Research note

Studies in Cyperaceae in southern Africa 41: The *Ficinia gracilis* Schrader complex — An overview

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Abstract

This overview of *Ficinia gracilis* Schrader shows the species complex to have an eastern and southern distribution in South Africa, from montane to coastal altitudes, in open grassland, on moist cliff ledges and in sandy Mediterranean-type (fynbos and renosterveld) habitats. Its components vary in morphological minutiae, but are unified in general growth form and reproductive morphology. Information in this account is derived from literature, herbarium and field studies. Some taxonomic detail is included, but it is NOT a full revision. *F. gracilis*, *F. cinnamomea* C.B. Clarke, *F. dasystachys* C.B. Clarke, *F. tribracteata* Boeck., *F. filiformis* (Lam.) Schrader, *F. tenuifolia* Kunth, *F. rigida* Levyns, *F. acrostachys* (Steud.) C.B. Clarke and an as yet unnamed but described species (see [Gordon-Gray, K.D., 1995. Cyperaceae in Natal. Strelitzia, Vol. 2, National Botanical Institute, Pretoria]) are treated. They constitute a complex of satellite elements that is worthy of molecular analysis.

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1. Introduction

The genus *Ficinia* Schrader (name conserved) has a history of misunderstanding and misidentification; even today some of its elements continue to be confused with genera of Scirpeae, within which tribe it was at first included. Recent morphological and DNA studies (Muasya et al., 1998) have shown it to be more correctly placed in Cyperaceae, near *Isolepis* R. Br. and *Cyperus* L. *Ficinia* is almost exclusively sub-Saharan African. A few taxa are eastern; far more are in the south west. Extra-African extension is reliably recorded only from the Malagasy Republic, with three species known (Chermezon, 1936-37). Their continuing presence requires confirmation.

In South Africa the *Ficinia gracilis* complex extends from the western Cape (33°–34° S) eastwards to the higher altitudes of the low Drakensberg to latitudes of approximately 22°–25° S. There are records of *F. gracilis* from Mt. Kilimanjaro (Tanzania) and Mt. Kenya (0–5°S) (Haines and Lye, 1983). The distributional hiatus from South Africa to Tanzania is apparently without intervening localities, but this requires further investigation.

2. Discussion

2.1. The plants

The plants are tufted or stoloniferous perennial herbs with grass-like leaves the laminas of which (very rarely reduced) vary from two to a fraction of a millimetre in width. The narrowest-leaved plants have a somewhat different facies from broader-leaved examples, but gradation in the field is gradual and erratic (often in mosaic) and there is some variation between young and old leaves on individual plants. Seemingly leaf width is correlated with microhabitat; to generalize, setaceous blades are most frequent in sandy, well drained poor soils, while wider laminas are common under more favourable conditions; plants of moist cliff ledges have leaves that are mostly narrow and elongated but never setaceous, while in wet habitats (rather unusual) the laminas are reduced to short projections. Inflorescences are shortly bracteated heads of closely packed spikelets; occasionally the first bract is slightly below the main head and subtends a very short branch (in which case the spikelets of the head are more loosely packed). Among the leaves the longitudinally-ribbed culms appear fairly robust. Culm/lamina length relationship has been used in taxon
diagnosis, but this is unreliable as culms elongate with maturation of fruits, which does not take place until late in the growing season. In living plants leaf sheaths are glabular with a sticky exudate that causes the sheaths to adhere and frequently results in coverage with soil particles. Microscopic examination reveals longitudinal rows of minute, often dark coloured glands between the projecting ridges of the sheaths. Membranous parts of the leaf sheaths are often, but not always, reddish, a colouration commonest in drier habitats. A ligule, either sloping away from the lamina, or with a truncate apex, is present in all taxa of the plexus, except the unnamed entity that is eligulate. It will be known elsewhere (F. eligulata Gordon-Gray) to bring it into line with the other entities (all presently recognized as species). Features of the reproductive organs are unifying for the plexus; they are not repeated here as they are well described in available florals.

2.2. The binomials of the complex and the entities they represent

F. gracilis Schrader (1832). Type: Zeyher 32 (K, holo.!, P, iso.). Schrader (1832) noted that Poiret’s Scirpus gracilis (1804) differed from his similarly named example. Raynal (1974) determined that Poiret’s basionym derived from Du Petit Thouars 17 (P, holo.) which is Ficinia ecklonea (Steud.) Nees. In consequence, Poiret’s name is superfluous in authorship of F. gracilis. (It is sometimes included even in current literature). Zeyher’s type, without precise locality within the Cape, may well be from the general area of Uitenhage (now the Eastern Cape Province) where collaboration was with Ecklon. Clarke (1897-98) listed F. gracilis from coastal parts of the Cape Province, Pondoland, and Natal, together with a variety commutata that differed in the lowest bract being positioned slightly below the main head. This character is not unusual for the species and varietal segregation has long been discontinued. Plants from the Eastern Cape are frequently named F. gracilis; for example Dyer (1937) remarked “very common amongst grass throughout” [the Albany and Bathurst Divisions]. This name has also been sporadically applied to plants from Lesotho, Natal (now KwaZulu-Natal), Free State, Mpumalanga and Limpopo districts of South Africa, where plants are to be found from altitudes of 30–2440 m (Archer, 2003).

F. cinnamomea C.B. Clarke (1897-98). Type: Cooper 635 (K, syn.!), Wood 1939 (K, syn.!).

This was a nom. nud. listed by Clarke (1894). In 1897 he described and differentiated the entity from F. gracilis on its compact, head-like inflorescence of 5–10 spikelets stating “manifestly compound in F. gracilis” [spikelet numbers 6–20 per head]. Gordon-Gray (1995) maintained F. cinnamomea, distinguishing it on the floral scale (glume) apexulum that is more markedly projecting than the thickened, but not often elongated, scale tip of F. gracilis. Also there were discrepancies in the nutlets and gynophores that required further study in order to make synonymy certain. Further investigation over a wider geographic range has subsequently provided more comprehensive understanding of variability, so that synonymy is no longer doubtful. But up to the present Clarke’s epithet has continued to be applied, particularly to plants from KwaZulu-Natal into the Eastern Cape, and mostly before inflorescences were fully structurally mature, and so not providing satisfactory examples for comparison. Taxonomists have mainly reserved the name ‘gracilis’ for specimens in which dark brown nutlets with faintly transversely lineolate or dotted surface (punctate) topography were present. It should be noted that nutlets reach full maturity only late in the growing season (into autumn in eastern South Africa; into mid-summer in the west).

F. dasystachys C.B. Clarke (1897-98). Type: Flanagan 922 (K, holo.!).

This specific epithet derives from the clearly mucronate, usually well-developed, curved apiculum of the floral scale. Collectively, these scale tips give inflorescences, at full maturity, a somewhat ‘shaggy’ appearance. Mature nutlets were not available to Clarke at the time of establishment of this taxon; nevertheless he stated the gynophore was “small, obpyramidal, margins entire” (Clarke, 1897-98). In general, plants named F. dasystachys differ from those named F. gracilis=[F. cinnamomea] only in degree. They are few in number and in scattered localities within the distributional range of the latter species. Mostly the habitats are seepage crevices among rocks, or in damp grassland at altitudes from 400–610 m (Archer, 2003). Greater robustness, including wider leaf laminas that very occasionally are much reduced, and a fairly stout, woody, contracted or elongated rhizome mainly account for the somewhat different facies that presumably led Clarke to regard this element as distinctive. An added factor in this decision must have been the lack of mature nutlets. These have now been obtained and when mature do not differ significantly from those of F. gracilis. They are sometimes fractionally larger, but fall within the range of measurements for F. gracilis. F. dasystachys seems best interpreted as a habitat variant.

F. tribracteata Boeckeler (1871-73). Type: Drege s.n. (not traced). Provenance: South Africa, Western Cape, Genardendal, Riveronderend Mts.

This binomial is now mostly overlooked. It is not included by Archer (2003), although there are still occasional specimens in herbaria that are so named. When mentioned, it is usually as a synonym of F. tenuifolia Kunth because of narrow leaf laminas. From Boeckeler’s (1871-73) and later Clarke’s (1897-98) descriptions there is no doubt the entity falls within limits of the F. gracilis complex.

F. filiformis (Lam.) Schrader pro parte=[F. tenuifolia Kunth]. Basionym Schoenus filiformis Lam. Illustr. t.p. 135 (1793). Type: ? Ecklon and Zeyher 72 (not located).

Both the above species epithets imply fine, thread-like, setaceous leaf laminas. The names, and F. filiformis in particular, have been freely applied to a number of entities with very narrow leaf blades, so that only a critical selection of specimens bearing this name are either F. tenuifolia Kunth, or F. oligantha (Steud.) J. Raynal. The latter taxon is not part of the F. gracilis complex and is not further considered.

Raynal (1974) established the synonymy of F. filiformis pro parte=[F. tenuifolia]. Burtt (1986), working the vegetation of the southern Drakensberg, described as novel F. undosa and related its nutlet to that of F. filiformis sensu stricto. F. undosa has proved to be synonymous with F. gracilis (Gordon-Gray,
Levyns (1950) in her account of sedges of the Cape Peninsula, named as *F. tenuifolia* plants with numerous setaceous leaves and other features that cannot be distinguished from those of *F. gracilis*: “sheaths rather sticky, blades very slender, channelled... fertile bracts with the green keel projecting beyond the apex... fruit light brown, 3-angled, transversely wrinkled, disc (gynophore) wanting.” Following the description, she commented “specimens from this area which have been named *F. tribracteata* cannot be separated from this species.” (Levyns, 1950).

*F. tenuifolia sensu* Levyns (above) is well represented in the Western Cape Province growing in sandy substrates from the Peninsula at 18° 40′ E into the Eastern Cape to longitudes 25°–26° E, where leaf blades are mostly wider and plants are often named *F. gracilis*.

Along the coastal hinterland of KwaZulu-Natal, sometimes associated with sandstone outcrops, and mostly in south-facing, damp, shaded crevices under rock overhangs are plants with long, narrow laminas that are slightly wider than the hair-like blades of *F. tenuifolia sensu stricto*. These plants represent a gradation between those of the Eastern Cape Province and those of low montane sites in Lesotho and KwaZulu-Natal that are usually named *F. gracilis* or *F. cinnamomea*. A considerable number of herbarium specimens that do not carry mature nutlets remain as *Ficinia* species. Some have been named *F. filiformis*. Others bearing this name are not this species in its strict sense. Clarke (1897-98) reported *F. filiformis* from “Kilimanjaro at an elevation of 10,000 ft” [approx. 3000 m]. The specimens on which he based this comment should be checked against specimens of *F. stolonifera* Boeck., which has often been misnamed *F. filiformis*. *F. stolonifera* is known to be present on Kilimanjaro (Haines and Lye, 1983).

*F. rigida* Levyns (1950) Type: Levyns 6532 (Bol, holo.) Provenance: S.A., Western Cape, Peninsula, Summit Rock, between Smitswinkel Bay and Buffalo Bay.

This species is a slightly more robust expression of *F. tenuifolia* with leaf laminae wider and more wiry, comparable with some examples of *F. gracilis* from the Eastern Cape. The glandular, sticky leaf sheaths and the reproductive organs are similar to those of *F. gracilis*. The characters given by Levyns to differentiate this taxon from *F. tenuifolia* = *F. filiformis* are insignificant. *F. rigida* must be considered synonymous with *F. filiformis*.

*F. acrostachys* (Stud.) C.B. Clarke (1897-98). Type: Ecklon 870 (K., holo.).

Provenance: S.A., Western Cape, Table Mountain. Basionym: *Scirpus acrostachys* Stud.

According to Clarke (1897-98), Steudel had only *Ecklon 870* for reference when he established *S. acrostachys*. This is an incomplete specimen consisting of the upper sections of two flowering culms. Clarke described for this taxon the mucronate glumes and the dark, transversely lineolate nutlets with gynophore small, obpyramidal, entire, that characterize *F. gracilis*, then noted, “it is nearest perhaps to *F. tenuifolia*, but has more numerous spikelets and a more compound head.” (Clarke, 1897-98). However, despite these resemblances to *F. gracilis* and its satellite taxa, *F. acrostachys* remains “inadequately known” (Archer, 2003). [Specimens were not available for study and so it is tentatively only that this species is included in this overview.]

Ficinia sp. A (Gordon-Gray, 1995). Type: Buchanan 71 (K!).

Provenance: S.A., KwaZulu-Natal.

Clarke (1897-98) included this specimen as another syntype of *F. cinnamomea*. However, it differs from *Cooper 635*, which has only young inflorescences, and *Wood 1939*, which is more mature. There are also differences from Zeyher 32 (K), the type of *F. gracilis*. The morphological differences that separate this described, but as yet unnamed, species from other taxa of the plexus are not profound, but are as distinctive and as constant as others that have been employed. It seems necessary to provide it with an epithet and so to bring it into line with other satellites of the complex. Field study over a number of years has shown its fairly limited distribution in Lesotho and in the midlands and low Drakensberg areas of KwaZulu-Natal, where plants, at full maturity, form a rather striking component of grassland and small rock outcrops. Culms are slender, yellowish rather than green, and with the weight of inflorescences carrying fruits bend outwards to give the impression of a miniature fountain. The absence of a ligule is notably distinctive within the plexus. The glands of the leaf sheaths are numerous, sometimes present on the lower parts of culms as well, and in living plants the exudate is plentiful. Elongate rhizomes are not known for this entity.

2.3. Discrepancies in the literature

From the standpoint of phenotypic morphology there can be little doubt that the taxa treated in this overview are closely related. The binomials applied to the various elements have been established during almost two centuries, by numerous observers; the plants not always observed *in situ*; examples often few and sometimes at stages of development not permitting full description. It is not surprising that their literature discloses some discrepancies among the taxa. The differences essentially relate to minutaie of structural form of the nutlet and gynophore in particular. With the more exhaustive study of specimens over their wide distributional range in South Africa, aided by modern techniques, the irregularities have become more explicable.

2.4. The nutlet

Surface topography of the nutlet has become a reliable and much used character in sedge identification. However, it is not always appreciated that marked change in this surface may take place with fruit maturation. In early stages of development the fruit epidermal pericarp is usually smooth surfaced, the cells living and photosynthetic. Gradually there are deposits of chemical compounds into these cells and with their death and drying changes in colour and in surface take place. Before dissemination, there is often the breakdown of the outer periclinal cell walls revealing the internal topography of deposits, especially silica, within the cells, and making clear the anticlinal cell walls. Discrepancies in descriptions of the nutlets of the various taxa of the complex are due to the observation of differing stages of development. The fully mature nutlet is dark brown, transversely lineolate and/or punctate; this last due to the stud-like minute deposits of silica.
visible on the internal walls, once the outer walls of the pericarp epidermis have broken down.

2.5. The gynophore

In Cyperaceae the ovary is frequently seated on a small obconical stalk. In *Ficinia* this stalk or gynophore is expanded into a ‘disc’ that is often three-lobed, the lobes generally alternating with the stamens. The presence of such a ‘disc’ is regarded as a main criterion of the genus, useful in distinguishing from close relatives that include *Isolepis* and *Cyperus*. In the *F. gracilis* complex the gynophore takes the form of a short ‘cup’ of tissue enveloping the base of the young fruit. Usually this tissue is thin, but there is variation from slightly swollen and obscurely three-lobed, to thin and more expanded with the lobes more clearly defined. In the literature it has been described most commonly as “small, obpyramidal, upper margin entire”, but also as “disc shortly three-lobed” and “disc lacking”. The last refers to nutlets where the gynophore has dried and fallen away leaving a minute stalk-like relic.

The function of the gynophore is unknown. According to Schonland (1922) “No investigation into its value in fruit dispersal or seed germination has been undertaken for any South African endemic species.” This still pertains. Can it be a food source for some predator which, while aiding dispersal, removes the tissue and so gives passage to water into the fruit assisting its germination? Or does the ‘disc’ serve as a sponge absorbing water itself, or as a food reservoir on which the very young germling may briefly depend?

3. Conclusion

There are bound to be differences of opinion as to how most effectively to treat a complex of species such as is represented in this overview. To the present, attention has not been drawn, except briefly, where it has been mentioned at all, to the close morphological similarity among these taxa. In lists presently being published they are recorded alphabetically without reference to one another. This is artificial and unhelpful to researchers pursuing investigation into relationships, be they phylogenetic, ecological or whatever. Alternatively, to include all the entities within one specific name, even with recourse to infraspecific categories, may lead to information loss. Some of the binomials must be recognized as synonymous. Do others reflect genetic difference, or are they merely habitat expressions? There is insufficient information to do more than hazard tentative guesses. An effective immediate compromise is proposed whereby related taxa are listed together, either bracketed, ‘bullleted’, or otherwise marked to indicate relationship. There are a number of such complexes, not only in Cyperaceae, but also in Poaceae and among the dicotyledons, Asteraceae for example.

4. Summary

There is good evidence supporting the interpretation that the species named below and treated in this overview represent a complex widely distributed geographically in eastern and southern sub-Saharan Africa.

*Ficinia gracilis* Schrader (1832)

*F. filiformis* (Lam.) Schrader *pro parte*=[*F. tenuifolia* Kunth (1837)]

*F. tribracteata* Boeckeler (1871-73)

*F. cinnamomea* C.B. Clarke (1897-98)

*F. dagystachys* C.B. Clarke (1897-98)

*F. rigida* Levyns (1950)

Up to now, they have been treated taxonomically as species morphologically distinct from one another. However, study has shown that clearly defined phenotypic discontinuities are mostly lacking; rather is there gradation from one taxon to another — with some minor distinctions perhaps habitat determined? While it is essential that even minor distinctions be recognized, morphological similarities and gradations are significant in that they are indicative of close phylogeny, whether they be genetically based, or merely habitat or environmental response in the phenotype.

*F. acrostachys* C.B. Clarke (1897-98) is insufficiently known and should be further investigated in its type locality of Western Cape, Table Mountain, in conjunction with other members of the complex.

*F. eligulata* presently unnamed, but described, (see Gordon-Gray, 1995) will be authenticated elsewhere. It differs from all the above entities in the absence of a stoloniferous rhizome and a ligule, but otherwise bears close relationship to *F. cinnamomea* with which it has been much confused.

Personally I have no difficulty in accepting the entities within this complex, with the possible exception of *F. eligulata*, under *F. gracilis* as expressions of that species, until modern molecular investigation has provided better understanding of the phenotypic/habitat/phylogenetic relationships among its components. In holding such opinion I may be in the minority. And there is value from the standpoints of biodiversity and conservation in not losing sight of the varied binomials, provided (and this is important) that their close phenotypic relationships are accepted and acknowledged.

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