TAXON 29(1): 85–95. FEBRUARY 1980

THE LINNAEAN SPECIES OF *GOMPHRENA* L. (AMARANTHACEAE)

James A. Mears[1]

Summary

The eleven species described as *Gomphrena* L. by Linnaeus are identified as species of *Gomphrena, Alternanthera* Forsskål, *Caraxeron* Rafinesque (= *Philoxerus* auct. mult., non R. Brown) and *Froelichia* Moench. *Alternanthera flava* (L.) Mears, comb. nov., is presented. It is demonstrated that Linnaeus' attitudes about the genus *Gomphrena* were more closely related to inflorescence characteristics than to stamen and stigma number.

During a study of *Alternanthera* Forsskål it was necessary to examine the types of species originally described by Linnaeus as *Gomphrena*. The discovery that several of Linnaeus' species of *Gomphrena* have been totally neglected or thoroughly misunderstood has led to this summary. One result of the study has been the realization that Linnaeus was led to place the species in *Gomphrena* and later in *Illecebrum* more by inflorescence characteristics than by stigma and stamen characteristics.

While *Gomphrena* L. of the first edition of *Species Plantarum* (1753) and the fifth edition of *Genera Plantarum* (1754) included nine species, the published concept of *Gomphrena* dates from Linnaeus' publications on the Clifford herbarium (1737, 1738), in which only two species were included: one, eventually named *Gomphrena globosa* L., based upon original plant material and earlier citations; the other, eventually named *Gomphrena flava* L., based only upon original plant material. *Gomphrena globosa* is consistent with the genus characters noted by Linnaeus in 1754 and with the placement of the genus in *Pentandria Digynia* (although *G. globosa* does sometimes have three stigma lobes); *G. flava* is monogynous and represents a species long regarded as part of the genus *Alternanthera*. In order to preserve the current concept of the genus *Gomphrena* L., *G. globosa* L. should be accepted as the lectotype species of *Gomphrena*, as proposed (Hitchcock and Green, 1929). Of the nine species of *Gomphrena* of 1753 only two, *G. perennis* L. and *G. serrata* L., are now considered congeneric with *G. globosa*. Either might have been selected as lectotype species without changing the current concept of the genus, but it was more appropriate to select the widespread cultivated species, *G. globosa*, known from 1737 to Linnaeus.

In *Species Plantarum* Ed. I. (1753) Linnaeus recognized nine species. In 1759 a tenth was described, and in 1762, an eleventh, while four were transferred to *Illecebrum* L. Since *Gomphrena* was described as a genus of Linnaeus' section *Pentandria Digynia* and *Illecebrum*, of *Pentandria Monogynia*, the 1762 transfers suggest a re-examination of floral parts.

(1) *Gomphrena globosa* L. Species Plantarum p. 224. 1753.

globosa. 1. Gomphrena caule erecto, foliis ovato-lanceolatis, capitulis solitariis, pedunculis diphyllis. Hort. cliff. 86. Hort. ups. 57. Fl. zeyl. 115. Vir. cliff. 22. Roy. lugdb. 418.

[1] The Academy of Natural Sciences of Philadelphia, 19th and the Parkway, Philadelphia, PA 19103, U.S.A. [Financial support toward publication gratefully acknowledged—Ed.]

Amarantho affinis indiae orientalis, floribus conglomeratis, ocymatri folio. Breyn. cent. 109.t.51. Comm. hort. 1. p. 85.5.45.

Habitat in India.

There are two specimens of *Gomphrena globosa* at LINN labelled 319.1 and 319.2. There are no associated marks to relate these specimens to *Species Plantarum*, and there is no evidence Linnaeus saw the specimens. Seven elements are cited in the 1753 description of *Gomphrena globosa*, which originated in the *Hortus Cliffortianus* (1738). The specimen on page 86 of the bound herbarium of Clifford at the British Museum (Natural History) matches the original description and the current concept of the species *Gomphrena globosa*. While the description in *Hortus Cliffortianus* was based on a specimen, several earlier descriptions and illustrations were included by Linnaeus from publications of Boerhaave, Breyne, Commelin, Hermann, Plukenet, Plumier, Rheede tot Draakenstein, Tournefort and Vaillant. In *Flora Zeylanica* (1747) Linnaeus maintained most of the earlier precedents while citing *Hortus Cliffortianus* and Burman's *Thesaurus Zeylanicus* (1737). *Hortus Upsaliensis* (1748) cites no new sources. Material from the Uppsala garden (P) and from Hermann's collection (BM) matches the Clifford specimen. Royen (1740) cites Boerhaave, Tournefort and the two publications related to Clifford's collection. Breyne's illustration (1678) was based on original material but matches the Clifford specimen. Commelin cites Breyne and *Wadapus* of Rheede tot Draakenstein. Hermann's material is not preferable as the type, as implied by Lourteig (1966), because the species concept was established before Linnaeus saw Hermann's herbarium in 1744 (Stearn, 1957; for the date). The plant material on page 86 of the bound *hortus siccus* of Clifford (BM) is designated the LECTOTYPE.

Gomphrena globosa L. is the widespread, cultivated species called globe amaranth. It was retained by Linnaeus in the genus *Gomphrena*.

(2) *Gomphrena perennis* L. Species Plantarum p. 224. 1753.

perennis. 2. Gomphrena foliis lanceolatis, capitulis diphyllis, flosculis perianthio proprio distinctis.
Amaranthoides perenne, floribus stramineis radiatis. Dill. elth. 24. t.20.f.22.

Habitat in Bonaris.

Gomphrena perennis L. is not represented in the Linnaean herbarium (LINN). The specimen in the Dillenian herbarium at Oxford (Druce and Vines, 1907) is said to have been given to Dillenius by Philip Miller. The Oxford material has not been seen, but the inaccurate illustration in *Hortus Elthamensis* (1732), which should be considered the type, corresponds in leaf, stem and inflorescence characteristics with a specimen at BM labelled "Gomphrena perennis Linn. A spec. hort. Miller." This species has always been retained in *Gomphrena* although it is not very closely related to *G. globosa* L.

(3) *Gomphrena serrata* L. Species Plantarum p. 224. 753.

serrata 3. Gomphrena caule erecto brachiato, capitulis solitariis terminalibus sessilibus, calycibus serratis.

Habitat in America.

There is no specimen labelled *Gomphrena serrata* in the Linnaean herbarium (LINN). However, there is a Houstoun specimen from Vera Cruz in the British Museum (Natural History) labelled by Solander with the Linnaean terminology (according to notes on the specimen and advice from herbarium assistants in 1975). It is

probable that the indicated Houstoun specimen is either the original specimen from Linnaeus' herbarium or a duplicate of it, but there is no proof that Linnaeus saw it in London in 1736 or later. Therefore it is designated the NEOTYPE of *Gomphrena serrata* L. There is a second Houstoun specimen of this species also at the British Museum (Natural History).

The species to which the name *G. serrata* L. applies was renamed by Jacquin (1805) *Gomphrena decumbens*, without reference to Linnaeus' species name. *Gomphrena dispersa* Standley is a name applied to some phenotypes of the same variable species. *Gomphrena serrata* L. is the most common and most widely distributed noncultivated species of *Gomphrena*. It is frequently misidentified as *G. celosioides* Martius, a closely related species restricted to South America except in cultivation.

Gomphrena serrata is closely related to *G. globosa* and was retained in *Gomphrena* by Linnaeus. It has five anthers and two long stigma lobes. Contrary to the description of Linnaeus, it is not the calyx which is serrate but the bracts.

(4) *Gomphrena interrupta* L. Species Plantarum p. 224. 1753.

interrupta 4. Gomphrena caule erecta, spica interrupta. Roy. lugdb. 419.

Habitat in America.

There is no specimen with this species name in the Linnaean herbarium (LINN), but there is a specimen in the J. E. Smith herbarium (LINN) under "465.4 Gomphrena interrupta. Froelichia." labelled "1. h. Linn. f." There is no reason to believe Linnaeus senior saw the Smith herbarium specimen. Royen (1740) cited no earlier precedents. Although it has not been possible in the last few years to locate the HOLOTYPE in the van Royen herbarium at Leiden (Veldkamp, pers. comm.), it had been identified previously as the species now known as *Froelichia interrupta* (L.) Moquin. In the original description of *Froelichia*, Moench (1794) called it *Froelichia lanata,* citing Linnaeus' species. *Gomphrena interrupta* L. was designated as the type species of *Froelichia* by Britton (1913). There is a Houstoun specimen of this species at the British Museum (Natural History); it might represent an isotype, but there is no reason to believe that Linnaeus saw it. The Houstoun specimen (BM) is designated the NEOTYPE since the van Royen herbarium specimen has not been located recently.

Froelichia is a genus closely related to some species of *Gomphrena*. It has spicate inflorescences, no leaves immediately under the inflorescences, calyx lobes fused in fruit and capitate (monogynous) stigmas. *Gomphrena interrupta* should not have been placed in a genus of *Pentandria Digynia*. Nonetheless, Linnaeus retained it in *Gomphrena* throughout his lifetime, although he transferred several "monogynous" species from *Gomphrena* to *Illecebrum* in 1762. Linnaeus probably had no specimen of his *G. interrupta* available for examination after he saw van Royen's material (1735-1738; see Stearn, 1957). *Gomphrena interrupta* shares with the other species Linnaeus retained in *Gomphrena* (1762) inflorescences that are not sessile and that are not conspicuously axillary.

(5) *Gomphrena flava* L. Species Plantarum p. 224. 1753.

flava 5. Gomphrena pedunculis oppositis bifidis tricapitatis, capitulo intermedio sessili.

Gomphrena pedunculis ad alas geminatis tricapitatis. Hort. Cliff. 87.

Habitat in Vera Cruce.

There is no specimen related to this name in the Linnaean herbarium in London

(LINN). In *Hortus Cliffortianus* Linnaeus cited a Houstoun specimen from Vera Cruz which is preserved in the Clifford Herbarium at the British Museum (Natural History). It is the HOLOTYPE of *Gomphrena flava* L. Suessenguth saw the specimen shortly before his death and identified it as the species *Alternanthera gracilis* (Martens and Galeotti) Uline and Bray, a decision noted by Holzhammer (1956). The rediscovery of the identity of *Gomphrena flava* L. requires the new combination **Alternanthera flava** (L.) Mears, comb. nov., based upon *Gomphrena flava* L. 1753. non Pavon ex Moquin. 1849, for the species earlier known as *Alternanthera gracilis*. *Alternanthera flava* is endemic to Central America.

Alternanthera flava has five anthers and a capitate stigma, yet Linnaeus retained it in *Gomphrena* when he transferred other monogynous species to *Illecebrum*. Again, it has a pedunculate, mostly terminal inflorescence, characteristics not shared by the species transferred to *Illecebrum*.

(6) *Gomphrena vermicularis* L. Species Plantarum p. 224. 1753.

vermicularis 6. Gomphrena foliis carnosis obtusis, capitulis oblongis terminalibus.
Caraxeron humile, cepeaefoliis, capitulis albis.
Vaill. act. 1722. p. 264.
Amaranthoides humile curassavicum, cepeae foliis lucidis, capitulis albis. Herm. Parad. 15.t.15. f.4.5.
Pluk. alm. 27.t.75. f.9
Amarantho affinis aizoides f. Amaranthoides minor americana procumbens, sedi teretifolii foliis & facie, flore oblongo niveo. Breyn, prod. 2.
Trifolii spica Crithmum maritimum non spinosum brasiliense, Raj. hist. 1331.

Habitat in Brasiliam, Curassao.

Five elements were cited by Linnaeus in 1753. Vaillant, in the Histoire/Memoires de l'Academie Royale des Sciences. Paris. 1722 (dated 1724 on the title page but dated 1722 on the binding at PH), page 195, is the source of the genus name *Caraxeron*, revived by Rafinesque (1837) for this species. Vaillant cites Hermann, Plukenet and Ray. Hermann and Plukenet cite Breyne and Ray while providing poor illustrations which match the current concept of the species. Breyne cites material of Marcgrave, while Ray cites material of Marcgrave and of Piso. There is no specimen of *Gomphrena vermicularis* L. in the Linnaean herbarium (LINN). I have seen no Vaillant material at P or relevant material of Plukenet, Breyne, or Ray. There is Hermann material of this species adequately labelled in the Sloane herbarium (BM vol. 2, p. 108) but the Hermann material of *Amaranthoides humile curassavicum cepeae foliis lucidis, capitulis albis* at P is a mixture of *Alternanthera sessilis* (L.) DC., *Alternanthera paronychioides* St. Hilaire and the species usually called *Philoxerus vermicularis* (L.) J. E. Smith. The Hermann material in the Sloane herbarium (BM) is designated the LECTOTYPE, so that the long accepted species name may be retained. There is other material of this species in vol. 92, p. 11 and vol. 95, p. 40 of the Sloane Herbarium (BM).

This species has been known as *Philoxerus vermicularis* (L.) Smith, since 1814 (usually attributed to later authorities). However, Robert Brown's publication (1810) of *Philoxerus* named three species, all Australian endemics generally regarded (Burbridge, 1963) as *Gomphrena* species. *Philoxerus* Brown is therefore the name of the endemic Australian species of *Gomphrena* if they are regarded as a separate genus. *Gomphrena vermicularis* and its closest relatives are distinct from species of *Gomphrena*, including the Australian endemics, in stamen and calyx characters; and it has been necessary (Mears, in preparation) to revive the name *Caraxeron* Vaillant ex

Rafinesque for the genus which includes *Gomphrena vermicularis* L. *Caraxeron vermicularis* (L.) Rafinesque has five anthers and two long stigma lobes. Nonetheless, Linnaeus transferred his species *Gomphrena vermicularis* to *Illecebrum* (*Pentandria Monogynia*) in 1762. Unique among all the Linnaean species of *Gomphrena* 1753, *G. vermicularis* has a bifurcate stigma *and* sessile, globose, axillary inflorescences. Again, the stigma characters were secondary to the inflorescence characters in the switch from *Gomphrena* to *Illecebrum* in 1762. (Linnaeus used the variant spelling "vermiculatum" in several later publications.)

(7) *Gomphrena sessilis* L. Species Plantarum p. 225. 1753.

7. Gomphrena caule repente, foliis lanceolatis subsessilibus, capitulis oblongis sessilibus axillaribus Fl. zeyl. 116. Amaranthus humilis, foliis oppositis, floculis ex alis glomeratis. Burm. zeyl. 17.t.4.f.2. Coluppa. Rheed. mal. 10p.21.t.9. sessilis

Habitat in India.

There is no material of this species in the Linnaean herbarium (LINN). The three elements included in the 1753 description are (1) Linnaeus' *Flora Zeylanica* (1747), in which Burman, Plukenet, Commelin, Rheede and Hermann are cited; (2) Burman's *Thesaurus Zeylanica* (1737) ["Amaranthus humilis, foliis oppositis, flosculis in alis conglomeratis" according to Burman] plate 4 and (3) Rheede tot Draakenstein's *Hortus Indicus Malabaricus* plate 9 in volume 10. The illustrations in Burman and Rheede tot Draakenstein probably represent the species now known as *Alternanthera sessilis* (L.) R. Brown ex DC., which was based on *Gomphrena sessilis* L. [In Mears (1977) I failed to note that while A. P. de Candolle did not attribute the name *A. sessilis* to R. Brown on p. 77 of *Catalogus Plantarum Horti Botanici Monspeliensis* . . . . 1813, he did attribute the name to R. Brown in a list on p. 4.]

There are five sheets of relevant material in the Hermann herbarium which is a part of the Sloane herbarium at the British Museum (vol. 2, page 2; vol. 2, p. 9, labelled *Gomphrena sessilis* 116; vol. 2, p. 78, labelled *Gomphrena* 116; vol. 5, p. 179; and vol. 5, p. 260). The Herbarium Flora Zeylanica in P has a sheet labelled "Amar. humilis Burm. Zeyl." The Delessert herbarium in Geneva has a Burman herbarium specimen still on the ornamented sheet. All of this material is the species now known as *Alternanthera sessilis* (L.) R. Brown ex DC. The Hermann material on page 9 of volume 2 of the Sloane Herbarium (BM) is designated LECTOTYPE. It is noteworthy that there is a good illustration of this species in Plukenet's *Phytographia* (1705) t.123.f.6., labelled "Amaranthoides madraspatana foliis angustis . . ." It appears not to have been cited by Linnaeus under any species now regarded as Gomphrenoideae. *Gomphrena sessilis* L. is the same as the type species of *Alternanthera* Forsskål, *Alternanthera triandra* Lamarck (Forsskål published no species name other than an abbreviation "Alternanthera achyranth." in an index). The species presents quite a problem for the Linnaean system of classification. It has five equivalent filamental structures and five slightly smaller but similar structures ("pseudostaminodia") alternating with the filamental structures, but it has only three anthers. Also, it has a capitate stigma. Linnaeus included it in *Gomphrena (Pentandria Digynia)* in 1753 but transferred it to *Illecebrum (Pentandria Monogynia)* in 1762. Forsskål (1775) was apparently the first to notice that it is triandrous. *Alternanthera sessilis* has *sessile*, axillary inflorescences.

(8) *Gomphrena ficoidea* L. Species Plantarum p. 225. 1753.

8. Gomphrena caule repente, capitulis rotundis sessilibus, foliis lanceolato-ovatis. Ficoidea

Gomphrena caule diffuso repente, capitulis sessilibus. Roy. lugdb. 418.

Amaranthoides marina repens, polygoni folio, capitulis argenteis. Plum. spec. 20

Habitat in America meridionali.

There is a specimen of the species now called *Alternanthera tenella* Colla (Mears, 1977; Veldkamp, 1978) in the Linnaean herbarium (LINN). The specimen apparently originated in the Uppsala garden. There is no evidence that Linnaeus saw the specimen before 1753.

The two elements cited by Linnaeus in 1753 are van Royen's *Florae Leydensis Prodromus* (1740) and Plumier's *Catalogus Plantarum Americanarum* (1703). Van Royen cites Tournefort, who cites Plumier. The Plumier illustration, while not identifiable, is possibly the species now known as *Alternanthera paronychioides* St. Hilaire. There is a specimen at L from van Royen's herbarium; the specimen was probably seen by Linnaeus (Veldkamp, 1978). The van Royen specimen is also *Alternanthera paronychioides*. The van Royen herbarium specimen is designated the LECTOTYPE.

The name *Alternanthera ficoidea* (L.) R. Brown ex Roemer and Schultes (1819) has been used consistently for more than 150 years for the species now called *Alternanthera tenella* Colla, in spite of Palisot de Beauvois' use (1818) of the name *Alternanthera ficoides* for a specimen and illustration now recognized as *A. sessilis* (L.) R. Brown ex DC. There is a question whether Beauvois' name is a new combination based upon *Gomphrena ficoidea* L. (as argued by Veldkamp, 1978) or a new species in 1818 (as argued by Mears, 1977). Mears lectotypified *Alternanthera ficoides* Palisot de Beauvois with a Beauvois specimen (G-DC: labelled "*Alternanthera ficoides* B! Afrique bord de la mer") which is now identified as *Alternanthera sessilis* (L.) R. Brown ex DC. Veldkamp (1978) recommends rejection of the name *Alternanthera ficoides* (L.) Palisot de Beauvois 1818 (= *Alternanthera paronychioides* St. Hilaire. 1833). While Palisot de Beauvois cited R. Brown under the genus name *Alternanthera*, he did not cite any earlier authority or binomial under the species name and description. Indeed R. Brown did not use the binomial. Moreover, Palisot de Beauvois' material (P, G-DC) is neither *Alternanthera ficoidea* (L.) R. Br. ex Roemer and Schultes (= *A. paronychioides* St. Hilaire) nor the species long mistakenly associated with that name (= *A. tenella* Colla). It is presumptive to argue that Palisot de Beauvois was transferring an earlier name when he cited no earlier species names and when his clearly labelled specimens are not either *Alternanthera* species earlier associated with the species names "ficoidea." Beauvois' erratic style promotes the argument that we must evaluate what he actually published, not what we think he must have meant.

It is my position, with reference to the recommendation of Veldkamp (1978) to reject the name *Alternanthera ficoidea* (L.) Beauvois, that (1) *A. ficoidea* (L.) Beauv. does not exist; (2) *A. ficoides* Beauv. 1818 typified by Beauvois, Guinea (G-DC; isolectotype, P) is a later synonym of *A. sessilis* (L.) R. Brown ex DC. 1813; (3) *A. ficoidea* (L.) R. Brown ex Roemer and Schultes. 1819. is a later homonymous orthographic variant of *A. ficoides* Beauv. 1818 (see Stafleu et al. (1978), Article 75.2 examples of orthographic variants: "*poikilantha* and *poikilanthes; pteroides* and *pteroideus.*"); and (4) therefore there is no need to reject *A. ficoides* Beauv. 1818 or *A. ficoidea* (L.) R. Brown ex Roemer and Schultes 1819. *Gomphrena ficoidea* L., now known as *Alternanthera paronychioides*, has five anthers and a capitate stigma; it also has sessile, axillary inflorescences. It was transferred to *Illecebrum* by Linnaeus in 1762.

(9) *Gomphrena polygonoides* L. Species Plantarum p. 225. 1753.

9. Gomphrena foliis lanceolato-sublatis, caule dichotomo villoso, capitulis axillaribus pedunculatis. Amaranthoides humile curassavicum, foliis polygoni. Herm. prodr. 17.t.17.f.1.Sloane.jam.48.hist.1. p.141.t.86.f.2.Raj.Suppl.126. polygonoides

Habitat in American meridionali.

Pedersen (1967) has explained adequately the reasons for considering *Gomphrena polygonoides* L. a nomen obscurum, summarized below.

The three elements cited by Linnaeus in 1753 are (1) Hermann's *Paradisus Batavus* (1698, p. 16, plate 17, figure 1) which cites a Breyne description; (2) Sloane, which cites Hermann; and (3) Ray, which cites Breyne, Hermann and Sloane. Neither the Hermann plate nor the Breyne description is identifiable, and neither Breyne nor Sloane specimens have been seen. The material at P and BM identified with the Hermann polynomial is a mixture of *A. sessilis, A. paronychioides, A. tenella,* and *C. vermicularis*. The material at BM identified with the Hermann polynomial is a mixture of *A. sessilis* and *A. paronychioides*. There is also a specimen (BM; herb. Sloane vol. 2, p. 105a) labelled with the Hermann polynomial, with the name Richardson added in pencil; it is *Lithophila muscoides* Sw.

There are five components of the Linnaean description: (1) lanceolate-subulate leaves; (B) villous stems; (C) branched stems; (D) axillary capitula; (E) pedunculate capitula. A comparison of the species identified in the material labelled with the Hermann terminology shows *A. sessilis*, with C, D and sometimes A; *A. paronychioides*, with B, C, D; *A. tenella* with B, C, D; *C. vermicularis* with C and D; and *L. muscoides*, A, B, C, D. None of the available type material has pedunculate capitula. Therefore the description must be considered in error! *Lithophila muscoides* might be considered the most likely fit, but there are doubts that the Sloane herbarium material ("Richardson") was seen by Linnaeus. *Caraxeron vermicularis* should be ruled out as the poorest fit. Any one of *A. sessilis, A. paronychioides* and *A. tenella* might be an equally good (poor) fit with the description. I select the material in the Sloane herbarium (BM) in volume 2, p. 106, which is identified as *Alternanthera sessilis* as the LECTOTYPE of *Gomphrena polygonoides* so that the name may not be resurrected to further confuse the nomenclature of *Alternanthera*.

The name *Alternanthera polygonoides* (and early combinations) has been used for several species, *A. paronychioides, A. tenella, A. Kurtzii* Schinz ex Pedersen; moreover *A. sessilis* and *A. caracasana* HBK have often been misidentified with this name. Linnaeus transferred *Gomphrena polygonoides* to *Illecebrum* in 1762. His concept of the species in 1762 probably included axillary sessile inflorescences.

(10) *Gomphrena brasiliana* L. Centuria II. plantarum . . . defert . . . E. Torner . . Upsala. June 1756.

135. Gomphrena (brasiliana) foliis ovato-oblongis, caule erecto capitulis pedunculatis globosis aphyllis.+

Amarantho affinis brasiliana, glomeratis parvisque floribus. Breyne, cent. t. 52.

Habitat in Brasilia.

Linnaeus' mark (+) indicates that he saw no specimen of this species; therefore Breyne's illustration must be the type. There is only a remote chance that a typotype exists: there is none at BM. Breyne's illustration is identifiable as part of the species now called *Alternanthera brasiliana* (L.) Kuntze, but it is impossible to determine the variety intended. It was necessary to delimit the type variety by a circuitous route (Mears, 1977).

Breyne's description, under item t.51 in the copy at PH (1678) while the illustration is t.52, reads " . . . parvisque flosculis." Linnaeus never corrected his misquotation. However, in 1759 Linnaeus changed the name to *Gomphrena brasiliensis*. In 1789 Jacquin cited the corrected Breyne citation with the name *Gomphrena brasiliensis* "Linn, syst. pag. 265. Amoen. Acad. 4.p.310." Willdenow knew they were the same, but subsequent authors referred to *Gomphrena brasiliana* L. and *Gomphrena brasiliensis* Jacquin as two different species, often in two different genera. Kuntze eventually brought the two back together. *Alternanthera brasiliana* has five anthers and a capitate stigma. There was no way for Linnaeus to know the stamen and stigma characteristics. He apparently kept it in *Gomphrena* on the basis of Breyne's illustration of pedunculate, nonaxillary inflorescences.

(11) *Gomphrena hispida* L. Species Plantarum Ed. II. p. 326. 1762.

hispida. 3. Gomphrena caule erecto-capitulis diphyllis foliis crenatis.
Nin-angani. Rheed. mal.9.p.141.t.72.

Habitat in Malabaria.
Flores coerulescentes.

No specimen examined by Linnaeus, with this binomial associated, has been seen. The illustration (vol. 9, p. 141. t. 72. "Min-angani" in the set at PH), which must be the type, does not correspond to any known species of the Gomphrenoideae. United petals and flowers, white becoming blue, are characters unknown in the Centrospermae. Perhaps the illustration represents some species of Verbenaceae (a suggestion made by D. Nicolson, pers. comm.). The name, which may never have been attached to a specimen, was retained by Linnaeus in *Gomphrena* in 1762.

Conclusions

The Linnaean species of *Gomphrena* are now considered species of four genera: *Gomphrena, Caraxeron* (*Philoxerus* auctt.), *Froelichia,* and *Alternanthera*. If Linnaeus knew before 1753 that his *G. sessilis, G. flava, G. brasiliana, G. interrupta,* and *G. ficoidea* had capitate stigmas (were "monogynous"), he neglected that information in 1753. The consistent characteristics of the species of *Gomphrena* recognized in 1753 are absence of a corolla, chartaceous sepals, and more or less condensed, globose inflorescences (actually somewhat spicate in *G. interrupta*). This reliance upon inflorescence characteristics is confirmed directly by Linnaeus' division of the genus *Gomphrena* into two groups, one labelled "floribus terminalibus caule erecto" and the other labelled "floribus lateralibus caule diffuso."

It is noteworthy that *Alternanthera pungens* HBK., the only other species of *Gomphrena, Caraxeron, Froelichia* or *Alternanthera* described by Linnaeus, was included by Linnaeus (1753) not in *Gomphrena* but in *Achyranthes* as *Achyranthes repens* L. (see Mears, 1977). *Alternanthera pungens* shares all the floral characteristics of Linnaeus' *Gomphrena ficoidea* (= *Alternanthera paronychioides*) but was included in *Achyranthes* (of *Pentandria Monogynia*). It is probable that the spinescent calyx which distinguishes *Alternanthera pungens* and obscures the globose shape of the sessile inflorescence, lead Linnaeus to group it with such species as *Achyranthes aspera* L. However, by 1762 Linnaeus had re-evaluated *Achyranthes repens* and transferred it to *Illecebrum* as *I. achyrantha* L.

When Linnaeus transferred *Gomphrena sessilis, G. ficoidea, G. polygonoides, G. vermicularis,* and *Achyranthes repens* to *Illecebrum* in 1762 he created a genus, *Illecebrum*, characterized by procumbent habit and sessile, axillary and more or less globose inflorescences, and (except for the undiscovered triandry of *G. sessilis*) five anthers. In 1762, Linnaeus retained *Gomphrena*, characterized by pedunculate, more

or less globose, mostly terminal inflorescences, five anthers, and a generally erect habitat. Perhaps he thought *G. flava, G. brasiliana,* and *G. interrupta* to be digynous; but they are not. Indeed Linnaeus had not seen the stamen and stigma characteristics of *G. brasiliana* and *G. hispida* and perhaps did not have material of *G. interrupta, G. serrata,* or *G. flava* to examine after 1738. Whether the genus was constructed with the assumption of digyny or in spite of an ambivalence of digyny and monogyny, the weight seems to have been with the visual evidence of pedunculate, more or less globose, mostly terminal inflorescences (see Table 1). The only way to interpret the transfer of *G. vermicularis* to *Illecebrum* in 1762 is that the decision was based on the inflorescence characters.

A study of the Linnaean species of *Gomphrena* has lead to the conclusion that Linnaeus' concepts of *Gomphrena* and *Illecebrum* were determined independently of, and perhaps before, his study of stamen and stigma characteristics. If he ever had the stamen and stigma characteristics for *G. sessilis, G. ficoidea, G. vermicularis, G. polygonoides, G. interrupta, G. brasiliana,* and *G. flava,* a majority of species of *Gomphrena* in 1753, he neglected them at one time or another in favor of inflorescence characteristics.

Acknowledgements

The American Philosophical Society provided a grant which helped to make it possible for me to examine specimens in Paris and London. A. Lourteig was particularly helpful with the collections of the Paris Museum while W. Stearn and J. Lewis assisted me at the British Museum (Natural History). A. Cronquist has advised me on several nomenclatural points over the years, and D. Nicolson has offered much advice and criticism of this paper. I am grateful to all those who have assisted me. This paper has been written while I receive a National Science Foundation research grant (DEB 879 19922) to study *Alternanthera.*

Literature Cited

Breyne, J. 1678. *Exoticarum aliarumque . . . centuria prima.* Danzig.

Burbidge, N. T. 1963. *Dictionary of Australian Plant Genera.* Angus & Robertson Ltd., Sydney.

Burman, J. 1737. *Thesaurus Zeylanicus.* Amsterdam.

Dillenius, J. J. 1732. *Hortus Elthamensis.* 2 vol. London.

Druce, G. C., and S. H. Vines. 1907. *The Dillenian herbaria.* Oxford.

Forsskål, P. 1775. *Flora Aegyptiaco-Arabica.* Copenhagen.

Hermann, P. 1698. *Paradisus Batavus.* Leyden.

Hitchcock, A. S., and M. L. Green. 1929. *Standard-species of Linnaean genera of phanerogamae.* Internat. Bot. Congress, Cambridge (England). 1930. Nomencl. Prop. Brit. Bot. 110–199. London.

Holzhammer, E. 1956. Die Amerikanischen Arten der Gattung *Gomphrena* L. pt. II. *Mitt. Bot. Staatsm. München* 2(14–15): 178–257.

Jacquin, N. F. 1789. *Collectanea ad botanicam . . . .* vol. 2. Vienna.

———. 1805. *Plantarum rariorum horti Caesarei Schoenbrunnensis.* vol. 4, Vienna.

Linnaeus, C. 1737. *Viridarium Cliffortianum.* Amsterdam (reference not seen).

———. 1738. *Hortus Cliffortianus.* Amsterdam.

———. 1747. *Flora Zeylanica.* Stockholm.

———. 1748. *Hortus Upsaliensis.* vol. 1. Stockholm.

———. 1753. *Species Plantarum,* ed. I. Stockholm.

———. 1754. *Genera Plantarum,* ed. V. Stockholm.

———. 1756. *Centuria II. Plantarum . . . defert.* E. Torner. Upsala.

———. 1762-3. *Species Plantarum,* ed. II. Stockholm.

Lourteig, A. 1966. L'Herbier de Paul Hermann, base du Thesaurus Zeylanicus de Johan Burman.

Mears, J. A. 1977. The nomenclature and type collections of the widespread taxa of *Alternanthera* (Amaranthaceae). *Proc. Acad. Nat. Sci. Phila.* 129: 1–21.

Moench, K. 1794. *Methodus plantas horti botanici* . . . Marburg.

Palisot de Beauvois, A. M. F. J. 1818. *Flore d'Oware et de Benin* . . . vol. 2. Paris.

Pedersen, T. M. 1967. Studies in South American Amaranthaceae. *Darwiniana* 14: 430–462.

Plukenet, L. 1691. *Phytographia* . . . . London. (1769 reissue examined).

Plumier, C. 1703. *Catalogus Plantarum Americanum.* Paris.

Rafinesque, C. S. 1837. *Flora Telluriana* pt. III. Philadelphia.

Ray, J. 1686–1688. *Historia Plantarum.* Vol. 1-2. London.

———. 1704. *Historia Plantarum.* Vol. III. (Supplementum tomi I et II). London.

Rheede tot Draakenstein, H. A. van. 1678–1703. *Hortus Indicus Malabaricus.* 12 vol. Amsterdam.

Royen, A. van. 1740. *Florae Leydensis Prodromus.* Leyden.

Sloane, H. 1696. *Catalogus Plantarum quae in Jamaica sponte proveniunt.* London.

———. 1707–1725. *A Voyage to the Islands Madera, Barbados . . . and Jamaica, with the Natural History.* London.

Stafleu, F. A., et al. 1978. International Code of Botanical Nomenclature. *Regnum Vegetabile* vol. 97.

Steam, W. T. 1957. "An Introduction to the *Species Plantarum* and cognate botanical works of Carl Linnaeus," with Carl Linnaeus. *Species Plantarum.* Facsimile. The Ray Society. London.

Tournefort, J. P. de. 1700. *Institutiones Rei herbariae.* Paris.

Vaillant, S. 1724. Suite de l'éclaircissement de nouveaux caractères de plantes. *Histoire de L'Académie Royale des Sciences. Année* 1722. Avec les Mémoires . . .

Veldkamp, J. F. 1978. A proposal to reject the name *Alternanthera ficoidea* (Linné) Beauv. (Amaranthaceae) in favour of *A. tenella* Colla. *Taxon* 27(2/3): 310–314.

Table 1. Selected characteristics of Linnaeus' Species of *Gomphrena*

Original Linnaean Name	Flower		Inflorescence				Habit	Present Identity
	stamen number	stigma number	apparently sessile or pedunculate	globose or not	apparently terminal or axillary	subtended by two leaves		
*								
G. globosa	5	2 (−3)	pedunculate	globose	terminal	+	erect	*G. globosa* L.
G. perennis	5	2	pedunculate	±globose	terminal	+	erect	*G. perennis* L.
G. serrata	5	2	pedunculate	globose	terminal	+	erect	*G. serrata* L.
G. interrupta	5	1	pedunculate	spicate	terminal	−	erect	*Froelichia interrupta* (L.) Moquin
G. flava	5	1	pedunculate	globose	terminal	−	erect	*Alternanthera* flava (L.) Mears
G. brasiliana	5	1	pedunculate	globose	terminal	−	erect	*Alternanthera brasiliana* (L.) Kuntze
G. hispida	?	?	pedunculate	±globose	terminal	+	erect?	Obscure (Verbenaceae?)
**								
G. vermicularis	5	2	sessile	globose	terminal	−	procumbent	*Caraxeron vermicularis* (L.) Raf.
G. sessilis	3	1	sessile	globose	axillary	−	procumbent	*Alternanthera sessilis* (L.) R. Brown ex DC.
G. ficoidea	5	1	sessile	globose	axillary	−	procumbent	*Alternanthera paronychioides* St. Hilaire
G. polygonoides	(5)?	(1)?	sessile?	globose	axillary	?	procumbent	Obscure; *A. sessilis*, by lectotypification

*group retained in *Gomphrena* in 1762.
**group transferred to *Illecebrum* in 1762