Duchassaingia</u>						
1. <u>fusca</u>	165	126	2	51	179	344
II. Sect. <u>Cristae-galli</u>						
2. <u>crista-galli</u>	135	72	-	46	118	253
3. <u>falcata</u>	77	60	-	18	78	155

	Monog.					
	& Suppl.	Suppl.	Suppl.	Suppl.	Suppl.	
	1 & 2,	#3,	#4,	#5,	#3,	
	1939/1940	1969	1970	1971	4 & 5	Total
III. Sect. <u>Micropteryx</u>						
4. poeppigiana	122	68	-	15	83	205
5. ulei	17	7	-	4	11	28
6. dominguezii	15	4	-	6	10	25
7. verna (1 with doubts)	24	19	-	4	23	47
IV. Sect. <u>Stenotropis</u>						
8. speciosa	28	31	-	13	44	72
V. Sect. <u>Edules</u>						
9. polychaeta	2	2	-	-	2	4
10. schimpffii	6	7	-	1	8	14
11. edulis (1 with doubts)	62	65	-	15	80	142
VI. Sect. <u>Leptorhizae</u>						
12. breviflora	28	30	-	12	42	70
12a. " fma. petraea	5	-	-	-	-	5
12b. " fma. oaxacana	3	-	-	-	-	3
13. leptorhiza	41	29	-	6	35	76
14. horrida	15	-	-	-	-	15
15. montana	8	11	-	2	13	21
VII. Sect. <u>Erythrina</u>						
16. peruviana	1	3	-	1	4	5
17. pallida (1 with doubts)	26	10	-	1	11	37
18. mitis (1 with doubts)	10	15	-	1	16	26
19. buchii	5	1	-	1	2	7
20. leptopoda	8	-	-	-	-	8
21. elenae	-	2	-	-	2	2
22. eggersii	26	-	-	-	-	26
23. amazonica	15	14	-	2	16	31
24. similis	3	-	-	-	-	3
25. corallodendrum						
var. coral-lodendrum (2 with doubts)	11	7	-	9	16	27
25a. " var. bicolor	18	7	-	1	8	26
25b. " var. connata (1 with doubts)	10	-	-	-	-	10
VIII. Sect. <u>Cubenses</u>						
26. cubensis	40	5	-	1	6	46
27. oliviae	-	2	-	1	3	3

		Monog. & Suppl. 1 & 2, 1939/1940	Suppl. #3, 1969	Suppl. #4, 1970	Suppl. #5, 1971	Suppl. #3, 4 & 5	Total
<hr/>							
IX. Sect. <u>Xyphanthus</u>							
28. herbacea (2							
with doubts)	105	81	-	28	109	214	
29. coralloides (3							
with doubts)	29	19	-	-	19	48	
30. flabelliformis	90	67	-	3	70	160	
31. lanata	15	42	-	3	45	60	
32. berteriana (4							
with doubts)	209	80	82	48	210	419	
33. castillejiflora	-	-	6	7	13	13	
34. americana (7							
with doubts)	62	20	-	-	20	82	
35. standleyana	37	3	-	42	45	82	
36. atitlanensis	-	-	11	4	15	15	
37. cobanensis	-	-	8	6	14	14	
38. chiapasana	2	14	22	25	61	63	
39. goldmanii	4	3	1	22	26	30	
40. rubrinervia	35	40	-	12	52	87	
41. mexicana (1							
with doubts)	19	13	15	14	42	61	
42. lanceolata	25	14	2	8	24	49	
43. hondurensis	11	6	-	-	6	17	
44. barqueroana	-	-	-	9	9	9	
45. gibbosa	28	13	3	9	25	53	
46. costaricensis (1							
with doubts)	41	40	12	17	69	110	
47. folkersii	32	5	5	23	33	65	
48. macrophylla	13	17	30	3	50	63	
49. florenciae	-	-	3	17	20	20	
50. huehuetenangensis	-	-	6	15	21	21	
51. cochleata	4	5	-	7	12	16	
52. chiriquensis	5	6	5	7	18	23	
53. globocalyx	-	-	4	7	11	11	
54. smithiana (1 with							
doubts)	9	20	-	4	24	33	
55. guatemalensis	1	6	11	2	19	20	
56. steyermarkii	-	-	8	22	30	30	
57. tajumulcensis	-	-	5	6	11	11	
58. williamsii	-	-	-	26	26	26	
X. Sect. <u>Variegatae</u>							
59. velutina	72	61	-	17	78	150	
59a. " fma.							
aurantiaca	6	1	-	-	1	7	
60. grisebachii	25	2	-	-	2	27	
<hr/>							
TOTAL	1805	1175	241	624	2040	3845	

APPENDIX XIII (Supplement)

CHANGES IN THE IDENTIFICATIONS

	cited originally as	cited later as
von Schrenk s.n.	berteroana (1:295)	chiapasana (V Suppl.)
Rosengarten s.n. (Krukoff Herb. 15124)	guatemalensis (5:636)	mexicana "
Tonduz 6781	lanceolata (1:311)	costaricensis "
Montealegre s.n. (Krukoff Herb. 9193)	berteroana (1:296)	costaricensis "
Steyermark 36469	macrophylla (4:689)	florenciae "
Austin Smith A-29	berteroana (4:688)	chiriquensis "
Tonduz 9715	costaricensis (1:316)	globocalyx "
Rowlee, W.W. & H. E. 251	berteroana (1:296)	globocalyx "
Brenes 15636	costaricensis (1:316)	steyermarkii "
Standley & Valerio 45768	"	" " "
" " 46620	"	" " "
" " 46714	"	" " "
Jorge Leon 768	" (5:637)	" "
Krukoff 8a	"	" "
Krukoff 4a	"	" "
Brenes 15636	"	" "
Standley 69228	guatemalensis (4:689)	williamsii "
" 69321	"	" " "
J. D. Smith 1793	"	" " "
Cook & Griggs 407	"	" " "

NOTES

Prior to 1968/1969 when field studies of Central American species were made, E. steyermarkii, described in 1970 (5b:175), was confused with E. costaricensis, whereas E. williamsii, described in this paper, was confused with E. guatemalensis.

During my field work in Mexico, discussed in this paper, E. standleyana became better known and, as a result, many specimens from Mexico (Tamaulipas, San Luiz Potosí, Hidalgo, Puebla, Veracruz and Oaxaca) confused previously with E. herbacea, were cited under E. standleyana (see under E. standleyana).

It should be noted also that inasmuch as E. glauca was placed in synonymy under E. fusca and E. flammea was reduced to synonymy under E. verna, all specimens originally cited under the above referred to two names, were renamed.

APPENDIX XIV (Supplement)

Citations of places of deposit of specimens.

- COI : Bot. Inst. of the Univ. Coimbra, Portugal.
IJ : Science Museum, Kingston, Jamaica.
LISC: Centro Bot. Junta Invest. Ultramar, Lisboa.
UCWI: Bot. Dept., Univ. West Indies, Saint Andrews, Jamaica.

BIBLIOGRAPHY

(In order to conserve space, I am citing here only the papers which are not cited in Supplement III).

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