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A revision of *Brillantaisia* (Acanthaceae)

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SYNOPSIS. *Brillantaisia* P. Beauv. is a genus of mainly woody herbs and subshrubs from tropical Africa and Madagascar. In this revision, a brief taxonomic history of *Brillantaisia* is presented, the morphological variation of the genus is described, and concepts of species and higher taxa are discussed. The Phylogenetic Species Concept of Nelson & Platnick is adopted as the criterion for species delimitation whilst hennigian monophyly is the criterion used for recognition of higher taxa. Twelve species of *Brillantaisia* are delimited. The relations between the twelve species of *Brillantaisia* and eleven outgroup species representing the genera, *Duosperma, Dyschoriste*, *Eremomastax*, *Hygrophila*, *Mellera* and *Mimulopsis,* are investigated using cladistic methodology and a phylogeny is presented. The results of cladistic analysis show that *Brillantaisia* and six species of *Hygrophila* both belong within a monophyletic group based on a suite of pollen characters. *Brillantaisia* is a monophyletic genus based on the laterally compressed upper corolla lip, membranous hinge at the apex of the corolla tube and winged petiole. *Hygrophila* is paraphyletic, and until further studies are undertaken on that genus, the sister group to *Brillantaisia* remains unresolved. Within *Brillantaisia*, section *Stenanthium* of Lindau is monophyletic; however, subgeneric taxa are not formally recognized in this treatment. A taxonomic account of the twelve species of *Brillantaisia* is provided with illustrations, distribution maps and a key. The main taxonomic changes are that *B. stenopteris* is new to science; *B. riparia* is raised from a variety of *B. pubescens* to species level; *B. grottanellii* is recognized as distinct from *B. madagascariensis*; *B. kirungae, B. ulugurica* and *B. cicatricosa* are considered conspecific and *B. owariensis* is circumscribed as a single widespread and variable species.

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XX(312094.1)

INTRODUCTION

The aim of this paper is to present a revision of *Brillantaisia* with a key for identification of species, addressing the following questions:

1. How many species are there in *Brillantaisia*?
2. Is the genus *Brillantaisia* monophyletic?
3. Are the subgeneric groups within *Brillantaisia* proposed by Lindau (1895*a*) monophyletic?
4. Is *Hygrophila* the sister group to *Brillantaisia*?
5. Is *Hygrophila* monophyletic?

Brillantaisia P. Beauv. is a genus of mainly woody herbs and subshrubs from tropical Africa and Madagascar. Plants of *Brillantaisia* generally have ovate leaves with a winged petiole, an open paniculate inflorescence of bilabiate purple flowers and capsules containing numerous seeds, each held on a hooked retinacula. At the outset of this study, there was no consensus concerning the delimitation of *Brillantaisia*, species boundaries within the genus or species relationships. The genus was thought to contain between 13 (Vollesen, pers. comm.) and 40 (Mabberley, 1987) species. The monospecific genus *Plaesianthera* (C.B. Clarke) Livera from Sri Lanka had recently been transferred to *Brillantaisia* as an Asian representative of the genus by Cramer (1991); however, this genus has been shown to be best placed within *Hygrophila* R. Br. (Sidwell, in press *a*) and is not discussed further in this paper. Prior to undertaking cladistic analyses, *Brillantaisia* is hypothesized as monophyletic (*sensu* Hennig, 1950, 1979), based on the presence of two posterior stamens, two staminodes and a laterally compressed upper corolla lip; the genus *Hygrophila* is hypothesized as the sister group to *Brillantaisia* based on previous classifications of Nees (1847), Bentham (1876), Lindau (1895*a*) and Bremekamp (1953, 1965), and the monophyly of the taxon Hygrophileae containing only *Brillantaisia* and *Hygrophila*, is provisionally accepted on the presence of four aperturate pollen (Scotland, 1992*a*, *b*, 1993; Furness, 1994) and a unique ndhF sequence (Scotland et al., 1995).

Taxonomic history

Brillantaisia was first described in 1818 by Ambroise Marie Palisot de Beauvois from a collection made near Agathon in Benin, West Africa (Palisot de Beauvois, 1818). A single species, *Brillantaisia owariensis* P. Beauv., was described as having a four angled stem, violet flowers in a panicle and ovate-lanceolate toothed leaves with an acute tip and a winged petiole. Thirty years later, Nees von Esenbeck (1847) overlooked the original publication of *Brillantaisia* and described two new genera of Acanthaceae from West Africa: *Belantheria* Nees and *Leucoraphis* Nees. Bentham (1849) recognized the oversight of Nees and transferred the two species of *Leucoraphis* to *Brillantaisia* as *B. lamium* (Nees) Benth. and *B. vogeliana* (Nees) Benth. and synonomized *Belantheria belvisiana* Nees with *Brillantaisia owariensis*. In 1853, Hooker addressed the already problematic issue of species delimitation in *Brillantaisia*. He agreed with Bentham (1849) that the three species described by Nees (1847) should be placed within *Brillantaisia*; however, after observation of a newly introduced garden plant from Sierra Leone (Lindley, 1853), Hooker (1853) concluded that the separation of those species on leaf margin and leaf shape characters was invalid as the character variation previously used to distinguish between the species could be seen on a single cultivated specimen. Hooker therefore united all the species recognized by Nees (1847) and Bentham (1849) under the earliest name, *Brillantaisia owariensis* P. Beauv.[1].

Since that time, many new species of *Brillantaisia* have been described (see Sidwell, 1997 for detailed discussion). Gustav Lindau was by far the most prolific describer of new species in the genus. Between 1893 and 1904 Lindau published descriptions of 25 new species of *Brillantaisia*. The first, largest and possibly most important of these publications was *Acanthaceae Africanae I* (Lindau, 1893), in which, ten new species of *Brillantaisia* were described. Characters used by Lindau at the species level included habit (herb or shrub), leaf shape (ovate or obovate), leaf base shape (cordate or not cordate), leaf apex shape (acuminate or not), cystoliths (present or absent), whole plant indumentum (pubescent or glabrous), sepal length (equal or unequal) and number of ovules. By the time of his account of Acanthaceae in Engler and Prantl's *Die Natürlichen Pflanzenfamilien* (Lindau, 1895*a*) Lindau had published fourteen names in *Brillantaisia*, and was the first and only worker to delimit subgeneric taxa within the genus. Lindau subdivided *Brillantaisia* into two sections: three species with spicate inflorescences were included in section *Stenanthium* Lindau, and nine species with paniculate inflorescences were mentioned in section *Euryanthium* Lindau. Section *Euryanthium* was further subdivided on leaf shape characters into Group A with lanceolate leaves (containing *B. lancifolia* Lindau) and Group B with non-lanceolate leaves (containing all other species with a paniculate inflorescence).

Brillantaisia is now generally considered to be more closely related to the genus *Hygrophila* R. Br. than to other members of the Acanthaceae because both genera possess a bilabiate corolla and numerous seeds. However, historically, the position of *Brillantaisia* within the Acanthaceae has been somewhat confused. Nees von Esenbeck (1847) was the first to produce a worldwide monograph of the Acanthaceae. He refined his work on Asian Acanthaceae (Nees, 1832), changing the rank of some taxa, and placed both *Brillantaisia* (as *Belantheria* and *Leucoraphis*) and *Hygrophila* in the subfamily Echmatacantheae (possessing retinacula), tribe Hygrophileae (corolla 5-parted; stamens 2 or 4; seeds numerous; fruits explosive), Subtribe 1. This was the first grouping of *Brillantaisia* and *Hygrophila* in the same taxon. However, in the same year Lindley (1847) listed *Brillantaisia* as of unknown affinity and noted that three eminent botanists working on the Acanthaceae – Brown, Nees and Meisner – were unable to agree on subdivision of the family. Lindley (1847: 679) noted that 'there are few natural Orders which now demand, in so eminent a degree, a searching investigation as that of Acanthads'. Bentham (1876) subdivided the Acanthaceae into five tribes using a combination of characters (corolla aestivation, ovule number, seed shape and retinacula type). *Brillantaisia* and *Hygrophila* were placed in tribe Ruellieae Benth. (aestivation contorted; seeds 2-many per locule; seeds laterally compressed; retinacula hooked), subtribe Hygrophileae (corolla two-lipped; filaments laterally connate). Baillon (1891) recognized six series in Acanthaceae and considered *Brillantaisia* sufficiently distinct to be placed in the monogeneric series Brillantaisiées characterized by the presence of two fertile posterior stamens, a strongly bilabiate corolla and many seeds per capsule.

The research of Lindau (1895*a*) placed *Brillantaisia* and

[1] There remains some confusion here as Hooker did not explicitly state that *Belantheria* Nees and *Leucoraphis* Nees (separated on the presence or absence of staminodes) should be united under one species of *Brillantaisia*. Typographic error increases the confusion as two species of Bentham (1849), *Brillantaisia lamium* and *Brillantaisia vogeliana*, are apparently mis-named by Hooker (1853), as '*Belantheria lamium*' and '*Belantheria vogeliana*', two combinations which had never been formally published prior to that work. The lumping of *Brillantaisia lamium*, *B. vogeliana* and *B. owariensis* by Hooker is not upheld in this work. Although leaf margin characters are very variable within the genus, there are other discrete morphological characters supporting the recognition of these three species as distinct.

Hygrophila in the Acanthoideae-Contortae-Hygrophileae having 'rippenpollen' with four equatorial apertures. Bremekamp (1965) also placed *Brillantaisia* with *Hygrophila*, in Acanthoideae-Ruellieae-Hygrophilineae, a group with bilabiate flowers in cymes, stamens united into a single group, style not held in place by a row or bundles of trichomes and subglobose, banded, usually four-aperturate pollen. As mentioned above, recent studies confirmed the monophyletic nature of the group consisting of these two genera based on a pollen type not found elsewhere in Acanthaceae (Scotland, 1993) and a unique ndhF sequence (Scotland et al., 1995).

Since the time of Nees von Esenbeck (1847) no monographic work has been undertaken for *Brillantaisia* and the prolific description of species by Lindau (1893; 1894; 1895*a*, *b*, *c*, *d*; 1896; 1897; 1898; 1904) served to exacerbate difficulties in understanding the group. Several regional floras (Heine, 1966; Benoist, 1967; Champluvier, 1985; Vollesen, in prep. *a* & *b*) have addressed the problem of the number of species within *Brillantaisia* in Gabon, Madagascar, Rwanda and East Africa respectively. The authors of these works disagree in particular on the number of species in several morphologically distinct groups within *Brillantaisia*. Taxonomists working on *Brillantaisia* have tended to split it into poorly defined groups and formally name many slightly differing forms of the great morphological variation within the genus. Many new species of *Brillantaisia* have been described, often from little material and based on characters that are highly variable within the genus. Identification of specimens has been inconsistent and a study covering the entire range of geographical and morphological variation of the genus is essential to clarify this confusion.

MORPHOLOGY

Initially I considered it impossible to separate description of the morphological variation of *Brillantaisia* from discussion of the transformation of that information into comparative morphological data (characters and character states) for phylogenetic analysis. However, morphological data are analysed at two different levels in this study. Characters and character states of individual specimens are analysed when delimiting species of *Brillantaisia*, and characters and character states of taxa are analysed when forming hypotheses of relations among those species. In order to emphasize the filtering of data undertaken when transforming observation and description into comparative data, a descriptive approach to discussion of characters is presented prior to discussion of character coding for cladistic analysis. A purely descriptive morphological section provides an overview of the genus, directly comparable with many published monographic studies and some flora accounts for the Acanthaceae, recent examples of which include studies on *Justicia* (Graham, 1988), *Justicia* sect. *Harnieria* (Hedrén, 1989), *Justicia* sect. *Ansellia* (Ensermu, 1990), *Ruellia* (Ezcurra, 1993), *Strobilanthes* (Wood, 1995), *Dicliptera* (Balkwill et al., 1996) and *Phaulopsis* (Manktelow, 1996). Brief discussion of morphological variation is given here and species that exhibit the range of variation of a particular organ are used as examples. Herbarium specimens relevant to the discussion are referenced by collector's name, number and herbarium acronym (e.g. *Kibuwa* 5191, UPS).

The data were obtained through observation of herbarium specimens from BM*, BR*, C, DSM*, E*, ETH, FHO*, G, HBG, K*, LISC, M, MHU, MO*, NY, P*, PRE, S, SCA*, SRGH, W, WAG*, YA* and Z (abbreviations follow Holmgren et al., 1990). Visits have been made to the herbaria marked with an asterisk. Gross morphological features were measured on mature vegetative and reproductive structures using a mm ruler or calipers which measure to 0.1 mm. Finer measurements were made using an 8 mm 0.1 graticule in a Leica Wild M8 dissecting microscope. Floral dissections were made after placing a flower into cold water and heating slowly until the water almost boiled. This usually took about 30 seconds and was sufficient to soften the delicate corolla. Boiling caused the corolla to disintegrate. Photographs were taken using a Nikon F-801s camera with FP4 black and white film and a Microtech MF80 fibre optic light source. Pollen preparations were acetolysed using a modification of Erdtman (1960) (see Sidwell, 1997). Light micrographs of pollen grains were taken using a Dialux 20EB photomicroscope. Scanning electron micrographs were taken at The Natural History Museum, London. Stubs were coated in gold-palladium 80:20% and viewed using an Hitachi S-800 SEM microscope with a working distance of 5–10 mm. Permanent slides of *Brillantaisia* wood were prepared according to Gourlay (pers. comm.): the stem was boiled for an hour, cut in transverse, tangential longitudinal and radial longitudinal sections on a sliding microtome and stained in safranin. The sections were passed through a dehydration series, washed three times in alcohol and mounted in Canada balsam.

Habit

Brillantaisia species range in habit from delicate herbaceous *Brillantaisia lancifolia* Lindau, approximately 50 cm high, to the large woody species *B. kirungae* Lindau which reaches 7 metres tall. Within this range, *Brillantaisia* species are mainly erect, perennial herbs around 1.5 metres tall which often become woody at the base of the stem. *Brillantaisia lamium*, *B. vogeliana* and *B. madagascariensis* T. Anderson ex Lindau, for example, are all erect, perennial herbs that produce adventitious roots at the lower nodes or along branches that touch the ground, enabling them to spread vegetatively. The terms herb, shrub and tree have been loosely applied by collectors to describe the habit of *Brillantaisia* species. For example, *B. madagascariensis* ranges in habit from a 'soft succulent herb' (*Mooney* 6071, S) or a 'perennial herb with creeping and ascending stems' (*Friis & Vollesen* 613, C) to a 'shrub to 2m tall' (*Kibuwa* 5191, UPS). According to the model of plant architecture, described by Weberling (1989) after Troll (1964), plants can be divided into four distinct and clearly defined zones: main florescence; enrichment zone; inhibition zone and innovation zone. This model was used by Manktelow (1996) in her monograph of *Phaulopsis* and can be applied to species of *Brillantaisia* (Fig. 1).

Figure 1 illustrates the architecture of *Brillantaisia* from the apex to the base of the plants as follows. The inflorescence is divided here into two distinct and more precisely defined parts: the terminal thyrse with lateral dichasial branches forms the main florescence and flowering lateral branches (coflorescences) which 'repeat the structure of the main axis to some extent' (Weberling, 1989: 225) form the enrichment zone. These two parts are separated from one another by the basal internode (bi on Fig. 1), and the whole flowering region is termed a synflorescence. Below the enrichment zone, where the axillary buds do not develop into coflorescences, is the inhibition zone, and below that, the region of vegetative growth is termed the innovation zone. The innovation zone is considered the region of production of new shoots after flowering in perennial plants. *Brillantaisia lamium*, *B. vogeliana*, *B. owariensis* and *B. madagascariensis* all exhibit the type of growth pattern described above and illustrated in Figure 1A. Two species, *B. lancifolia* and *B. debilis* Burkill have a main florescence and lack the enrichment zone (Fig. 1B). In the annual species, *B. pubescens* T. Anderson ex Oliv. inhibition of the lateral shoots does not occur, lateral coflorescences occur to the base of the plant and the inhibition and innovation zones

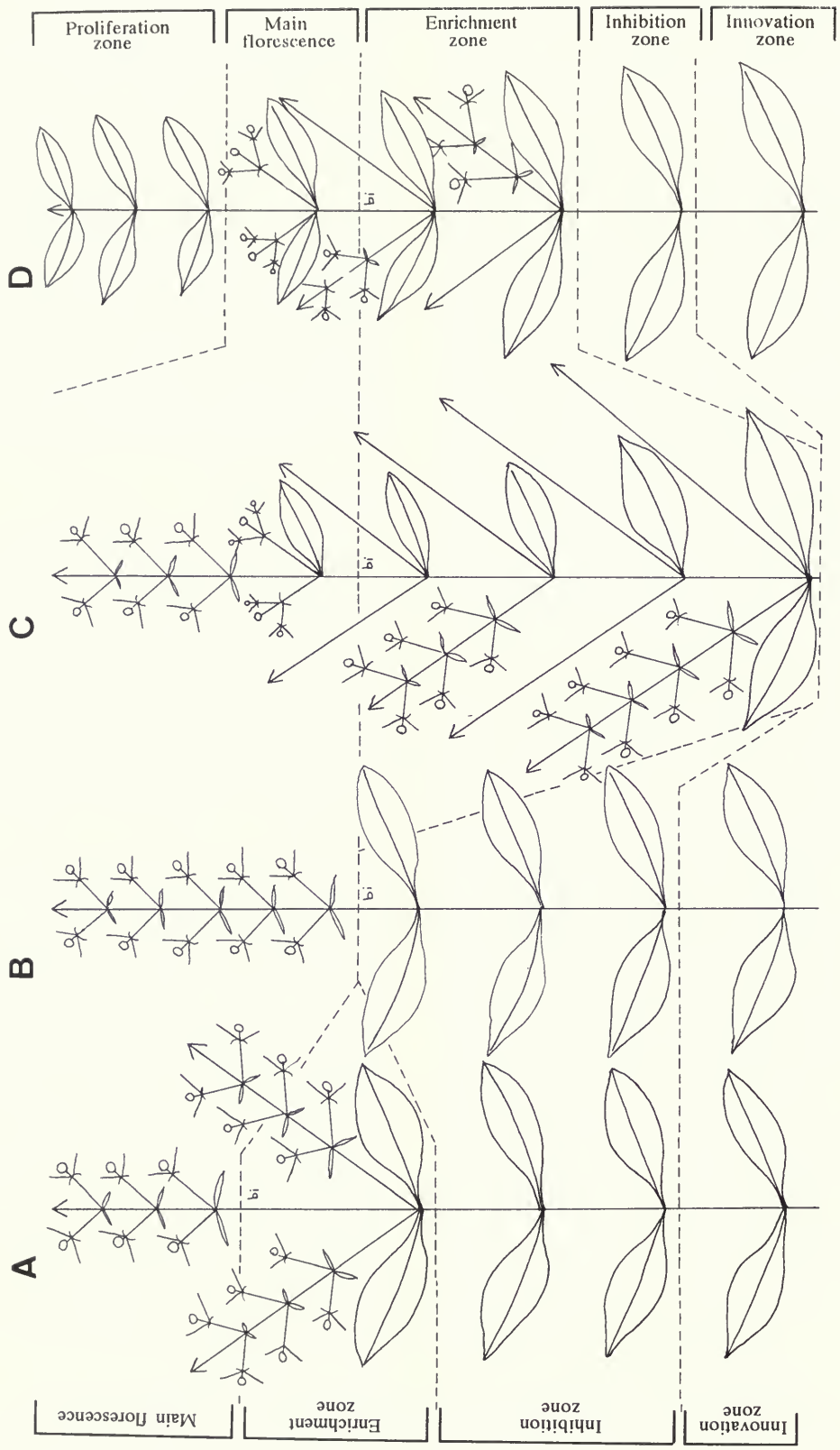


Fig. 1 Models of the architecture of *Brillantaisia* species. A. The model of Troll (1964) and Weberling (1989) with four zones, separated by dashed lines: the main florescence; enrichment zone; inhibition zone and innovation zone; B–D modifications of A; B lacking an enrichment zone; C. lacking inhibition and innovation zones; D with a proliferation zone above the main florescence.

are absent (Fig. 1C). In two species of *Brillantaisia*, the main axis of the plant continues to grow vegetatively above the flowering region. This phenomenon is termed proliferation. Troll (1964) considered the type of vegetative growth seen in *B. oligantha* Milne-Redh. and occasionally in *B. riparia* (Vollesen & Brummitt) Sidwell to be late proliferation which 'consists of the return of the inflorescence apex to a vegetative condition' (Weberling 1989: 257; Fig. 1D). The robust *Brillantaisia kirungae* has been described as a 'very large, straggling, bushy herb' (*Ball* 62, SRGH), a 'robust subshrub' (*Bridson & Lovett* 544, MO) or even a 'small tree' (*Thomas* 3790, MO; *White* 13908, FHO). White's description of *B. kirungae* includes bole measurements which clearly indicate that the plant is a tree, 4 m high with a trunk 1.4 m tall and 12 cm in diameter at 70 cm height (White, 1984); however, such accurate measurement and application of terminology is unusual. I was unable to study this species in the field and the precise pattern of architecture of *B. kirungae* remains uncertain.

Indumentum

The variation of trichomes on different organs of Acanthaceae has been studied in some detail by previous researchers (e.g. Ahmad, 1976, 1978). Singh & Jain (1975) studied the structure and ontogeny of trichomes of Acanthaceae and classified them into forty types in two major groups: glandular and eglandular. Species of *Brillantaisia* possess both glandular and eglandular trichomes. Eglandular trichomes on *Brillantaisia* are of three types: simple filiform trichomes, three to nine cells long, tapering towards the apex; short uniseriate trichomes, two cells long, also tapering to the apex and unicellular trichomes with a rounded apex that is often purple. Glandular trichomes are stalked with a multicelled, capitate head (Selvaraj & Subramanian, 1983) and a two to many celled stalk. The number of cells in the head and stalk of glandular hairs varies continuously between organs and among individuals of *Brillantaisia*. Detailed discussion of indumentum types on the different parts of *Brillantaisia* plants is presented in Sidwell (1997).

Cystoliths

Calcium carbonate cystoliths are present in most members of Acanthaceae and were extensively documented in the last century by Hobein (1884). Recent studies by Inamdar et al. (1990) indicated that variation of cystolith morphology may be a useful taxonomic character above the generic level in Acanthaceae. The cystoliths of *Brillantaisia* are solitary, elongated and pointed at one end. All vegetative parts, bracts, bractlets and calyces are covered in this type of cystolith. The size of cystoliths in *Brillantaisia* varies intraspecifically and even within a single organ of one specimen.

Stem

In this work, the stem is treated as the axis of the plant below the main florescence and basal internode as shown in Figure 1 and is equivalent to the 'hypotagma' of Weberling (1989: 230). The stem is square towards the apex, longitudinally grooved on opposite sides and more rounded towards the base of the plant. The corners of the upper stem are usually slightly curved but may be sharply angled and winged. The stem is slightly swollen at or just below the nodes in all species. Below the basal internode the stem varies in diameter from 1–2 mm in *Brillantaisia debilis* to *c.* 10 mm in *B. kirungae*. In *B. madagascariensis*, *B. vogeliana* and *B. lamium* adventitious roots may be produced at the lower nodes. The epidermal stem surface is covered in cystoliths, oriented parallel to the stem. Multicellular trichomes which may be glandular or eglandular are present on the upper stem and are particularly dense at the nodes.

Wood anatomy

A review of the wood anatomy of 38 species of Acanthaceae was written by Carlquist & Zona (1988). No species of *Brillantaisia* or *Hygrophila* were included in his survey which concluded that 'Woods of Acanthaceae are characterized by relatively narrow vessels with simple perforation plates and alternate lateral wall pitting, septate libriform fibers, scanty vasicentric axial parenchyma, rays both multiseriate and uniseriate, erect ray cells abundant in rays ... numerous small crystals or cystoliths in ray cells ... and nonstoried structure' (Carlquist & Zona, 1988: 201). The stems of plants of *Brillantaisia* often become lignified at the base, particularly in *B. owariensis* and *B. kirungae*. Data on woodiness are incomplete, however, as the lower stem and woody rootstock are very rarely collected on herbarium specimens. One specimen (*Poulsen* 523, FHO) included a collection of the lignified lower stem of *B. kirungae* 20 mm in diameter. This piece of stem showed a clear central pith with wood 7 mm thick and bark 1 mm thick. Transverse sections (Fig. 2A, B) show the vessels, which are relatively broad for the family, to be usually solitary and arranged radially with columns of parenchyma forming medullary rays between the regions of vessels. The vessels have simple perforation plates and minute pitting on the outer walls (Fig. 2F). The fibres are long, thin-walled, septate cells (Fig. 2C, E, F) between which are regions multiseriate rays characterized by a predominance of erect ray cells (Fig. 2C, D). Cystoliths are visible in ray cells but cannot be seen in the sections shown here.

Leaves

The leaves of *Brillantaisia* are characteristically ovate with a winged petiole. However, they vary enormously in size, shape, margin, the extent of the petiole wing and the distribution and density of trichomes on both surfaces. Leaf shape ranges from linear-lanceolate to broadly ovate (Fig. 3). The petiole may be unwinged, or winged to the base. The margin is often irregular, sometimes having dentate, crenate and serrate teeth and may be secondarily toothed. The leaf texture ranges from chartaceous in *B. vogeliana* to slightly coriaceous in *B. owariensis* and *B. kirungae*. The venation is eucamptodromus with tertiary veins becoming perpendicular to the midrib toward the apex of the leaf. In *B. kirungae*, the leaves often dry black. Some *Brillantaisia* species can be recognized to species level when sterile. For example, *B. lamium* has perhaps the most characteristic leaves of all the species, with a usually cordate leaf base, an entire margin and an unwinged petiole (Fig. 3A). *Brillantaisia lancifolia* has lanceolate, entire leaves (Fig. 3I). Plants of *B. madagascariensis*, *B. debilis*, *B. oligantha*, *B. pubescens* and *B. riparia* all possess entire-margined, ovate leaves with a cuneate leaf base narrowly tapering into a winged petiole (Fig. 3B, F, G, H, L). The species with toothed leaves are very variable and relatively difficult to distinguish from one another. Leaves of *B. vogeliana* can be easily recognized by the presence of irregular teeth on the petiole wing, particularly where it widens into the lamina base (Fig. 3C), and by the rather open tertiary venation with unclear quaternary veins. Leaves of *Brillantaisia kirungae* are also characteristically grossly, irregularly toothed (Fig. 3E) and have prominent horizontal and vertical tertiary and quaternary veins giving a very close squared pattern. The leaves of *B. owariensis* exhibit a large range of leaf size, shape and margin type (e.g. Fig. 3K). The leaves often have prominent, parallel tertiary veins running between the secondary veins, with the quaternary veins not clear. Unfortunately, herbarium specimens tend not to show the extent of variation of leaf size in the genus. *Brillantaisia kirungae* and some forms of *B. owariensis* have very large lower leaves which have rarely been collected as they do not readily fit into a plant press.

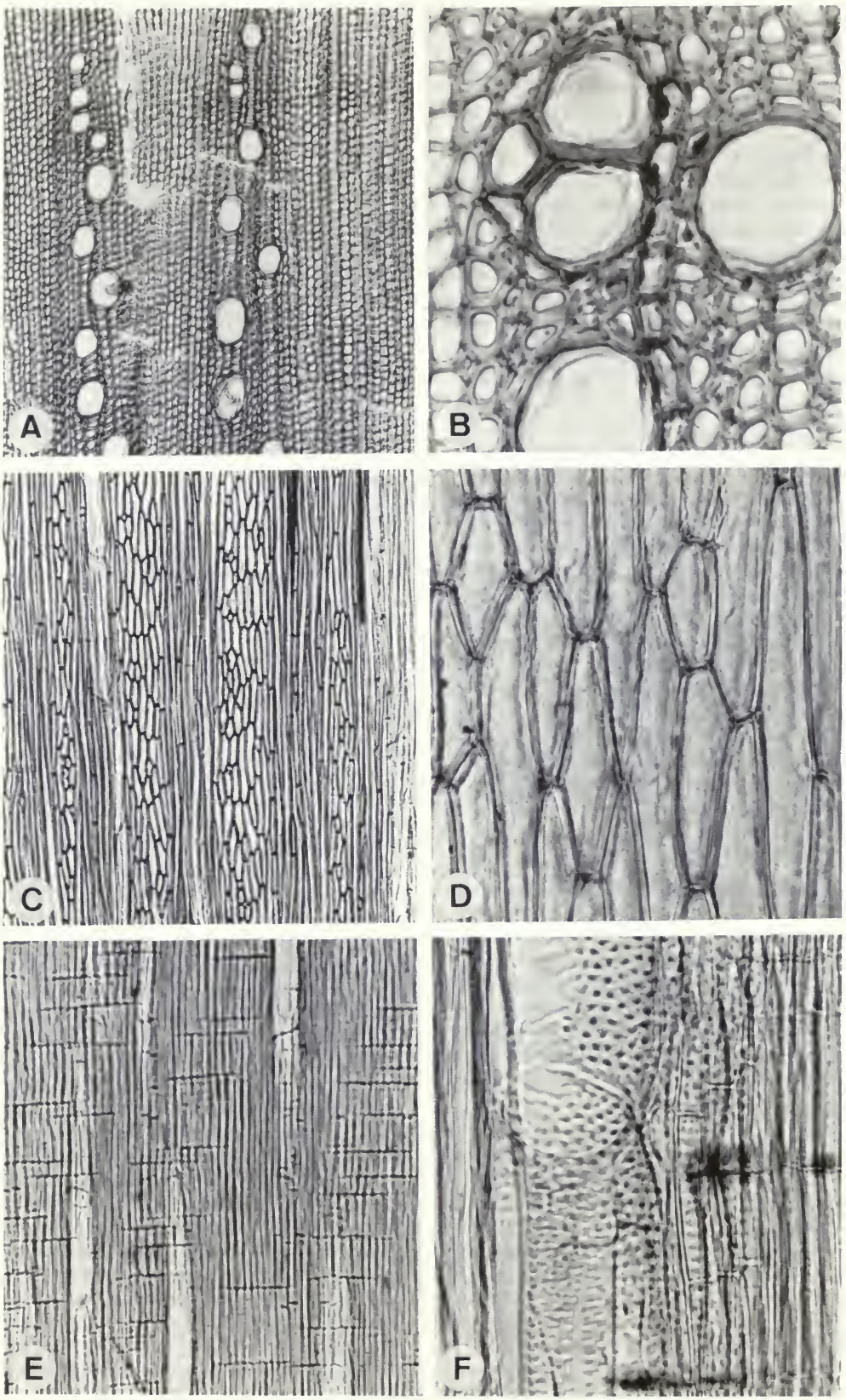


Fig. 2 Wood anatomy of *Brillantaisia kirungae* (*Poulsen* et al. 523, FHO, C, K). A. TS × 50; B. TS × 250; C. TLS × 50; D. TLS × 250; E. RLS × 50; F. RLS × 250.

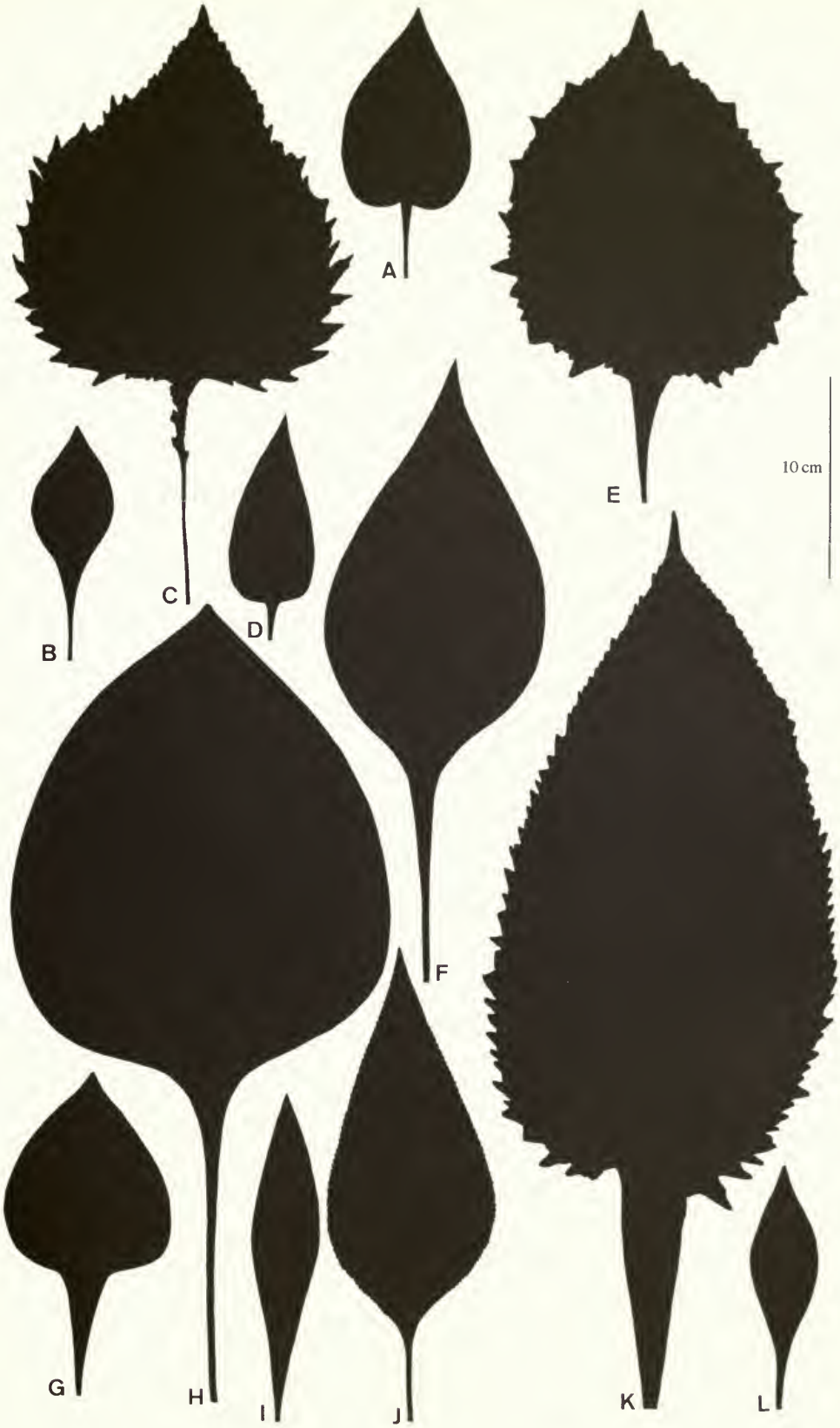


Fig. 3 Leaf shape variation in *Brillantaisia*. A. *Brillantaisia lamium* (*Figueiredo & Arriegas* 32, LISC); B. *B. debilis* (*Louis* 2161, WAG); C. *B. vogeliana* (*Manktelow* et al. 89, UPS); D. *B. lamium* (*IFI* 32657, MO); E. *B. kirungae* (*Friis & Vollesen* 58, C); F. *B. oligantha* (*Brass* 17042, MO); G. *B. madagascariensis* (*Loveridge* 71, MO); H. *B. pubescens* (*Vollesen* 2392, UPS); I. *B. lancifolia* (*Talbot* 200, BM); J. *B. grottanellii* (*Ensermu & Zerihun* 619, ETH); K. *B. owariensis* (*Barbosa* 1812, LISC); L. *B. riparia* (*Robyns* 151, BR).

Inflorescence

Brillantaisia inflorescences have been described in general terms as 'panicules' (Heine, 1966: 83), 'panicules terminales amples ou spicifomes, formes de cymes lâches ou contractées' (Benoist, 1967: 28) or 'large open or contracted panicles, rarely in spiciform racemes' (Vollesen, in prep. *a*). As with many genera of Acanthaceae, it is often difficult to pinpoint a precise division between the vegetative and floral parts of *Brillantaisia* plants and inflorescence structure and variation cannot be described by simply using the broad conventions of botanical terminology such as panicle, raceme, spike or cyme. Although several workers have studied the morphology of Acanthaceae inflorescences in detail, for example in the genera *Pseuderanthemum*, *Ruellia*, *Barleria* and *Lepidagathis* (Sell, 1969*a*), *Anisotes* (Baden, 1981), *Justicia* (Graham, 1988), *Duvernoia* and *Adhatoda* (Manning & Getliffe-Norris, 1985), *Ruellia* (Ezcurra, 1993), *Phaulopsis* (Manktelow, 1996) and *Dicliptera* (Balkwill, 1996) and discussed the problem of appropriate descriptive terminology, there has been no attempt to reach a consensus regarding the application of terms to the inflorescences of Acanthaceae. Several of these studies (Baden, 1981; Manning & Getliffe Norris, 1985; Graham, 1988) illustrated and discussed modifications of different inflorescence types from an 'ancestral' compound dichasium via 'elaboration', 'reduction' and 'condensation' (Graham, 1988: 555). Hedrén's (1989: 20) terminology for *Justicia* sect. *Harnieria* attempted to 'find a simple and consistent terminology for supposedly homologous structures'. However, his terms were different from those previously used for *Justicia* or other Acanthaceae and have not been generally applied at that level. The lack of generally applicable terminology and the lack of parallel usage of available terminology has meant that the easiest solution for each botanist working on Acanthaceae inflorescences has been to develop his or her own clear, explicit terminology for a particular group of plants. *Brillantaisia* inflorescences are described below in light of both important general works on inflorescence morphology (Rickett 1944, 1955; Troll, 1964; Sell, 1969*a*; Weberling, 1989) and the studies of Acanthaceae mentioned above.

The model of the habit of *Brillantaisia* species described above (Fig. 1A) is used as a starting point for understanding inflorescence architecture. The habit model divides the inflorescence into a terminal, main florescence and a lower enrichment zone of lateral coflorescences, the whole flowering region of a plant being termed a synflorescence (Fig. 4A–F). The basic 'unit' of Acanthaceae synflorescences is the dichasium, described by Rickett (1944: 216) as 'a cluster formed by a dichotomy beneath a terminal flower' which 'in its simplest form consists of three flowers' (Fig. 4A). In *Brillantaisia* synflorescences, the basic dichasium structure is repeated and modified so that in most species the amount of dichasial and monochasial branching increases, more or less regularly, down the synflorescence from the apex (Fig. 4A & B). Following the terminology of Weberling (1989: fig. 109) the main florescence of *Brillantaisia* is usually a regular, dichasially branching thyrse or double thyrse (Fig. 4A). Below the main florescence, lateral coflorescences may be present (Fig. 4C). Plants of *B. madagascariensis* and *B. grottanellii* Pichi-Sermoli have very short lateral inflorescence branches, hence the spicate florescence on which Lindau based his sectional division of *Brillantaisia* mentioned above (Fig. 4D). The apex of the main florescence may return to indeterminate vegetative growth as in *B. oligantha* (Fig. 4E). In this case, the lateral dichasia are produced in the axil of a leaf rather than a bract and the question of whether the whole structure is the main florescence or a synflorescence of lateral dichasia arises once again. Indeterminate main florescences may also have lower coflorescences as seen in *B. riparia* (Fig. 4F).

The development of a general terminology for Acanthaceae inflorescences to help clarify higher level homology assessment is considered essential, but beyond the boundaries of this study as it will require detailed ontogenetic, anatomical investigations across a wide range of taxa.

Bracts and bractlets

The bracts of *Brillantaisia* are paired at the nodes of the main florescence axis. In most species of *Brillantaisia* the bracts are foliose, becoming smaller towards the apex of the inflorescence. The bracts are often caducous, for example, *B. owariensis*, has large leaf-like bracts present in the young developing inflorescence which fall soon after the inflorescence opens. The bracts of *B. kirungae* are large, rounded at the apex, amplexicaul and pubescent with short trichomes. Amplexicaul bracts are not seen in other species of *Brillantaisia*. Hedrén (1989: 21) used the term bracteole to refer to 'small, narrow bracts', differentiating them from 'leaf-like bracts'. His terminology is considered imprecise as 'bracteole' specifically refers to 'a leaflike organ subtending a flower in an inflorescence that is itself subtended by a bract' (Blackmore & Tootill, 1984: 48) and does not refer to the size or shape of the organ. The bractlets of *Brillantaisia* do not subtend the flowers, but occur at the dichotomous branching of the dichasial florescence. The term bractlet is used (as by Daniel, 1984) in preference to the term bracteole and refers to the second, third or higher order leaf-like structures at the nodes of the lateral branches of the main florescence or coflorescences. The bractlets of most species of *Brillantaisia* are linear, sessile, and rounded at the apex. Plants of *Brillantaisia pubescens* have shortly petiolate, rounded bractlets which are persistent and highly characteristic of the species.

Calyx

The calyx of *Brillantaisia* has five linear or spathulate, pubescent sepals that are united at the base. The upper adaxial sepal is usually larger than the other four although *B. lamium* and some forms of *B. owariensis* have five subequal sepals. In *B. kirungae*, the upper sepal may be several times wider and longer than lateral sepals. Plants of *B. pubescens*, *B. riparia* and *B. vogeliana* have clearly spathulate sepals. During fruit maturation, the calyx may lengthen significantly. In *B. pubescens*, the largest sepal is as long as the fruit. In *B. owariensis* the upper sepal is occasionally much longer than the fruit.

Corolla

The corolla of *Brillantaisia* has left contort aestivation (Scotland et al., 1994) common to all members of the Contortae *sensu* Lindau (1895*a*). The two lipped corolla of *Brillantaisia* is highly characteristic of the genus. The corolla tube is cylindrical, the upper lip is hooded and strongly laterally compressed, the lower lip is usually reflexed with three lobes at the apex. Between the base of the lower lip and the corolla tube is a region of membranous folded tissue which acts as a hinge allowing the corolla lobes to pivot on the corolla tube presumably facilitating pollination. Corolla morphology varies in the length and width of the tube, the ratio of the tube to the lobes, the shape of the lower lip, and the pubescence of the petals (see Figs 8–16). Corollas range in colour from deep purple to pink with white forms found occasionally in *B. vogeliana*, *B. lamium and B. madagascariensis*. The West African white-flowered *B. madagascariensis* was previously recognized, on the basis of this character alone, as a separate species.

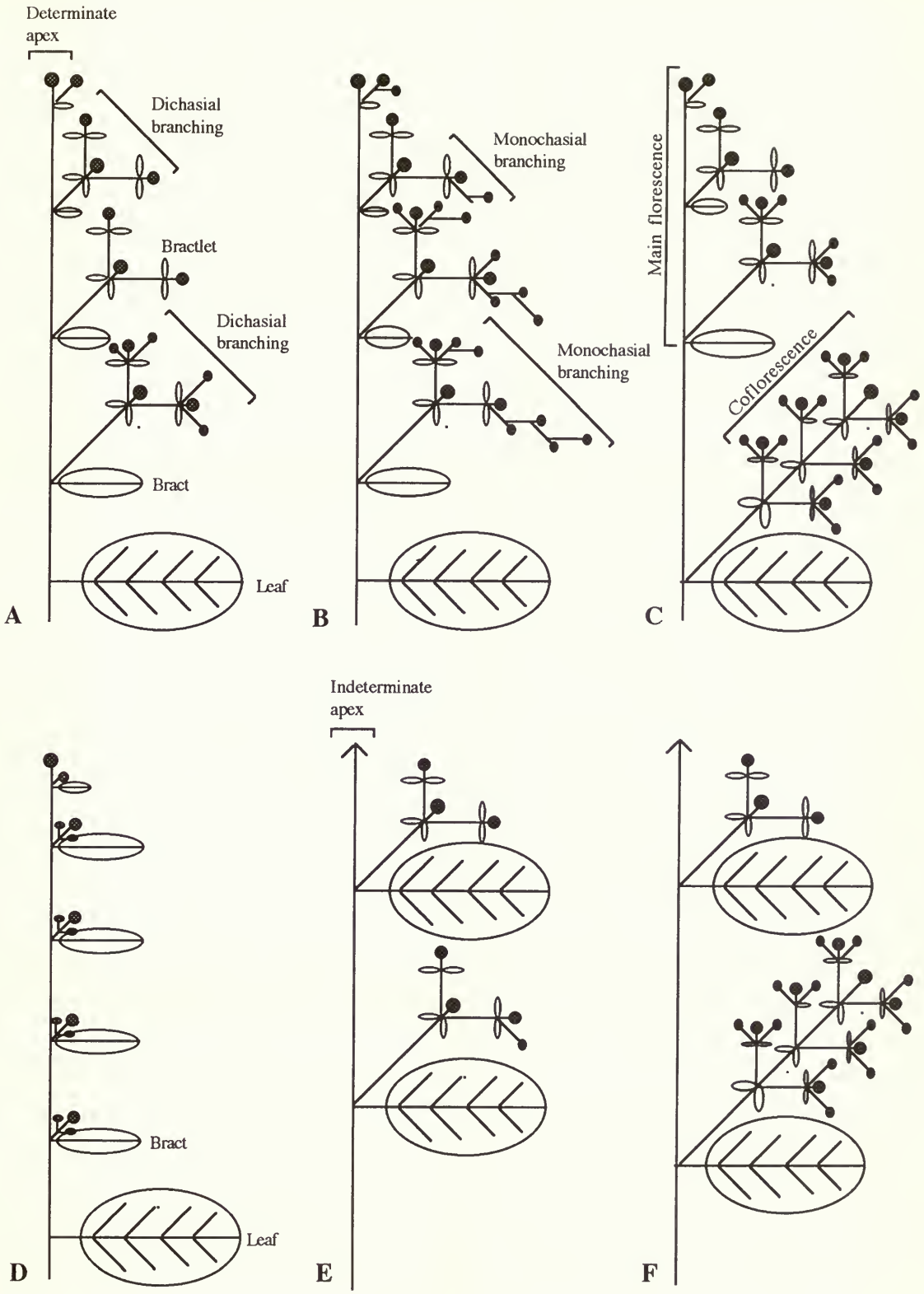


Fig. 4 Synflorescence structure of *Brillantaisia* species. A. basic structure of main florescence: determinate at the apex, with lateral branching once or twice dichasial; bracts on main axis foliose becoming smaller towards the apex, smaller foliose bractlets on lateral branches; B. main florescence with lateral branching both dichasial and monochasial; C. main florescence with lower lateral coflorescence repeating the structure of the main florescence, the whole forming a synflorescence; D. main florescence with reduced lateral branches forming a spike with large persistent bracts; E. main florescence with indeterminate apex; F. main florescence with indeterminate apex and lower lateral coflorescence.

Androecium

Species of *Brillantaisia* have two stamens and two staminodes. It is the two posterior stamens in *Brillantaisia* that are fertile, unlike other Acanthaceae with two stamens in which the anterior pair develop (e.g. Fig. 12C). This was mentioned by Lindau (1895*a*: 278) who stated 'Die Reductionen im Andröecium gehen stets so vor sich, dass die hinteren Stb. zuerst zu Staminodien werden oder ganz verschwinden, nur bei *Brillantaisia* finden sich ausnahmsweise die beiden vorderen Stb. zu Staminodien umgebildet'. The fertile anthers are symmetrical, sagittate, dorsifixed and dehiscent through long lateral slits. The filaments are flattened towards the base, narrowing towards the anther and are almost as long as the corolla lobes and held in the upper hooded lip. The staminodes usually extend beyond the corolla tube and have a small flattened vestigial anther at the apex. In *B. pubescens* (Fig. 8E), *B. riparia* (Fig. 9B) and *B. oligantha* (Fig. 10B) the staminodes are minute or absent.

Pollen

The pollen grains of Acanthaceae are very variable and have been used extensively in taxonomic research on the family (Radlkofer, 1883; Lindau, 1895*a*; Bremekamp, 1944; Raj, 1961; De, 1960; Immelman, 1989; Scotland, 1991, 1992*a*, *b*, 1993; Furness, 1994). The pollen of *Brillantaisia* is usually oblate spheroidal but ranges from suboblate to spheroidal (terms according to Punt et al., 1994). Lindau (1895*a*) used the term rippenpollen to describe the usually oval-ellipsoidal grains with pseudocolpi and equatorial apertures found in *Brillantaisia*. Pollen grains of *Brillantaisia* are four-aperturate (see Fig. 5 and plates in Furness, 1994). The apertures are compound colporate structures consisting of an elongated colpus with a circular endoaperturate pore in the centre. Between the four apertures are pseudocolpi, similar to the colpi but lacking an endoaperture. The number of apertures on a pollen grain occasionally varies and may range from four to six within a single sample. In one pollen sample of *B. owariensis* studied by Furness (1994) all the pollen grains had five apertures, but this character has not been consistently found in other samples of the same species or elsewhere in the genus. Scanning electron micrographs (Fig. 5) clearly show that *Brillantaisia* pollen has raised bands of tectum with pseudocolpi between these bands. The collumellae are fused into a distinct bireticulate tectum in most species of *Brillantaisia* forming a primary reticulum with a smaller reticulate secondary tectum in the lumen (Fig. 5E). *Brillantaisia madagascariensis* has very characteristic pollen with irregularly clavate tectum ornamentation (Fig. 5A–C). *Brillantaisia grottanellii* is morphologically very similar to *B. madagascariensis*, however, investigation of pollen morphology showed this species to lack any tectal ornamentation (Fig. 5D–F). These data combined with gross morphological data, support recognition of *B. grottanellii* as a distinct species.

Gynoecium

The ovary of *Brillantaisia* species is cylindrical, 1–2 mm in diameter and up to 6 mm long and pointed at the apex, tapering to the base of the style (e.g. Fig. 9D). The ovary sits on an annular disc and has parietal placentation with two rows of ovules on each placental axis. *Brillantaisia* species have between twelve and sixty ovules in contrast to most other Acanthaceae which usually have just four ovules per ovary. The style is linear and with a small slightly flattened region at the apex forming the end stigma (Fig. 12D). Many species of Acanthaceae and related families have a simple bifid stigma whereas the second lobe of the stigma of *Brillantaisia* is reduced to a barely visible raised 'tooth' at the base of the receptive stigmatic surface.

Fruit

The fruit of *Brillantaisia* are dry, elastically dehiscent capsules with retinacula (Figs 8–16), characteristic of many members of the Acanthaceae (Sell, 1969*b*). The capusles are erect on the lateral synflorescence branches, each valve has a longitudinal groove from base to apex and within each valve, the seeds are held on two rows of dry, comparatively large, hook-shaped retinacula (Fig. 14A & E). The retinacula is a hardened outgrowth from the funicle of the developing embryo. The capsules of *Brillantaisia* are many seeded (Figs 8–16), compared to the capsules of most Acanthaceae which usually contain only 2 or 4 seeds. Often one or two ovules at the narrowed base or apex of the fruit do not develop into fully mature seeds. The fruit vary between species in size and the number of seeds per capsule and pubescence, for example: the fruit of *B. pubescens* are the smallest in the genus (Fig. 8F); plants of *B. vogeliana* have small fruit with up to 30 seeds per valve (Fig. 13A & C); plants of *B. kirungae* have large glandular pubescent fruit with 8–10 seeds per valve (Fig. 12E) and the fruit of *B. debilis* and *B. lamium* are glabrous (Figs 14A & 16C).

Seeds

Seed surface characters have been shown to be taxonomically useful at the species level in several groups of Acanthaceae including *Hypoestes* (Balkwill & Getliffe-Norris, 1985) and *Peristrophe* (Balkwill et al., 1986), and in the recognition of infrageneric taxa in *Justicia* (Immelman, 1990; Lester & Ezcurra, 1991) and *Siphonoglossa* (Immelman, 1990). The production of mucilage (myxospermy) is common in the Acanthaceae. The mucilage was considered by Kippist (1845) to come from pores in the ends of the seed trichomes. Grubert (1974) said the mucilage was produced by the seed coat.

The seeds of *Brillantaisia* were first described in detail by Schaffnit (1906). The seeds are flattened, asymmetrical, kidney-shaped and covered with long, hygroscopic trichomes which are adpressed when the seed is dry. When wet, the seeds produce mucilage and the hygropscopic trichomes rapidly expand. Trichomes of seeds of all *Brillantaisia* species are along, thin, single cell tapering towards and rounded at the apex with regular annular and occasionally spiral thickening from base to apex. Similar trichomes are common to all species of *Brillantaisia* and *Hygrophila* (Schaffnit, 1906), and were also reported in *Ruellia* by Kippist (1845).

CONCEPTS OF SPECIES AND HIGHER TAXA

The importance of explicitly stating the concepts and methods used for recognition of taxa in botanical monography was highlighted by Luckow (1995) and McDade (1995), among others, and has been discussed in relation to a revision of *Brillantaisia* in an earlier paper (Sidwell, in press *b*). Implicit taxonomic convention that the personal opinion of an expert botanist is sufficient to delimit taxa was deemed unnacceptable for an unbiased scientific study of *Brillantaisia*. The literature on species concepts was carefully reviewed and evaluated and a brief outline of the conclusions of that paper is presented below. Above the level of species, relationships of higher taxa are hierarchical and all groups are recognized on the single criterion of Hennigian monophyly. Species are thought of as different from higher taxa and are delimited independently from considerations of monophyly and prior to any cladistic analysis. They are 'consistent with cladistic theory but independent of constraints of autapomorphy' (Nixon & Wheeler, 1990: 213) and can be

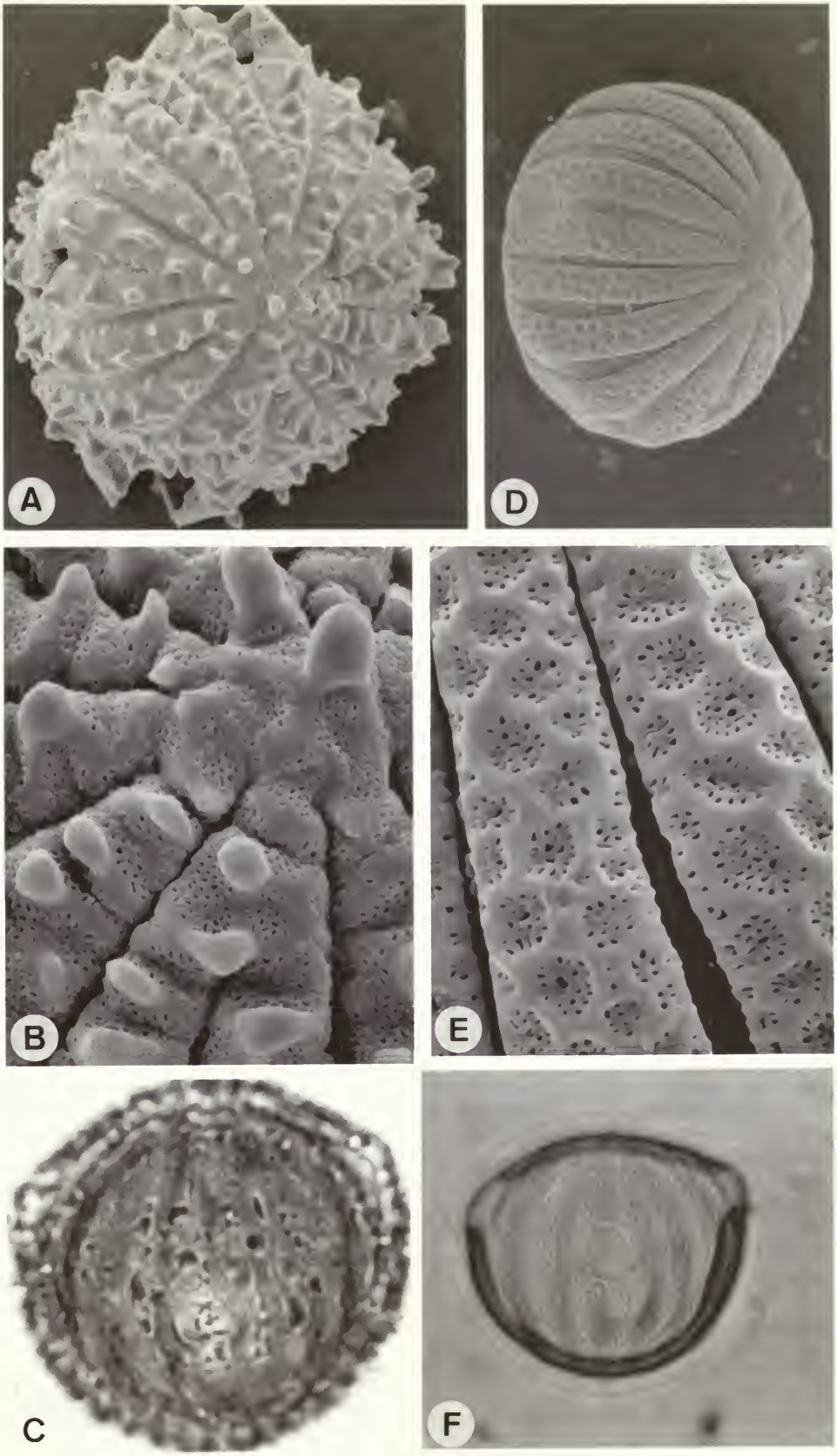


Fig. 5 The pollen of *Brillantaisia madagascariensis* and *B. grottanellii*. A–C *B. madagascariensis* pollen (*Gutzwiler* 841): A. SEM polar view × 1.5 K; B. SEM close up of tectum × 7 K; C. Light micrograph, equatorial view × 1 K with clavate 'spines' on the tectum. D–F the smaller pollen of *B. grottanellii* (*Ensermu* et al. 821): D. SEM subpolar view × 1.5 K; E. SEM close up of tectum × 7 K; F. Light micrograph, equatorial view × 1 K, with an even, non-spiny bireticulate tectum.

'recognized by either unique characters or unique combinations of characters' (Luckow, 1995: 595). Nelson & Platnick (1981) noted the fact that 'species' are only represented by the samples available to a particular biologist and that in practice 'those samples that a biologist can distinguish, and tell others how to distinguish (diagnose), are called species' (Nelson & Platnick, 1981: 11). However, they go on to point out that a pattern based species concept is incomplete without an element of process – that of self perpetuation – and state that '. . . species are simply the smallest detected samples of self-perpetuating organisms that have unique sets of characters' (Nelson & Platnick, 1981: 12).

The species of *Brillantaisia*

Twelve species of *Brillantaisia* were recognized. All twelve species could be recognized on the presence of unique sets of morphological characters; however, two kinds of species group are present. Seven of these species are monothetic, possessing a single character diagnostic for that species group and five species polythetic, lacking any single diagnostic character. As well as falling within the definition of a polythetic group, defined by the possession of a unique set of characters, *Brillantaisia owariensis* could also be considered a widespread and variable '*ochlo*-species' (Sidwell, 1997). The term *ochlo*-species was first coined by White (1962: 79) to describe three species of *Diospyros* (Ebenaceae) which are all widespread and 'have very complicated variation patterns'. White wrote 'Some of their variation is closely correlated with geography, but most of it is not, so that the pattern is of the checkerboard type discussed by Mayr (1942: 37) but more complicated than any of his examples. Such species cannot be satisfactorily subdivided and could conveniently be distinguished from monotypic and polytypic species by calling them *ochlo*-species' (White, 1962: 79). Without further extensive and detailed field study of numerous populations of *B. owariensis*, recognition of subspecific taxa remained informal.

RELATIONS OF THE SPECIES OF *BRILLANTAISIA* 1: FORMULATION OF THE DATA MATRIX

Choice of outgroup

Multiple outgroups were chosen. Species were selected both from within the tribe Hygrophileae (*Hygrophila* species) and outside the tribe Hygrophileae. Within the tribe Hygrophileae, six species of *Hygrophila* were selected. These species represent the morphological and geographical variation of the genus, they are well delimited with no problems regarding species concept and they are represented by plenty of herbarium material at K and BM. Outside the tribe Hygrophileae, single species of the five genera considered most closely related to the Hygrophileae by Vollesen (pers. comm.) were included in the analysis.

Choice of characters

Stevens (1991), Wilkinson (1995) and Gift & Stevens (1997) all noted that individual scientists take very different approaches to character choice and character state delimitation and unfortunately, rarely explicitly state the criteria used at this stage of their research. Stevens (1984: 395) stated that 'the common meeting place of the systematist and morphologist is the analysis of similarity and its conversion into hypotheses of homology' and recently Pleijel (1995: 309) wrote that 'character coding represents the link between observation and analysis and greatly influences the results [of phylogeny reconstruction], but has nevertheless received little attention'. Thiele (1993: 275) described the method of converting description of morphology into comparative data for analysis as a filter that 'operates between the discovery of variation and the recording of that variation in the data matrix. Details of operation of the filter are often obscure...'. The main issues to be considered in coding morphological data for cladistic analysis are the coding of continuous versus discrete characters (e.g. Pimentel & Riggins, 1987; Cranston & Humphries, 1988; Chappill, 1989; Bateman et al., 1992; Gift & Stevens, 1997), the treatment of multistate versus binary data (compare Pimentel & Riggins, 1987; Pleijel, 1995; Wilkinson, 1995), ordered versus unordered characters (see Mickevich & Lipscomb, 1991: 127; Scotland, 1992*c*: 16; Quicke, 1993: 25 for illustrations of different character state transformation series), and missing entries in a data matrix (Doyle & Donoghue, 1986; Nixon & Davis, 1991; Platnick, 1991; Maddison, 1993).

In this study, 'ordinary character coding is based on the notion of character-state transformation series, in which states of the same character are seen as transformations of one another, and the whole assemblage of mutually transformable states forms a character' (de Pinna, 1996: 10). In this paper, the term binary refers only to presence/absence characters and not to two-state characters, for example 2 or 4 stamens. Multistate characters are consequently taken to be all characters with two or more states. This definition clarifies the difference between binary and two-state characters where the 0 may mean two completely different things: either 0 is the absence of character state 1 (binary), or 0 is the presence of a different character state homologous to 1 (two-state/multistate). Only discrete characters were selected for cladistic analysis. Continuously variable characters were excluded in this study because of subjectivity in coding character states (Pimentel & Riggins, 1987; Gift & Stevens, 1997) and because these data inflate tree length (Cranston & Humphries, 1988). All assumptions regarding the direction of transformation series were considered inappropriate prior to analysis (Hauser & Presch, 1991) and characters were treated as unordered throughout.

The data matrices

In preliminary analyses, discussed in Sidwell (1997), 48 characters were scored for 23 taxa forming a baseline data matrix from which all further analyses were derived. Missing data were present in 19/48 characters and in 19/23 taxa either because it was inapplicable to score a character for a particular taxon, or because a taxon was polymorphic for a particular character. In the analysis presented here, the baseline data matrix was transformed to remove both inapplicable and polymorphic missing data from the analyses. Three groups of characters were recoded to remove inapplicable missing data following Maddison (1993) and seven taxa, polymorphic for at least one character, were divided into monomorphic subunits following Nixon & Davis (1991). The 32 characters used in these analyses are presented in Table 1. The data matrix of 32 terminal units scored for the 32 characters is presented in Table 2.

RELATIONS OF THE SPECIES OF *BRILLANTAISIA* 2: ANALYSIS OF THE DATA MATRIX

Data were analysed using the mh*bb* command of HENNIG86 version 1.5 (Farris, 1988). Tree Gardener version 2.2 (Ramos, 1997) was used to edit matrices, run HENNIG86 via a windows shell and to

Table 1 List of 32 characters, numbered 0–31 to fit with conventions of HENNIG86 (Farris, 1989), scored for cladistic analysis of 32 taxa of Acanthaceae listed in Table 2.

No.	Character description
0.	Inhibition and/or innovation zones below synflorescence: absent (0), present (1)
1.	Leaf blade shape: broadly ovate to ovate 1:1-2 (0), linear-lanceolate (1)
2.	Leaf margin: entire or subentire (0), strongly rather irregularly toothed (1)
3.	Leaf pubescence: glabrous (0), pubescent (1)
4.	Petiole: absent (0), present unwinged (1), present entire or subentire wing (2), present clearly toothed wing (3)
5.	Proliferation zone: absent (0), present (1)
6.	Main florescence shape: spicate (0), paniculate (1)
7.	Enrichment zone of axillary/lateral inflorescences: absent (0), present (1)
8.	Bract shape: broadly ovate/ovate/linear (0), obovate/rounded (1)
9.	Bract base: not clasping rachis (0), clasping rachis (1)
10.	Bract pubescence: eglandular (0), glandular (1)
11.	Sepal length: equal/subequal (0), unequal (1)
12.	Sepal shape: linear (0), spathulate (1)
13.	Sepal fusion: free (0), fused (1)
14.	Sepal width: upper sepal slightly wider than the lower four (0), upper sepal highly developed, usually twice as wide as the lateral sepals (1)
15.	Corolla shape: not bilabiate (0), bilabiate hooded but not laterally compressed (1), bilabiate hooded and laterally compressed (2),
16.	Corolla hinge: absent (0), present (1)
17.	Upper corolla lip pubescence: subglabrous (0), glandular pubescent (1)
18.	Stiff trichomes on lower corolla lip: absent (0), present (1)
19.	Stamen arrangement: four fertile stamens (0), two posterior stamens with staminodes ca 1mm long (1), two posterior stamens with staminodes >2mm long (2), two anterior stamens with no staminodes
20.	Anther spur: absent (0), present (1)
21.	Number of colporate apertures in pollen: three (0), four (1)
22.	Colpus size: long (0), short/very short (1)
23.	Paired aperture position: equatorial (0), opposite pairs at uneven height (1)
24.	Atrium at pore: absent (0), present (1)
25.	Pollen shape: spheroidal (0), prolate or subprolate (1)
26.	Collumellae shape: not branched at base (0), branched at base (1)
27.	Ornamentation: single reticulum (0), double reticulum (1)
28.	Spines on pollen: absent (0), present (1)
29.	Style: not persistent in fruit (0), persistent in fruit (1)
30.	Number of ovules in the fruit (both locules): less than ten (0), greater than 10 (1)
31.	Fruit trichomes: absent (0), present (1)

view trees. CLADOS (Nixon, 1992) was used to look at character distribution on the HENNIG86 trees. Two types of character transformations were plotted onto the trees using CLADOS: either as unique occurrences (synapomorphies) in black or white or convergence or parallelism (homoplasy) in grey. The values of tree length, consistency index (CI) and retention index (RI) are provided. All characters are treated throughout as unweighted.

Results

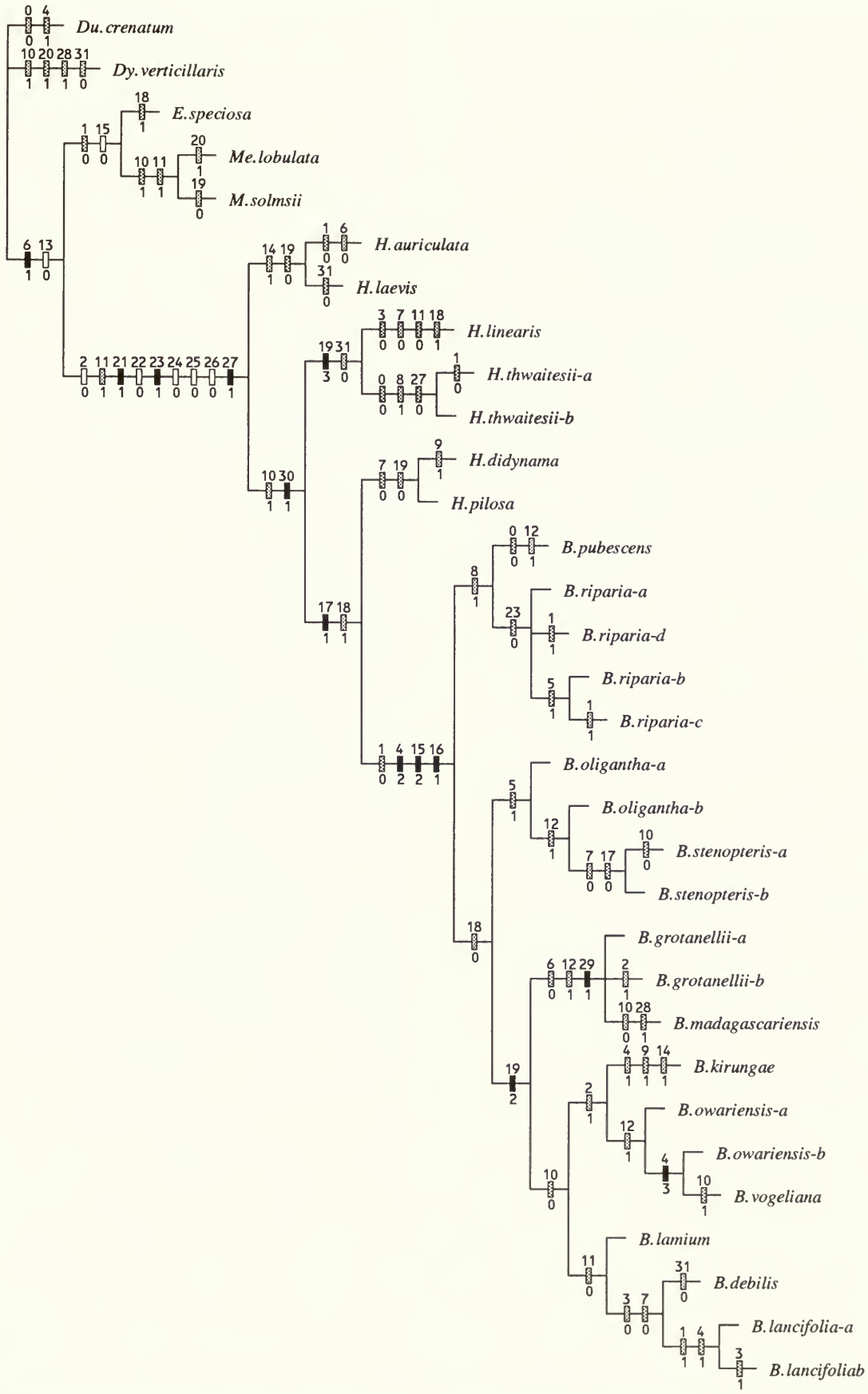
The analysis produced 122 equally parsimonious trees, 87 steps long, CI=0.42 and RI=0.76. Tree 25/122 is presented in Figure 6 and the strict consensus of these trees is presented in Figure 7. Apart from a few collapsed nodes, the consensus tree (Fig. 7) is very similar to the tree given in Figure 6, and the major clades are the same in both trees. Although the consensus tree (Fig. 7) is accepted as a working hypothesis of the phylogeny of *Brillantaisia*, the results are discussed here with reference to the characters shown on the tree in Figure 6. The results show that *Brillantaisia* and six species of *Hygrophila* both belong within a monophyletic group, the tribe Hygrophileae, based on a suite of pollen characters [21(1); 22(0); 23(1); 24(0); 25(0); 26(0) &27(1)] and an entire to subentire leaf margin [2(0)] (this character reverses further up the tree [2(1)] in the species *B. kirungae, B. owariensis and B. vogeliana*). The outgroup to the *Brillantaisia-Hygrophila* clade is a group with non-bilabiate corollas [15(0)] containing the species *Eremomastax speciosa*, *Mellera lobulata* and *Mimulopsis solmsii*. The ((*Brillantaisia-Hygrophila*) (*Eremomastax* (*Mellera-Mimulopsis*))) clade is characterized by the presence of paniculate inflorescences [6(1)] and sepals which are free or fused only slightly at the base [13(0)].

Table 2 Data matrix of 32 terminal units derived from recoding polymorphic missing data scored for the 32 morphological characters presented in Table 1.

Taxon	Character number						
	0-4	5-9	10-14	15-19	20-24	25-29	30/31
Duosperma crenatum (Lindau) P.G. Meyer	01111	0?1?0	00010	10001	00101	11000	01
Dyschoriste verticillaris C.B. Clarke	11110	00100	10010	100?1	10101	11?10	00
Eremomastax speciosa (Hochst) Cufod.	10110	01100	00000	00011	00101	11000	01
Mellera lobulata S. Moore	10110	01100	11000	00001	10101	11000	01
Mimulopsis solmsii Schweinf.	10110	01100	11000	00000	00101	11000	01
Hygrophila auriculata (Schumach.) Heine	10010	00100	01001	10000	01010	00100	01
Hygrophila didynama (Lindau) Heine	11010	01001	11000	10110	01010	00100	11
Hygrophila laevis Lindau	11010	01100	01001	100?0	01010	00100	?0
Hygrophila linearis Burkill	11000	01000	10000	10013	01010	00100	10
Hygrophila pilosa Burkill	11010	01000	11000	10110	01010	00100	11
Hygrophila thwaitesii (Benth.) Heine-a	00010	01110	11000	10003	01010	00000	10
Hygrophila thwaitesii (Benth.) Heine-b	01010	01110	11000	10003	01010	00000	10
Brillantaisia debilis	10002	01000	00000	21102	01010	00100	10
Brillantaisia grottanellii-a	10012	00100	11100	21102	01010	00101	11
Brillantaisia grottanellii-b	10212	00100	11100	21102	01010	00101	11
Brillantaisia lamium.	10012	01100	00000	21102	01010	00100	11
Brillantaisia lancifolia-a	11001	01000	00000	21102	01010	00100	11
Brillantaisia lancifolia-b	11011	01000	00000	21102	01010	00100	11
Brillantaisia madagascariensis	10012	00100	01100	21102	01010	00111	11
Brillantaisia oligantha-a	10012	11100	11000	21101	01010	00100	11
Brillantaisia oligantha-b	10112	01100	01100	21102	01010	00100	11
Brillantaisia owariensis-a	10112	01100	01100	21102	01010	00100	11
Brillantaisia owariensis-b	10113	01100	01100	21102	01010	00100	11
Brillantaisia pubescens.	00012	01110	11100	21111	01010	00100	11
Brillantaisia riparia-a	10012	01110	11000	21111	01000	00100	11
Brillantaisia riparia-b	10012	11110	11000	21111	01000	00100	11
Brillantaisia riparia-c	11012	11110	11000	21111	01000	00100	11
Brillantaisia riparia-d	11012	01110	11000	21111	01000	00100	11
Brillantaisia stenopteris-a	10012	11000	01100	21001	01010	00100	11
Brillantaisia stenopteris-b	10012	11000	11100	21001	01010	00100	11
Brillantaisia kirungae	10111	01101	01001	21102	01010	00100	11
Brillantaisia vogeliana.	10113	01100	11100	21102	01010	00100	11

Duosperma crenatum and *Dyschoriste verticillaris* form an unresolved outgroup to all other species in this analysis. Within the *Brillantaisia-Hygrophila* clade, the twelve species of *Brillantaisia* form a monophyletic genus based on a laterally compressed upper corolla lip [16(1)], a membranous hinge at the apex of the corolla tube [15(2)] and a winged petiole with an entire or subentire margin [4(2)]. Within *Brillantaisia*, a clade containing eight species is delimited on the presence of staminodes greater than 2 mm long [19(2)]. The other four species within the genus all have minute staminodes and form a partially unresolved outgroup to that clade. Section *Stenanthium* of Lindau, recognized by him as consisting of all species of *Brillantaisia* with spicate inflorescences (*B. grottanellii* and *B. madagascariensis*) is monophyletic in this analysis based on the persistence of the style in fruit [29(1)], a character which maybe an artifact of the maturity of specimens examined for those species and requires reconsideration. Section *Stenanthium* of Lindau containing all other species of *Brillantaisia* is paraphyletic. Subgeneric taxa are not formally recognized in this account. The six species selected to represent *Hygrophila* form successive pairs of sister taxa to *Brillantaisia*. However, in this analysis, *Hygrophila* is paraphyletic and requires further study, including a more comprehensive cladistic analysis, before the precise sister group to *Brillantaisia* can be identified. *Hygrophila* is necessarily accepted as a paraphyletic genus for nomenclatural convenience, but it should be recognized as a diverse group, in need of revision, and is best conceived as comprising all members of the tribe Hygrophileae that do not belong within *Brillantaisia*. Within the constraints of time and the Linnaean hierarchy, acceptance of well known groups which are paraphyletic is inevitable.

Fig. 6 One of 122 equally parsimonious trees (tree 25/122) produced from analysis of the data matrix in Table 1. Synapomorphic characters are shown by the black and white bars and homoplasious characters by the grey bars. Character numbers are given above each bar and the state of that character is given below each bar.


Du. crenatum
Dy. verticillaris
E. speciosa
Me. lobulata
M. solmsii
H. auriculata
H. laevis
H. linearis
H. thwaitesii-a
H. thwaitesii-b
H. didynama
H. pilosa
B. pubescens
B. riparia-a
B. riparia-d
B. riparia-b
B. riparia-c
B. oligantha-a
B. oligantha-b
B. stenopteris-a
B. stenopteris-b
B. grotanellii-a
B. grotanellii-b
B. madagascariensis
B. kirungae
B. owariensis-a
B. owariensis-b
B. vogeliana
B. lamium
B. debilis
B. lancifolia-a
B. lancifoliab

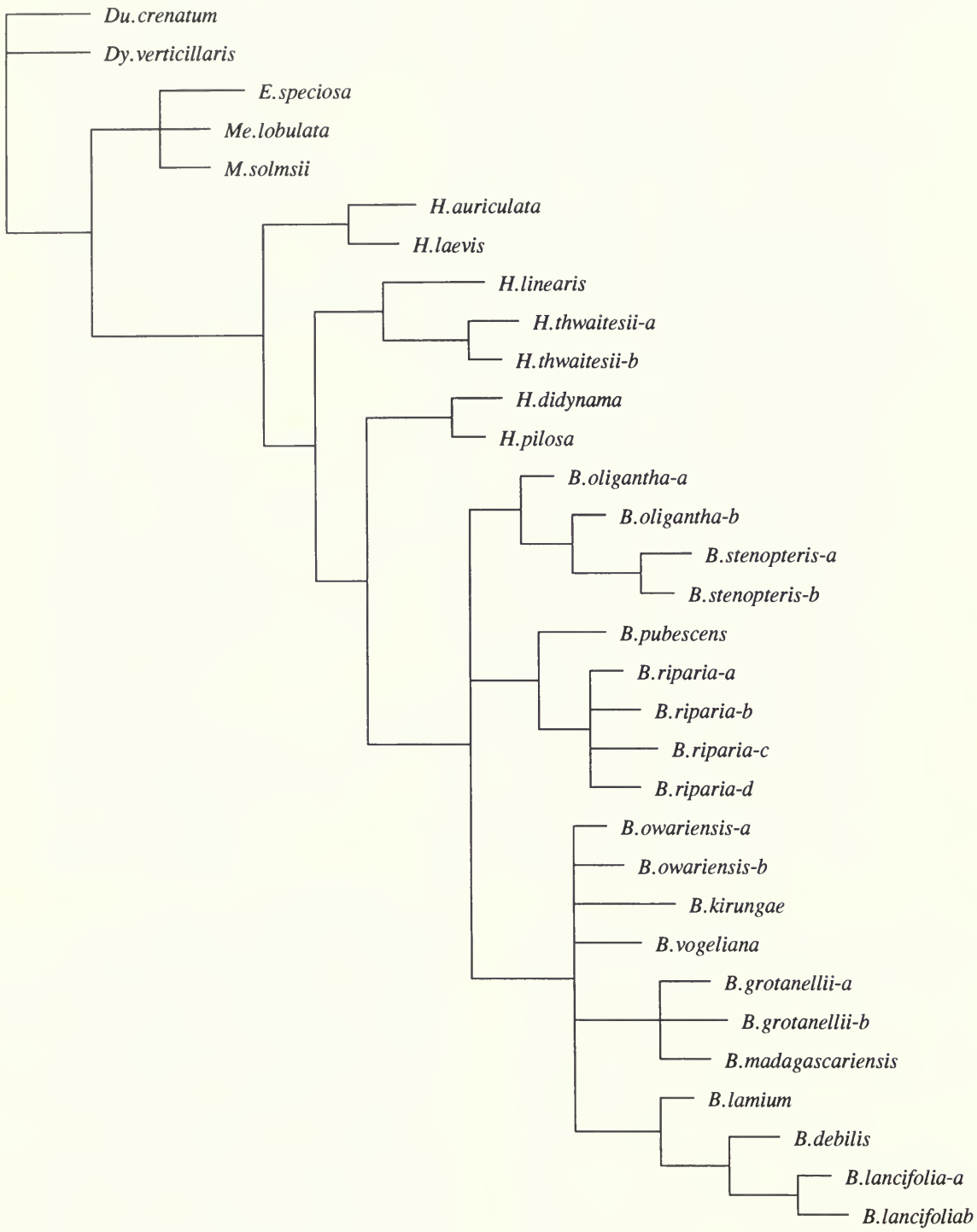


Fig. 7 Strict consensus of 122 trees produced from analysis of the data matrix in Table 1.

TAXONOMIC ACCOUNT

Brillantaisia P. Beauv., *Flore d'Oware* **2**: 67. t. 100, fig. 2 (1818); Burkill in *Fl. trop. afr.* **5**: 37 (1899); Durand & Durand, *Syll. fl. congol.*: 416–418 (1909); Chevalier, *Explor. bot. Afrique occ. franç.* **1**: 493 (1920); Robyns, *Fl. parc nat. Albert* (1947); Heine in *Fl. W. trop. Afr.* 2nd ed., **2**: 405 (1963); Heine in *Fl. Gabon* **13**: 28 (1966); Benoist, *Fl. Madag. fam. 182*: 28 (1967); Agnew, *Upl. Kenya wild fls*: 583 (1974); Troupin, *Fl. pl. lign. Rwanda*: 84 (1982); Champluvier in *Fl. Rwanda* **3**: 444 (1985). Type species: *Brillantaisia owariensis* P. Beauv., *Flore d'Oware* **2**: 68, t. 100: fig. 2 (1818).

Belantheria Nees in DC., *Prodr.* **11**: 96 (1847). Type species: *Belantheria belvisiana* Nees in DC., *Prodr.* **11**: 96 (1847).

Leucoraphis Nees in DC., *Prodr.* **11**: 97 (1847). Type species: *Leucoraphis vogeliana* Nees in DC., *Prodr.* **11**: 97 (1847).

Ruelliola Baillon in *Bull. Mens. Soc. Linn. Paris* **2**: 852 (1890); Baillon, *Hist. pl.* **10**: 427 (1891); Lindau in *Nat. Pflanzenfam.* **4**(3b): 307 (1895). Type species: *Ruelliola grevei* Baillon in *Bull. Mens. Soc. Linn. Paris* **2**: 852 (1890).

Erect to prostrate herbs to erect, sturdy shrubs. *Stems* square, usually swollen at the nodes, glabrous to densely pubescent; cystoliths longitudinal, narrowing towards one end. *Leaves* opposite, decussate, petiolate, broadly ovate to ovate, occasionally elliptic or linear-lanceolate; leaf base cordate or truncate to cuneate; apex acute or acuminate; margin entire to irregularly toothed; glabrous to pubescent above and below; indumentum of multicellular, eglandular trichomes, evenly pilose to dense and villose above, mainly on midrib and primary lateral veins below; cystoliths usually visible, with a hand lens, above and below over entire leaf surface. *Petiole* usually winged, lamina decurrent in top half of petiole, though occasionally broadly winged to base; petiole wing margin entire, occasionally toothed towards apex. *Inflorescence* a variously modified dichasium forming either a terminal thyrse and/or lateral axillary thyrse with vegetative growth occasionally continuing above flowering axes; dichasial branching usually lax, becoming monochasial towards base of inflorescence, occasionally contracted forming spike with flowers appearing in verticillasters. *Bracts* on main inflorescence axis ovate to broadly ovate, foliaceous, equal in size to the uppermost leaves at base of inflorescence, becoming smaller towards the apex of the inflorescence; *bractlets* on lateral inflorescence branches linear to obovate. *Calyx* with five equal or unequal, linear to spathulate sepals, dorsal sepal longer and usually broader than the four lateral sepals; usually hirsute, with glandular and eglandular trichomes. *Corolla* two-lipped, purple, magenta, blue or violet, occasionally white; corolla tube cylindrical, often paler than corolla lobes, with two brown-yellow markings in throat; upper lip hooded, laterally compressed, two-lobed at apex, often glandular pubescent on outer surface; lower lip broad, ridged and bullate above, reflexed at edges, three-lobed at apex, occasionally with stiff trichomes on adaxial surface, two membranous lateral pouches at base of lower lip form a hinge with the apex of the corolla tube. *Androecium* with two posterior stamens fertile; filaments white, flattened, often sparsely pubescent towards the base; anthers sagittate, dorsifixed; two anterior stamens reduced to slender staminodes, often with membranous vestigial anther at apex, occasionally minute or absent. *Gynoecium* with slender, linear style, often sparsely pubescent towards base; stigma a single flattened lobe at the end of the style, second, lower lobe reduced to minute tooth; ovary two-locular on annular disc, usually pubescent, placentation axial; ovules numerous. *Fruit* a linear, convex, two-valved capsule, pointed at apex with deep longitudinal groove down centre of each valve, green with red apex when immature, brown to black when dry, glabrous or glandular and/or eglandular pubescent, elastically dehiscent. *Seeds* rounded to slightly kidney shaped, flattened, each held on a hardened, hook-shaped retinacula, covered with adpressed trichomes which are hygroscopic and expand rapidly, producing mucous when wet.

DISTRIBUTION. Throughout tropical Africa with two species extending to Madagascar.

HABITAT. The distribution of *Brillantaisia* species is centred in the Guineo-Congolian rain forests with species also occuring in montane rain forests and woodland throughout Africa. Plants of *Brillantaisia* are often found in mesic sites or rooted in water and when in drier savannah type vegetation only occur in shady, wetter places. In West Africa *Brillantaisia* is commonly found in disturbed areas (e.g. roadsides, plantations, farmland).

Brillantaisia is a genus of 12 species several of which are widespread and tend to be very variable morphologically, and is most diverse in the Guineo-congolian forests. Many species have previously been described in the genus based on local variation which has been shown to be continuous by extensive study of specimens. The variation within each species is discussed in detail after each description. A full list of specimens studied is provided in Sidwell (1997) and a constantly updated list is available from the author.

Key to fertile specimens of *Brillantaisia*

1. Inflorescence a contracted thyrse with short peduncles, forming a spike; flowers/fruit in verticillasters 2

   Inflorescence a lax thyrse with elongated, clearly visible peduncles 3

2. Bracts with glandular and eglandular trichomes, linear-ovate; style often pubescent towards apex ..... 11. **B. grottanellii**

   Bracts lacking glandular trichomes, ovate to broadly ovate; style pubescent only at base ..... 12. **B. madagascariensis**

3. Bractlets obovate-rounded, shortly petiolate; corolla lips less than twice the length of the corolla tube; sepals spathulate; flowers with stiff, unicellular trichomes on inner surface of lower lobe 4

   bractlets linear; corolla lips more than twice the length of the corolla tube; sepals linear or spathulate; flowers lacking unicellular trichomes on inner surface of lower lobe 5

4. Flowers small, 12–25 mm long, inflorescence highly branched; leaves 1.25–1.8 times longer than wide ..... 1. **B. pubescens**

   Flowers large, 30–40 mm long; inflorescence branched 3–4 times; leaves 1 9–3.0 times longer than wide ..... 2. **B. riparia**

5. Leaves lanceolate to elliptic, occasionally ovate, entire or barely crenate; inflorescence narrow terminal thyrse branching 1–2 times ..... 9. **B. lancifolia**

   Leaves ovate to broadly ovate, entire or clearly toothed; inflorescence lax, open, terminal or lateral thyrse branching 2–many times 6

6. Fruit glabrous or with a few erect trichomes at the apex; leaves entire or subentire 7

   Fruit pubescent; leaves toothed, or if leaves entire to subentire, inflorescences slender, lateral, thyrse with apex usually reverting to vegetative growth 8

7. Leaves pubescent particularly towards petiole; fruit 22–30 × 2–5 mm, with 14–16 seeds per locule ..... 8. **B. lamium**

   Leaves usually glabrous; fruit 18–22 × 1–2 mm, with 18–28 seeds per locule ..... 10. **B. debilis**

8. Fruit with 8–10 very rarely to 16 seeds per locule; woody shrub or small tree, leaves often drying black ..... 6. **B. kirungae**

   Fruit always with more than 12 seeds per locule; herb to 2 m tall, not drying black 9

9. Flowers 15–25 mm long (rarely to 35 mm); fruit with 20–24 seeds per locule; leaves thin, rather papery when dry, often toothed at the top of the petiole wing ..... 7. **B. vogeliana**

   Flowers 30–45(–50) mm long; fruit with 12–20 seeds per locule; leaves not thin and papery when dry, petiole wing usually entire 10

10. Lower corolla lip with clearly visible multicellular trichomes on upper surface ..... 3. **B. oligantha**

    Lower corolla lip glabrous 11

11. Leaf margin subentire or with small serrations; petiole wing tapering gradually to base of petiole; lower corolla lip strongly reflexed, centre of lower lip bent up to 90° ..... 4. **B. stenopteris**

    Leaf margin usually strongly toothed; petiole wing tapering gradually to broad and toothed; lower corolla lip not not strongly reflexed ..... 5. **B. owariensis**

1. **Brillantaisia pubescens** T. Anderson ex Oliv. in *Trans. Linn. Soc. London* **29**: 125 (1875); Burkill in *Fl. trop. afr.* **5**: 38 (1899); Durand & Durand, *Syll. fl. congol.*: 417 (1909); De Wild., *Contr. Fl. Katanga* **1**: 143 (1913); Benoist in *Cat. pl. madag.* **13** (1939); Vollesen in *Opera Bot.* **59**: 79 (1980); Vollesen & Brummitt in *Kew Bull.* **36**: 571 (1981). Type: Tanzania, Khutu, Kirengwe, *Grant* s.n. (K!-holotype).

Fig. 8. Map in Vollesen & Brummitt (1981: 571).

Brillantaisia rutenbergiana Vatke in *Abh. Natürwiss, Vereine, Bremen* **9**: 131 (1885); Palacky, *Cat. pl. madag.* **3**: 57 (1907). Type: Madagascar, Andranovaka, *Rutenberg* s.n. (P-holotype).

Ruelliola grevei Baillon in *Bull. Mens. Soc. Linn. Paris* **2**: 852 (1890); Baillon, *Hist. pl.* **10**: 427 (1891); Lindau in *Nat. Pflanzenfam.* **4**(3b): 307 (1895). Type: Madagascar, *Greve* 26 (P!-holotype; P!-isotype).

Brillantaisia anomala Lindau in *Pflanzenw. Ost-afr.* **C**: 366 (1895); Lindau in *Bot. Jahrb. Syst.* **24**: 312–313 (1898); Lindau in *Nat. Pflanzenfam.* **4**(3b): 296 (1895). Type: Mozambique, Villa Gouveia, *de Carvalho* s.n. (COI-holotype).

B. pubescens var. *rutenbergiana* (Vatke) Benoist in *Cat. pl. madag.* **13** (1939).

Hygrophila pubescens (T. Anderson ex Oliv.) Benoist in *Fl. Madag. fam. 182* **1**: 36 (1967) non Nees (1847).

Icones: Anderson in *Trans. Linn. Soc. London* **29**: pl. 125 pro parte (1875); Benoist in *Fl. Madag. fam. 182.* **1**: fig. IV 14–18 (1967).

Straggling annual, highly branched, aromatic herb, (0.3–)0.45–1 m tall, smelling minty or balsamic. *Stems* 2–5(–14) mm in diameter, covered in short glandular trichomes and longer fine, white eglandular trichomes. *Leaves* broadly ovate to ovate 50–110 × 85–160 mm, often caducous; leaf base cuneate to shortly attenuate, occasionally truncate; apex acute; margin entire, occasionally slightly crenate; indumentum of silky, eglandular trichomes above and below; lateral veins 7–9(–13) each side of midrib; petiole to 75 mm long, winged towards lamina, wing narrow, decurrent on petiole in upper ⅓–½. *Inflorescence* highly branched open thyrse with lateral inflorescences to base of stem, branches slender, rachis indumentum irregularly glandular-pubescent with longer eglandular trichomes. *Bracts* obovate to elliptic, to 35 × 45 mm, petiolate, irregular glandular pubescent on both surfaces; bractlets obovate-rounded, to 5 × 8 mm, persistent. *Sepals* unequal, spathulate, larger upper sepal 12–14 × 0.5 mm, 1.5–2 mm wide at broadened apex, smaller lateral sepals 8–10(–13) × < 0.5 mm, pubescence of slender eglandular trichomes with shorter glandular trichomes, denser towards spathulate apex. *Corolla* purple to pale purple/pink occasionally with white upper lip, tube 5–10 mm long; upper lip 8–13(–15) mm long, pubescent externally; lower lip 7–12(–15) mm; trichomes on lower lip white, purple at apex; apical lobes 1 × 1 mm, central lobe smaller. *Androecium* with filaments 6–8 mm long; anthers 1–2.5 mm long; staminodes minute < 0.5 mm long or absent, glabrous. *Gynoecium* with style 8–9 mm long; stigma 1 mm long; ovary 2–3 mm long, glandular pubescent. *Capsule* 10–15 × 2–2.5 mm with 8–16 seeds per locule, yellow brown when dried, sparsely glandular pubescent with longer eglandular trichomes towards the apex.

DISTRIBUTION. East and Central Africa, Malawi, Zambia, Zimbabwe, Mozambique and Tanzania, west to Zaire, Madagascar.

HABITAT. Sandy dry places, river beds, shade on forest floor or in savannah woodlands under, for example, *Adansonia digitata* and *Faidherbia albida* trees, or with *Acacia*, *Albizia*, *Parkia*, *Lepisanthes* and *Terminalia* (*Abdallah & Vollesen* 95/176 K). Locally common; 0–1000 m.

SELECTED COLLECTIONS

DEMOCRATIC REPUPUBLIC OF THE CONGO: Upemba National Park, Kaswabilenga, 17 June 1948, 700 m, *de Witte* 03986 (BR, K). TANZANIA: Lindi, 11 September 1934, *Schlieben* 5323 (G, H, LISC, M, MO, PRE, S, US, Z); 2 km NW of Kingupira, 5 June 1975, *Vollesen* 2392 (C); 6 km along Kisiwani-Mnazi road, 800 m, 7 May 1995, *Abdallah & Vollesen* 95/176 (K). MOZAMBIQUE: Maringua, Dabi river, 25 June 1950, *Chase* 2547 (BM). MALAWI: Salima, Chipoka near Ilala Quarry, 25 May 1972, *Salubeni* 1803 (MO, SRGH); Chimpakati village, Mlunguzi River, 27 June 1987, *Usi & Kaunda* 606 (MAL). ZAMBIA: Petuake district, 5 September 1947, *Greenway & Brenan* 8044 (PRE); NW of Mwern-na-ntipa, 7 August 1962, *Tyres* 339 (SRGH). ZIMBABWE: Binga district, September 1955, *Davies* 1426 (MO, SRGH); Urungwe district, 20 September 1981, *Pope* 1987 (MO, SRGH). MADAGASCAR: *Perrier* 9416 (P); Madirobe, July 1912, *Kaudern* s.n. (S).

Table 3 Four characters that differ between plants of *Brillantaisia pubescens* and *B. riparia.*

Character	*B. pubescens*	*B. riparia*
Inflorescence type	very highly branched	branched 3-4 times
Corolla length	to 25 mm	30-40 mm long
Hinge at apex of corolla tube	not well developed	well developed
Leaf shape	ovate	elliptic

Fig. 8 *Brillantaisia pubescens* T. Anderson ex Oliv. A. Habit × 0.7; B. Lower leaf × 0.7; C. Bract and bractlets × 1; D. Gynoecium × 3; E. Corolla dissection showing androecium × 3; F. Capsule × 4.

Brillantaisia pubescens is one of the more distinctive species in the genus. The highly branched inflorescence, small flowers and rounded persistent bracts are not found elsewhere in *Brillantaisia*. *Brillantaisia pubescens* sensu lato was split into two subspecies by Vollesen & Brummitt (1981) on the basis of flower size. I consider the large flowered plants to be a different species (*B. riparia*) and treat *B. pubescens* s.s. as including only those plants with smaller flowers. Two specimens of *B. pubescens* have slightly larger flowers than most (*Tinley* 2639, SRGH; *Thera & Kaunda* 313, PRE); however, the leaf shape and venation are that of *B. pubescens* and this variation does not blur the boundary between *B. pubescens* and *B. riparia*. The original illustration of the small flowered *B. pubescens* by Fitch (Anderson 1875: pl. 125) almost certainly contributed to confusion over species delimitation as the type specimen was represented as having many more, larger flowers than it actually has. It appears that large flowered specimens of *B. riparia* have been identified as *B. pubescens* by reference to the illustration. There are several characters by which plants of the two taxa can be clearly distinguished (Table 3).

2. **Brillantaisia riparia** (Vollesen & Brummitt) Sidwell, **comb. nov.** Type: Malawi, 13 miles N. of Kasungu, Dwangwa River, *Pawek* 3908 (K!-holotype).

Fig. 9. Map in Vollesen & Brummitt (1981: 571).

Brillantaisia pubescens var. *riparia* Vollesen & Brummitt in *Kew Bull.* **36**: 571 (1981); Vollesen in *Opera Bot.* **59**: 79 (1980).

Icon: Anderson in *Trans. Linn. Soc. London* **29**: pl. 125 pro parte (1875).

Annual viscid-pubescent, aromatic, rather woody herbs to 0.5-1 m tall. *Stems* erect or ascending; pilose with eglandular and glandular trichomes. *Leaves* oblong, elliptic to ovate 20–25(–52) × 39–59(–95) mm, often fallen below; upper most leaves of main axis oblong, 5–8 × 10–15 mm; base gradually tapering, cuneate; apex acute, rounded at tip; margin entire to slightly crenate; glabrous to pilose; lateral veins 4–9(–11) each side of midrib; petiole 14–22 mm long, lamina decurrent on petiole forming very narrow wing sometimes to base. *Inflorescence* leafy-bracteate terminal thyrse, with lower lateral panicles, occasionally with vegetative growth continuing at apex; rachis covered in short simple trichomes with longer fine, non glandular and stalked glandular trichomes. *Bracts* as leaves; bractlets elliptic-obovate, rounded at apex, margin entire, glandular trichomes and slender white trichomes above and below. *Sepals* unequal, larger upper sepal linear-spathulate, 14–18 × 1 mm; smaller lateral sepals spathulate, 9–14 × 0.5–1 mm. *Corolla* purple to blue-purple; corolla tube 13–15 × 2 mm; upper lip 20–25 mm long, glabrous; lower lip 20–25 mm long, glabrous below, with straight erect stiff trichomes on centre of inner surface, trichomes white with a dark purple-black tip; apical lobes 2 × 2–3 mm, triangular, rounded to blunt or notched at apex. *Androecium* with filaments (10–)20–22 mm long; anthers 4–5 mm long; staminodes 3–4 mm long, pale, translucent, difficult to see with the naked eye, broadened slightly at apex sometimes to curved vestigial anther. *Gynoecium* with style to 30 mm long, stiff upward pointing trichomes towards base; stigma 2 mm long; ovary 3 mm long glandular pubescent. *Capsule* 14–19 × 2 mm with 8–12 seeds per locule, light brown, covered with simple short trichomes and longer, glandular trichomes.

DISTRIBUTION. Mozambique and Malawi.

HABITAT. Damp, shady places; 1000 m.

SELECTED COLLECTIONS

MOZAMBIQUE: Vila Cabral, 8 September 1942, *Mendonça* 680 (LISC); Nampula, 3 October 1942, *Mendonça* 1219 (LISC); between Namapa and Chiure, 19 August 1948, *Barbosa* 1812 (LISC); Niassa, Vila Cabral, Meponda, 9 September 1958, *Monteiro* 46 (LISC). MALAWI: Kasungu, 27 August 1946, *Brass* 17442 (BM, MO, NY, SRGH, US); Machinga, 19 October 1979, *Banda & Salubeni* 1571 (MO, SRGH); Liwawazi river, 3 September 1986, *Kaunda & Usi* 429 (MAL); Liwonde, 9 September 1988, *Banda & Kaunda* 3452 (MO).

Brillantaisia riparia was considered a variety of *B. pubescens* by Vollesen & Brummitt (1981). Due to the difference in flower size and shape, leaf shape, leaf venation and inflorescence structure, I consider *B. riparia* a separate species from *B. pubescens*. The two species are clearly very closely related yet are easily distinguished in the field. Brummitt (pers. comm.) noted that *B. riparia* should be compared with *B. oligantha*. *Brillantaisia riparia* and *B. oligantha* are superficially similar, both having lateral inflorescences, trichomes on the lower lip of the corolla and flowers of roughly equal size. However, there are several differences in gross morphology (Table 4) that clearly separate the two.

3. **Brillantaisia oligantha** Milne-Redhead in *Mem. New York Bot. Gard.* **9**: 20–21 (1954); Binns, *Check List Herb. Fl. Malawi*: 12 (1968). Type: Malawi, Nchisi Mountain, 30 January 1946, *Brass* 17042 (K!-holotype; BM!, MO!-isotypes).

Fig. 10. Map 1.

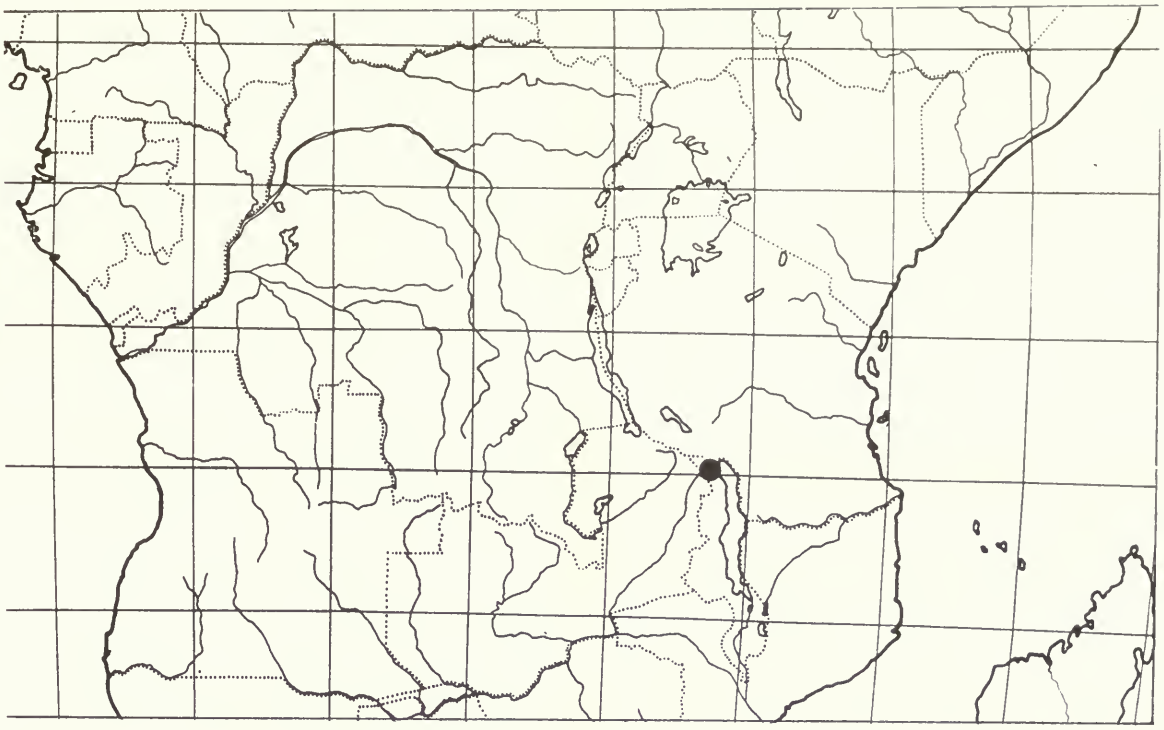
Viscid herb 0.3–1.8 m tall. *Stems* 2–2.5 mm across, slightly winged on angles of stem, pubescent, with straggling eglandular and shorter multicellular glandular trichomes. *Leaves* ovate to broadly ovate, 36–65(–130) × 87–160(–210) mm; leaf base cuneate to attenuate; apex acuminate; margin subentire to shallowly crenate or dentate; subglabrous to roughly pubescent; 7–10(–16) lateral veins each side

Table 4 Four characters that differ between plants of *Brillantaisia riparia* and *B. oligantha*.

Character	*B. riparia*	*B. oligantha*
Inflorescence branching	stout, straight	slender, curving
Corolla tube	straight, long, narrow	inflated, short, broad,
Lower corolla lip trichomes	straight, single celled	multicellular
Lower corolla lip shape	gibbous, not strongly reflexed	strongly reflexed

Fig. 9 *Brillantaisia riparia* (Vollesen & Brummitt) Sidwell. A. Habit × 0.7; B. Corolla dissection showing androecium × 2; C. Capsule × 3.2; D. Gynoecium × 2; E. Bract and bractlets × 1.

Fig. 10 *Brillantaisia oligantha* Milne-Redhead. A. Habit × 0.7; B. Corolla dissection showing androecium × 2.5; C. Capsule × 1.8; D. Gynoecium and calyx × 2.5; E. Bract and bractlets × 3.



Map 1 The distribution of *Brillantaisia oligantha* Milne-Redhead.

of midrib; petiole (15–)40–70(–120) mm long, lamina decurrent on petiole forming a slender wing almost to the base of the petiole. *Inflorescence* lateral few flowered thyrse to 45–75 mm long, branches very slender, branching 3–4 times, rachis pubescent. *Bracts* as leaves; bractlets narrowly obovate (0.3–)1.5–4 × (0.8–)2–9 mm, glandular pubescent above and below. *Sepals* unequal; linear to spathulate, larger upper sepal 6–10 × 1 mm, smaller lateral sepals 5–9 × 0.5 mm, pubescent. *Corolla* deep blue to purple, sometimes tinged brown on the upper lip, corolla tube 3 × 7.5 mm; upper lip 13–17 mm long, sparsely pubescent outside; lower lip 14–18 mm long, strongly reflexed with lateral fold down centre and deep hinge at base, multicellular trichomes on inner surface; apical lobes to 2.5 × 3 mm. *Androecium* with filaments 10–15 mm long, pubescent at base; anthers 1–4 mm long; staminodes 1 mm long with small vestigial anther. *Gynoecium* with style 1–1.5 mm long, pubescent along the entire length; stigma 20–25 mm long; ovary 3 × 1 mm, covered in short glandular trichomes. *Capsule* 20–27 × 1–2 mm with 10–12 seeds per locule, very sparse, short, glandular trichomes.

DISTRIBUTION. Restricted to the Nchisi and Mughese mountain ranges in Malawi.

HABITAT. Shady places in wet forest, or in dry evergreen or semi-evergreen forest, also along roadsides in these areas. Locally common; 1000–1400 m.

SELECTED COLLECTIONS

MALAWI: Nchisi Mountain, 29 July 1946, *Brass* 17021 (NY); 30 July 1946, *Brass* 17042 (BM, K, MO); 10 July 1960, *Chapman* 827 (BM); 1 September 1970, *Salubeni* 1485 (SRGH); *Salubeni* 1487 (MAL, PRE, SRGH); Chitipa district, Mughese, 12 September 1977, *Phillips* 2836 (MO); *Pawek* 12984 (K, LISC, MAL, MHU, MO, SRGH).

Brillantaisia oligantha is an easily distinguished species, with lateral axillary inflorescences only. The lower corolla lip is more strongly reflexed in *B. oligantha* than in other species of the genus and has multicellular trichomes on the adaxial surface. Previously thought to be restricted to the Nchisi mountains of Malawi, collections from Mughese in Malawi are clearly the same species. *Brillantaisia oligantha* can appear morphologically similar to *B. riparia*, both species having entire leaves and fine white silky trichomes on vegetative parts, however, *B. oligantha* has a much shorter, broader corolla tube, a more hooded upper lip, and a more slender, less branched inflorescence. This species is also closely related to *B. stenopteris* Sidwell, sp. nov. from Tanzania. However, the new species has larger flowers, lacks any trichomes on the lower lip of the corolla and is found in a different habitat to *B. oligantha*.

4. **Brillantaisia stenopteris** Sidwell, **sp. nov.** Type: Tanzania, Morogoro region, Kombola, 8 July, 1933, *Schlieben* 4068 (LISC!-holotype, MO!, PRE!-isotypes)

Fig. 11. Map 2.

Herba perennis usque ad 2 m alta. Folii lamina ovata vel latiovata 25–144 mm longa, 40–220 mm lata, apice acuminata, basi cuneata, margine obscure serrata, lamina 11–16 venatus, petiolo breviter decurrente; petiolo 15–90 mm longo. Inflorescentia ad 20 cm longa, cymosa, terminalis, interdum vegitativus ad apice. Corolla 24–30 mm longa, tubus circiter 8–9 mm longus; labium posticum 18–22 mm longum; labium anticum 17–23 mm longum, glabrum. Fructus incognitus. Species nova affinis *Brillantaisia oligantha* Milne-Redh. sed floribus majoribus et labium anticum sine pilis longis septatis differt.

Herbs to 2 m tall. *Stems* erect, 2 mm in diameter, pubescent, trichomes white, eglandular with shorter glandular trichomes. *Leaves* ovate to broadly ovate 25–140 × 40–220 mm; leaf base cuneate; apex

acuminate; margin serrate, occasionally subentire; adaxial surface subglabrous to roughly pubescent, abaxial surface with fine non glandular trichomes; 11–16 lateral veins on each side of the midrib; petiole 15–90 mm long, lamina decurrent on the petiole forming a narrow wing, often to the base of the petiole. *Inflorescence* open panicle, sometimes becoming vegetative at the apex, to (4–)7–20 cm long; lateral branches slender, few flowered. *Bracts* as leaves or ovate, sessile; bractlets ovate-linear 7–12 × 1–3 mm. *Calyx* unequal, sepals slightly spathulate, larger upper sepal 10–12 × 1–2 mm, smaller lateral sepals 8–10 × 1 mm; covered in long non glandular and short glandular trichomes. *Corolla* purple, corolla tube 8–10 × 3 mm, upper lip to 18–22 mm long, glandular pubescent outside; lower lip 17–23 mm long, glabrous on inner surface. *Androecium* with filaments 25 mm long; anthers 4 mm long; staminodes 1 mm long, minute, lacking vestigial anther. *Gynoecium* with style 30 mm long; stigma 4 mm long; ovary 6 mm long, densely pubescent. *Capsule* not known.

DISTRIBUTION. Restricted to the Morogoro region of Tanzania.

HABITAT. Rain forest; 1000 m.

COLLECTIONS EXAMINED

TANZANIA. Morogoro region, Kombola, 8 July 1933 *Schlieben* 4068 (LISC, MO, PRE); Kilosa district, 13 November 1987, *Poçs* et al. 8722 (UPS).

Brillantaisia stenopteris is very closely related to *B. oligantha* from the Nchisi and Mughese mountains in Malawi. The two species have similar ovate, cuneate leaves with a long slender petiole wing. However, they can be easily distinguished due to the larger flowers and absence of trichomes on the inner surface of the lower corolla lip of *B. stenopteris*. The corolla tube of *B. stenopteris* is longer and thinner than that of *B. oligantha*, resembling the corolla tube of *B. riparia*, which is also closely related to *B. stenopteris*.

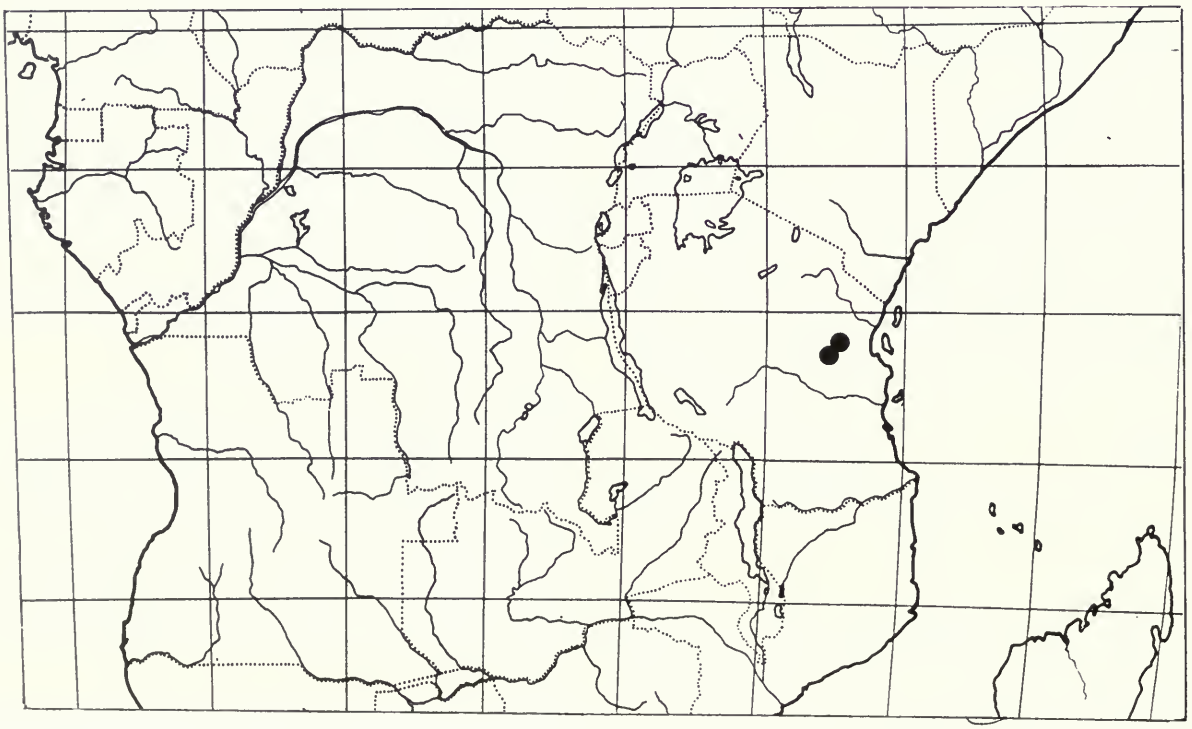
5. **Brillantaisia owariensis** P. Beauv., *Flore d'Oware* **2**: 68 (1818); Bentham in *Niger Fl.*: 477 (1849); Hooker in *Bot. Mag.*: 79: t. 4717 (1853); Durand & Schinz, *Études fl. Congo* **1**: 217 (1896); Burkill in *Fl. trop. afr.* **5**: 40 (1899); Durand & Durand, *Syll. fl. congol.*: 417 (1909); Benoist in *Bull. Soc. Bot. France* **60**: 335 (1913); Chevalier, *Explor. bot. Afrique occ. franç.* **1**: 493 (1920); Hutchinson & Dalziel in *Fl. W. trop. Afr.* **2**: 254 (1931); Heine in *Fl. W. trop. Afr.* 2nd ed., **2**: 406 (1963). Type: Nigeria, Benin, Agathon, *Palisot de Beauvois* s.n. (G!-lectotype; G!-isolectotypes).

Belantheria belvisiana Nees in *DC. Prodr.* **11**: 96 (1847). Type: as for *B. owariensis.*

Brillantaisia patula T. Anderson in *J. Proc. Linn. Soc. Bot.* **7**: 21 (1864); Burkill in *Fl. trop. afr.* **5**: 41 (1899); Hiern in *Cat. afr. pl.* **1**: 807 (1900); De Wild., *Études fl. Bas- Moyen- Congo* **1**: 314 (1903–1906); Durand & Durand, *Syll. fl. congol.*: 417 (1909); Benoist in *Bull. Soc. Bot. France* **60**: 335 (1913); De Wild., *Contr. Fl. Katanga* **1**: 143 & **2**: 144 (1913); Mildbraed, *Wiss. Erg. zweit. deut. Zentr.-Afr. Exped., Bot.* (1922); Hutchinson & Dalziel in *Fl. W. trop. Afr.* **2**: 254 (1931); Exell, *Cat. pl. S. Tomé*: 260 (1944); Robyns, *Fl. parc. nat. Albert.* **2**: 269–270 (1947); Heine in *Fl. W. trop. Afr.* 2nd ed., **2**: 406 (1963); Heine in *Fl. Gabon* **13**: 94, pl. 19, figs 1–6 (1966); Champluvier in *Fl. Rwanda* **3**: 444–448 (1985). Type: Congo, *Smith* s.n. (K!-holotype; BM!, P!-isotypes).

B. alata T. Anderson ex Oliv. in *Trans. Linn. Soc. London* **29**: 125 (1875); S. Moore in *J. Bot.* **18**: 197 (1880); Durand & Schinz, *Études fl. Congo* **1**: 216–217 (1896); Durand & De Wild., in *Bull. Soc. Roy. Bot. Belgique* **36**: 83 (1897); De Wild., *Miss. Ém. Laurent* **1**: 182 (1905); De Wild., *Études fl. Bas- Moyen- Congo* **1**: 314 (1903–1906); De Wild., *Contr. Fl. Katanga* **1**: 143 (1913). Type: Uganda, Unyoro, *Speke & Grant* 583 (K!-holotype).

B. salviiflora Lindau in *Bot. Jahrb. Syst.* **17**: 101 (1893); Burkill in *Fl. trop. afr.* **5**: 41 (1899); Benoist in *Bull. Soc. Bot. France* **60**:



Map 2 The distribution of *Brillantaisia stenopteris* Sidwell.

Fig. 11 *Brillantaisia stenopteris* Sidwell. Habit × 0.7; B. Corolla dissection showing androecium × 2.5; C. Gynoecium and calyx × 2.5; D. Bract and bractlets × 3.

336 (1913). Type: Togo, Bismarksburg, *Büttner* 341 (B†-holotype).

B. nitens Lindau in *Bot. Jahrb. Syst.* **17**: 102 (1893); Burkill in *Fl. trop. afr.* **5**: 41 (1899); Lindau in *Wiss Erg. deut. Zentr.-Afr. Exped., Bot.* **2**: 292 (1911); Benoist *in Bull. Soc. Bot. Fr.* **60**: 336 (1913); Mildbraed, *Wiss. Erg. zweit. deut. Zentr.-Afr. Exped., Bot.* (1922); Hutchinson & Dalziel in *Fl. W. trop. Afr.* **2**: 254 (1931); Robyns, *Fl. parc. nat. Albert.* **2**: 270–272 (1947); Heine in *Fl. W. trop. Afr.* 2nd ed., **2**: 406 (1963); Blundell, *Wild fl. Kenya*: 104 (1982); Champluvier in *Fl. Rwanda* **3**: 448 (1985); Blundell, *Wild fl. E. Afr.*: 389 (1987). Type: Cameroon, W. of Buea, *Preuss* 847 (B†-holotype; K!-isotype).

B. dewevrei De Wild. & Th. Dur. in Durand & De Wild., in *Bull Soc. Roy. Bot. Belgique* **38**: 44–45 (1899); Burkill in *Fl. trop. afr.* **5**: 51 (1899); De Wild. & Durand, *Ann. Mus. Congo Sér. 3 Bot.* **1**: 174–175 (1901); De Wild. & Durand in *Bull. Herb. Boissier* **1**: 833 (1901); Durand & Durand, *Syll. fl. congol.*: 416–417 (1909). Type: Congo, between Lukolela an Gombi, *Dewevre* s.n. (BR!-holotype).

B. nyanzarum Burkill in *Fl. trop. afr.* **5**: 39 (1899); Robyns, *Fl. parc. nat. Albert.* **2**: 272 (1947); Andrews, *Fl. pl. Sudan* **3**: 171 (1956); Agnew, *Upl. Kenya wild fls*: 583 & 584 (1974); Synnott in *Comm. Forestry Inst. Occ. Papers* **27**: 68 (1985). Type: Kenya, Kavirondo, *Scott-Elliot* 6999 (K!-holotype).

B. leonensis Burkill in *Fl. trop. afr.* **5**: 41 (1899); Benoist in *Bull. Soc. Bot. France* **60**: 335 (1913); Hutchinson & Dalziel in *Fl. W. Trop. Afr.* **2**: 254 (1931). Syntypes: Sierra Leone, *Scott-Elliot* 3990a (K!), *Windwood Reade s.n.* (K!), *Don* s.n. (BM!).

B. patula var. *welwitschii* Burkill in *Fl. trop. afr.* **5**: 41 (1899); Hiern in *Cat. afr. pl* **1**: 807 (1900). Syntypes: Angola, near Sange, Quiapoza and Cuango Rivers, *Welwitsch* 5149 (BM!), Quibolo, *Welwitsch* 5182 (BM!, K!, P!).

B. mahonii C.B. Clarke in *Bull. Misc. Inform.* 1906: 251 (1906); S. Moore in *J. Bot.* **45**: 89 (1907); Lind, *Comm. fl. pl. Uganda*: 140, fig. 82 (1962). Type: Uganda, Entebbe, *Mahon* s.n. (K!-holotype).

B. bauchiensis Hutchinson & Dalziel in *Fl. W. trop. Afr.* **2**: 253 (1931); Hutchinson & Dalziel *Fl. W. trop. Afr.* 2nd ed., **2**: 407. Syntypes: Nigeria, Bauchi Plateau, *Lely* P129 (K!), *Dent Young* 195 (K!).

Icones: *P. Beauv., Flore d'Oware* **2**: t. 100 fig. 2 (1818); Anderson in *Trans. Linn. Soc. London* **29**: pl. 124 (1875); Hooker in *Bot. Mag.*: 79: t. 4717 (1853) excluding glabrous fruit; Heine in *Fl Gabon*, Acanthacées: **13**: pl. 19 figs 1–6 (1966); Agnew, *Upl. Kenya wild fls*: 584 (1974); Blundell, *Wild fl. Kenya*: pl. 264 (1982); Champluvier in *Fl. Rwanda* **3**: fig. 139: 2, 3A–3D (1985); Blundell, Wild *fl. E. Afr.*: pl. 849 (1987).

Herbs or woody herbs to 1–3(–4) m tall, viscid, often aromatic. *Stems* 1–8(–15) mm in diameter, glabrous or pubescent towards apex. *Leaves* ovate to broadly ovate (35–)50–140(–210) × (25–)40–120(–185) mm; leaf base cordate to cuneate; apex acuminate sometimes markedly so; margin toothed, usually irregularly serrate, crenate towards apex with or without secondary toothing; eglandular pubescent above and below, sometimes densely pubescent; lateral veins 6–19 each side of the midrib; petiole (10–)30–90(–130) mm long, lamina decurrent in upper ½–¾ length of petiole, occasionally entire length of petiole. *Inflorescence* a many flowered terminal panicle (9–)15–40(–60) cm long with 4–18 nodes; rachis glandular pubescent. *Bracts* ovate, (3–)20–50(–75) × (5–)15–25(–40) mm, usually falling early; bractlets linear oblong, to 20 × 5 mm, eglandular pubescent. *Sepals* subequal to unequal, linear, (5–)9–15(–22) × 1 mm long, rounded to slightly spathulate at the apex, glandular pubescent. *Corolla* pale purple to deep blue-purple often with yellow markings in throat; tube (5–)7–10(–14) × 2–6 mm long; upper lip (13–)18–30(–60) mm long, outer surface of upper lip glandular pubescent; lower lip (14–)18–30(55) mm long, glabrous; apical lobes (1–)2–5(–10) mm long. *Androecium* with filaments (20–)25–35(–40) mm long; anthers (2–)5–7(–10) mm long; staminodes (10–)15–25(–30) mm long with small vestigial anther at the apex. *Gynoecium* with style (15–)20–35(–45) mm long; stigma 2–4(–6) mm long; ovary 3–7 mm long, pubescent. *Capsule* (15–)18–26(–33) × 2–3 mm with (10–)12–18(–24) seeds per locule; covered with eglandular and glandular trichomes.

DISTRIBUTION. Throughout tropical Africa.

HABITAT. Moist montane forest particularly in open shady places where competition is reduced in recently disturbed areas; 600-1600 m.

SELECTED COLLECTIONS

SIERRA LEONE: 18 November 1965, *Adam* 22109 (MO, P); 2 January 1966, *Adam* 22916 (MO, P); 27 November 1965, *Adam* 27084 (MO); Mt. Nimba, 14 December 1966, *Bos* 2397 (WAG); 8°25'W 7°32'N, 18 December 1967, *Geerling & Bockdam* 1859 (C, MO, WAG); LIBERIA: 10 January 1965, *Adam* 20549 (BR, K, MO, P, UPS); Grand Cape Mount Co., 21 December 1947, *Baldwin* 10778 (K, MO); 6 November 1947, *Baldwin* 10182 (K, MO); Loffa country, 21 December 1966, *Bos* 2552 (K, WAG). IVORY COAST: 24 November 1909, *Chevalier* 22421 (P); 20 km de Man sur route de Danané, 23 November 1956, *de Wilde* 859 (WAG); Mont Tonkoui, près de Man, 3 December 1985, *Ake Assi* 17170 (G). GHANA: Bauchi Plateau, 17 April 1955, *Morton* K416 (K, WAG); Kofordua, *Dalziel* 148 (C, E, K, M, MO, PRE, WAG). NIGERIA: Mandaga, Nambila Plateau, 4 January 1955, *Latilo & Daramola* FH1 28992 (FHO); Shasha Forest Reserve, *Richards* 3108 (BM, MO, NY); 11 December 1976, *Ariwaodo* 33. CAMEROON: 13 February 1927, *Dalziel* 8232 (US); Buea, *Preuss* 1029 (BM, M); Dschang, December 1938, *Jacques-Felix* 2600 (P); 31 km on Ebolowa-Ambam Road, 1 September 1974, *de Wilde* 7544 (WAG); Lake Oku, 6°13'N 10°28'E, *Thomas* 4381 (MO, YA); GABON: Woleu-Ntem Province, 14 November 1933, *Le Testu* 9395 (BR); CENTRAL AFRICAN REPUBLIC: 10 December 1936, *Eckendorf* 73 (P); CONGO: Sangha, 2°N 13°55'E, 27 November 1991, *Thomas* 9005 (MO); DEMOCRATIC REPUPUBLIC OF THE CONGO: 12 January 1914, *Bequaert* 1905 (BR); Kivu, Lac Mokoto, 27 July 1953, *van der Ben* 648 (BR); Yangambi region, Yabahondo village, October 1952, *Germain* 8141 (BR, W, Z). RWANDA: Rwaza, SE de Ruhengeri, 23 February 1972, *Auquier* 2684 (BR). BURUNDI: 2 June 1969, *Lewalle* 3795 (BR). UGANDA: Bigera River, 3 August 1906, *Bagshawe* 1131 (BM). KENYA: December 1933, *Dale* 3208 (BR, FHO); January 1932, *Brodhurst-Hill* 693 (Z). TANZANIA: 26 January 1991, *Kayombo* 1072 (MO). ANGOLA: 24 June 1958, *Montiero, Santos & Murta* 205 (PRE).

Brillantaisia owariensis is the most widespread and variable of all species in the genus and has caused many problems of species delimitation for botanists over the years. After extensive herbarium studies, supplemented by field work in Cameroon and Tanzania, I consider it impossible to split this group into discrete taxa and recognize it as a very diverse '*ochlo*-species' (sensu White, 1962: 79) and accept that, although unsatisfactory, this is the only viable option without further extensive studies in the field. *Brillantaisia owariensis* sensu meo encompasses all fairly robust, woody *Brillantaisia* plants with a paniculate inflorescence, toothed leaves with a winged petiole and pubescent fruit. Morphological variation within the group appears more pronounced in certain parts of Africa. In East Africa, for example, clear morphological differences can be observed between different isolated groups and two representative specimens may look nothing like one another when the extremes of morphological variation are observed. However, when morphological variation is studied accross the whole of Africa, character differences break down and distinct groups cannot be distinguished.

Variable characters include leaf shape, leaf base shape, leaf margin, number of lateral veins, calyx shape, inflorescence density, flower size, fruit length/width and fruit pubescence. The morphological variation within *Brillantaisia owariensis* is informally described below in terms of two main groups: the *nitens* group and the *patula* group.

Plants which tend to differ from typical *B. owariensis* in possessing rather finely toothed leaves, a somewhat narrow petiole wing, larger number of lateral nerves and a relatively dense inflorescence could be assigned to the *nitens* part of *Brillantaisia owariensis*. *Brillantaisia nitens* was described by Lindau (1893) as being distinct from all other Brillantasias due to the leaf pubescence, which is comparatively dense for the genus. Plants with characters of the *nitens* group tend to occur in the forests of Cameroon and further west in tropical Africa. Plants that are slightly more robust than typical *Brillantaisia owariensis,* with velvety-tomentose leaves, have previously been distinguished as *Brillantaisia bauchiensis* in Nigeria and *B. leonensis* in Sierra Leone. Specimens with longer calyx lobes and sub-persistent bracts were previously assigned to *B. mahonii*. Specimens from East Africa that generally have the same morphological characters as those of the *nitens* group, but differ in the presence of more persistent bracts, have often been identified as *B. nyanzarum*.

The *patula* group: The most distinct node of variation within *Brillantaisia owariensis* is seen on specimens that can be informally described as the *patula* group. These plants have a very open, lax, 'zigzag' inflorescence architecture and often have large flowers and a linear calyx. Specimens with these characteristics do not seem to be restricted to one area of Africa and have been collected from Guinea to Zaire and on São Tomé. Most *patula* specimens have been collected from the Congo basin. Leaves of the *patula* 'node' often, but not always, have a distinct wing to the base of the petiole (*Mocquery's* 115, Z; *Richards* 3018, BM) which is occasionally amplexicaul.

6. **Brillantaisia kirungae** Lindau in *Götzen, Durch Afrika von Ost nach West, Sonderabdr.*: 9 (1896); Burkill in *Fl. trop. afr.* **5**: 42 (1899); Durand & Durand, *Syll. fl congol.*: 417 (1909); Robyns, *Fl. parc nat. Albert* **2**: 269 (1947). Type: Zaire, Mount Kirunga, *von Götzen* 48 (B†-holotype).

Fig. 12.

B. ulugurica Lindau in *Bot. Jahrb. Syst.* **22**: 112 (1897); Burkill in *Fl. trop. afr.* **5**: 43 (1899); Brenan & Greenway, *Checklist brit. empire 5 Tangan. terr.* **2**: 6 (1949). Syntypes: Tanzania, Uluguru Mts, *Stuhlmann* 8850 (B†) & *Stuhlmann* 9224 (B†)

B. subulugurica Burkill in *Fl. trop. afr.* **5**: 42 (1899); Binns, *Checklist herb. fl. Malawi*: 12 (1968). Type: Mozambique, Makua, Namuli Hills, *Last* s.n. (K!-holotype).

B. grandidentata S. Moore in *J. Bot.* **45**: 331 (1907). Type: Uganda, Toro, Fort Portal, *Bagshawe* 1270 (BM!-holotype).

B. cicatricosa var. *kivuensis* Mildbr. in *Bull. Jard. Bot. État* **17**: 86 (1943); Robyns, *Fl. parc nat. Albert* **2**: 270 (1947). Type: Zaire, Lake Magera, *de Witte* 1434 (BR!-holotype; BR!-isotype).

B. nitens sensu Agnew, *Upl. Kenya wild fls*: 583 (1974), non Lindau (1893).

Icones: Champluvier in *Fl. Rwanda* **3**: fig. 139, 1A–1D (1985); Fischer & Hinkel, *Nat. env. Rwanda*: fig. 68 (1992).

Stout shrubby herbs 1–2 m tall to shrubs or small trees 2–5(–7) m tall with bole 1.4 m high and 12 cm diameter, viscid and sometimes aromatic. *Stems* erect, 5–20(–120) mm across, shortly puberulent. *Leaves*, broadly ovate 60–320 × 50–240 mm; leaf base cordate or truncate to attenuate or cuneate; apex acute to acuminate; margin irregularly toothed, teeth single or double, smaller becoming crenate towards the apex, rarely entire; puberulous; lateral veins 7–13 each side of the margin, lower laterals closer together; petiole (0–)10–140 mm long, lamina gradually decurrent on top ½–¾ of petiole, upper pair of leaves at base of inflorescence sessile. *Inflorescence* a terminal thyrse 15–25(–40) cm long, lateral branches erect, at 30–50 degrees to the main rachis, flowers crowded at end of lateral branches; rachis shortly pubescent; trichomes, red-brown, non glandular, sometimes straggly purple trichomes. *Bracts* broadly ovate to ovate, occasionally elliptic, base slightly amplexicaul, apex rounded to acute; bractlets ovate(-linear), falling late or remaining in fruit. *Sepals* unequal, larger upper sepal linear, rounded at tip or slightly spathulate, (8–)10–14(–19) × 1–3(–5) mm, often twice as wide as lateral sepals (clearly seen in bud), occasionally very large; smaller lateral sepals linear 8–15 × 1 mm; densely pubescent dorsally. *Corolla* pale blue to bright blue-purple or pink-purple, with darker markings on lower lip; corolla tube 6–10 × 3–6 mm, occasionally inflated; upper lip 19–35 × 6–10 mm, evenly covered in dense, eglandular and glandular trichomes; lower lip 19–40 × 10–18(–25) mm, ridged on upper surface; apical lobes triangular, 3–10 × 2–8 mm. *Androecium* with filaments 20–25(–30) mm long; anthers (3–)5–8 mm long; staminodes 8–12 mm, very slender often with well developed vestigial anther. *Gynoecium* with style 25–40 mm long; stigma 2 mm long; ovary 5–10 mm, covered in tangled glandular trichomes, sometimes also with non glandular trichomes. *Capsule* 30–40 × 2–5 mm with 8–10(–16) seeds per locule; black, glandular puberulous. Specimens often drying black.

DISTRIBUTION. East and central Africa, from Kenya south to Zimbabwe and Mozambique, west to Uganda and Eastern Zaire.

HABITAT. In gaps in mid altitude and montane forest, forming thickets, often along streams. Very local; 1000–3500 m.

SELECTED COLLECTIONS

DEMOCRATIC REPUPUBLIC OF THE CONGO: Kivu, 27 July 1959, *Cambridge Congo Expedition* 146 (BM, LISC, US). RWANDA: Parc des Volcans, 27 July 1974, *Van der Veken* 10350 (BR). BURUNDI: Rwegura, 29 May 1969, *Lewalle* 3640 (BR, G); Bubanza, 22 June 1980, *Reekmans* 9408 (K, MO, UPS). SUDAN: Imatong Mts, Gilo Village, 8 November 1980, *Friis & Vollesen* 58 (C). UGANDA: Ruwenzori Mts, Namwamba Valley, 17 January 1935, *Taylor* 3156 (BM, MO, NY, S). KENYA: 18 March 1977, *Faden & Faden* 77/919 (BR, US, WAG). TANZANIA: Rungwe, Kiwara River, 9 August 1949, *Greenway & Eggeling* 8394 (PRE); Morogoro, Bunduki, 17 August 1951, *Greenway & Eggeling* 8594 (FHO); Nugwi River, 19 August 1952, *Carmichael* 102 (FHO); Mbisi Mts, 17 June 1960, *Leach & Brunton* 10069 (SRGH); Ufipa, 6 August 1960, *Richards* 12983 (SRGH); Kilosa District, Ukaguru Mts, 7 August 1972, *Mabberley* 1403 (K), Mufindi Tea Estate, 17 August 1984, *Bridson & Lovett* 544 (MO). MOZAMBIQUE: Namuli Peaks, 26 July 1962, *Leach & Schelpe* 11470 (LISC, SRGH); MALAWI: Nchisi Mts, 4 September 1929, *Burtt Davy* 1228 (FHO); Kafwimba Forest, 4 July 1973, *Pawek* 6978 (C, PRE, SRGH, UPS). ZIMBABWE: Ngoruma reserve, 14 August 1962, *Plowes* 2261 (LISC, SRGH); Vumba, 20 September 1968, *Müller* 802 (SRGH).

Brillantaisia kirungae is the largest and most woody of the species of *Brillantaisia* and is easily recognized by the woody or shrubby habit; highly irregularly toothed leaves; large flowers in a crowded erect inflorescence; broad upper calyx lobe and large, few-seeded fruit. This species is rather variable in leaf shape and toothing (most collections lack the larger lower leaves, so measurements given above need refining after more field studies); the degree of contraction of the inflorescence; density of the indumentum on both the inflorescence and fruit; and flower size, particularly the size of the lobes at the apex of the lower lip. Previous treatments of *Brillantaisia kirungae* have all divided it into more than one species. For example,

Fig. 12 *Brillantaisia kirungae* Lindau. A. Habit × 0.7; B. Lower leaf × 0.7. C. Corolla dissection showing androecium × 1.4; D. Gynoecium × 1.4. E. Capsule × 1.4; F. Bract and bractlets × 1.

Burkill (1899) recognized four species: *Brillantaisia cicatricosa* with subglabrous sepals and numerous seeds; *B. kirungae* with lanceolate bracts; *B. ulugurica* with large flowers and large lobes at the apex of the lower corolla lip and a new species, *B. subulugurica* which was considered distinct from *B. ulugurica* due to the shorter corolla tube. More recently, Champluvier (1985) recognized two species, *B. kirungae* and *B. cicatricosa*, separated on the size of the upper sepal. All of the characters used by previous authors to divide this species are continuously variable when the entire geographical variation of the group is accounted for. In his treatment of the genus for the *Flora of Tropical East Africa* and *Flora Zambesiaca*, Vollesen (in prep *a* & *b*) recognizes two species within this group, *B. cicatricosa* and *B. ulugurica*. He considers plants of *B. cicatricosa* to have irregularly large-toothed leaves; smaller lower corolla lip lobes; smaller seeds, to lack glandular trichomes on the fruit and to have a more northerly distribution from Kenya, Uganda, Burundi, Rwanda and Zaire. *Brillantaisia ulugurica sensu* Vollesen is recognized as distinct on the basis of smaller irregular teeth on the leaves; leaf margin becoming entire towards the apex; larger lobes on the lower corolla lip; larger seeds; both glandular and non glandular trichomes on the fruit; and a more widespread geographical range in Uganda, Burundi, Zaire, Tanzania, Malawi, Mozambique, Zimbabwe and Zambia. Two characters used by Vollesen to distinguish *B. cicatricosa* from *B. ulugurica* are not overlapping or continuous in his species descriptions: seed size and fruit hair type. I have studied the two species across their entire range which includes specimens from Sudan and Angola. It appears that although some '*cicatricosa*-like' specimens do have smaller flowers, deeply toothed leaves with a more cordate base, smaller seeds and no glandular tricomes on the capsule, these characters are continuously variable and there is no morphological data to suppport separatation of the two species.

A new species from Tanzania was mentioned by Vollesen (in prep. *a*) as closely related to *Brillantaisia ulugurica*. Plants belonging to the new putative new species were recognized primarily by the presence of long, rather synthetic looking, purple, eglandular trichomes on the panicle and calyx, and by the larger capsule (no measurements given). Several intermediates between *B. ulugurica sensu* Vollesen, with short puberulent trichomes on the panicle and short glandular and eglandular trichomes on the calyx, and the purple haired *sp. nov.* cf. *B. ulugurica* have been studied (e.g. MOZAMBIQUE: *Leach & Schelpe* 11470; MALAWI: *Chapman & Chapman* 9271 Mt Mulanje; *Burtt Davy* 1228) and I consider the variation to represent one species. Within the single species recognized in this treatment, plants with a more lax inflorescence, more slender sepals and smaller flowers tend to occur further north-north west (SUDAN, Gilo Village, *Friis & Vollesen* 58 C; RWANDA, Parc des Volcans, *Van der Veken* 10350, BR; UGANDA, Kanaba Pass, *Makerere College* 29) whereas larger more robust plants are more commonly from Malawi and Mozambique.

Typification of this species is somewhat problematic as mentioned by Champluvier (1985). I disagree with her decision to retain the epithet *cicatricosa*. Specimens of *B. kirungae* sensu meo have historically been named as *B. cicatricosa*, *B. kirungae*, or *B. ulugurica*, however, the type specimens of all three of these names were destroyed in Berlin. The protologue of the earliest name, *B. cicatricosa* Lindau, is somewhat ambiguous and does not fit the species description above. Although the Latin diagnosis of *B. cicatricosa* mentions the large upper sepal of this species, several characters do not fit the group well, notably subglabrous sepals and 16–20 seeds in the capsule. The original description of *B. cicatricosa* Lindau mentioned that the species was close to *B. pubescens* T. Anders., however without a type specimen of *B. cicatricosa* the variation observed by Lindau when he made this seemingly misplaced statement cannot be checked. It may well be the case that Lindau based his observation on the illustration of Fitch in Anderson (1875) which has caused considerable confusion in *Brillantaisia* (see p. 86). *Brillantaisia cicatricosa sensu* Burkill (1899) adds to the ambiguity of this name as he describes the species as having entire, glabrous leaves, a loose inflorescence, nearly glabrous sepals and 16–20 seeds, whereas the species recognized here has irregularly toothed pubescent leaves and a crowded inflorescence. A variety of *B. cicatricosa* Lindau was formally recognized by Mildbraed (1943) on the presence of glandular trichomes on the calyx. This taxon is illustrated in *Flore du Rwanda* (Champluvier, 1985) and clearly falls within *B. kirungae* as delimited here. However, I am not certain that Mildbraed saw the type specimens of *B. cicatricosa* or that he understood Lindau's concept of that species. Therefore, as the protologue of *B. cicatricosa* Lindau is ambiguous and the description of *B. cicatricosa* by Burkill does not fit this species, I treat this name as dubious, and use the second earliest name, *B. kirungae*, for this species.

7. **Brillantaisia vogeliana** (Nees) Benth. in *Hooker, Niger Fl.*: 477 (1849); Anderson in *Journ. Linn. Soc. Bot.* **7**: 21 (1864); Burkill in *Fl. trop. afr.* **5**: 40 (1899); Benoist in *Bull. Soc. Bot. France* **60**: 335 (1913); Hutchinson & Dalziel in *Fl. W. trop. Afr.* **2**: 254 (1931); Exell, *Cat. pl. S. Tome*: 260 (1944); Mildbraed, *Wiss. Erg. zweit. deut. Zentr.-Afr. Exped., Bot.*: 192 (1922); Robyns, *Fl. parc. nat. Albert* **2**: 272 (1947); Heine in *Fl. W. trop. Afr.* 2nd ed., **2**: 406 (1963); Heine in *Fl. Gabon* **13**: 92 (1966). Type: Fernando Po, *Vogel* 179 (K!-holotype; K!-isotype).

Fig. 13.

Leucoraphis vogeliana Nees, in DC., *Prodr.* **11**: 97 (1847).

Brillantaisia molleri Lindau in *Bot. Jahrb. Syst.* **17**: 99 (1893). Type: São Tomé, *Möller* 33 (87) (B†-holotype; COI!, K!-isotypes).

B. preussii Lindau in *Bot. Jahrb. Syst.* **17**: 100 (1893). Syntypes: Cameroon, Barombi, *Preuss* 320 (K!-isosyntype) Buea, *Preuss* 998 (BM!, K!-isosyntypes)

B. soyauxii Lindau in *Bot. Jahrb. Syst.* **17**: 101 (1893); Burkill in *Fl. trop. Afr.* **5**: 39 (1899); Benoist in *Bull. Soc. Bot. France* **60**: 335 (1913); non Heine in *Fl. Gabon* **13**: 84 (1966). Type: Gabon, Munda, Sibange Farm, *Soyaux* 454 (B†-holotype; E!, H!, US!,WAG!-isotypes).

B. schumanniana Lindau in *Bot. Jahrb. Syst.* **17**: 102–103 (1893). Type: Cameroon, *Braun* 47 (B†-holotype).

Icones: Heine in *Fl. Gabon* **13**: pl. 18, figs 1–6 (1966); Heine, in *Fl. W. trop. Afr.* 2nd ed., **2**: 406, fig. 300 (1963).

Erect herbs to 0.2–1 m tall. *Stems* erect, 2–4 mm in diameter, branching near base, leaf petioles fused across each node, glabrous or shortly pubescent with a fringe of trichomes at the nodes. *Leaves* ovate to broadly ovate 35–100(–110) × 45–120(–150) mm, papery, bright green, paler below, evenly pilose; leaf base truncate or cordate, occasionally shortly attenuate; apex slightly acuminate, rounded; margin irregularly serrated, dentate at base of lamina around the widest part of the leaf, crenate towards the apex of the leaf; lateral veins 7–13 each side of midrib, prominent; petiole (30–)40–120 mm, lamina decurrent on upper third of petiole, wing often toothed at top. *Inflorescence* a terminal lax thyrse (8–)12–20(–30) cm long, with smaller lateral inflorescences in axils of lower leaves; rachis shortly glandular pubescent with slender non glandular trichomes. *Bracts* to 7 × 15 mm, often falling early; bractlets linear elliptic to 2 mm long, glabrous with fringe of irregular glandular trichomes. *Sepals* unequal, slightly spathulate, larger upper sepal 6–15 mm long, smaller lateral sepals 6–10(–12) mm long, viscid glandular pubescent. *Corolla* clear

Fig. 13 *Brillantaisia vogeliana* (Nees) Benth. A. Habit × 0.7; B. Corolla dissection showing androecium × 3; C. Capsule × 2; D. Gynoecium × 3; E. Bract and bractlets × 1.

mauve-violet, white in throat with lateral yellow spots; corolla tube paler, tube 2–4 × 5–10 mm, slightly shorter than the calyx lobes; upper lip 11–15(–25) mm covered with glandular and non glandular trichomes on outer surface, more so towards the apex; lower lip 10–15(–25) mm long; apical lobes to 1 × 1 mm, central tooth broader than the laterals, glabrous. *Androecium* with filaments 12–17(–24) mm long, glabrous; anthers 2–4(–6) mm long; staminodes 6–10 mm long, flattened at tip to vestigial anther, glabrous. *Gynoecium* with style 15–20 mm long; stigma 1.5–3 mm long; ovary 3–4 mm long. *Capsule* (10–)17–21(–24) × 1–2 mm with 20–24 seeds in each locule, indumentum of slender white non glandular trichomes and short glandular trichomes.

DISTRIBUTION. Throughout West Africa and on the islands of the Gulf of Guinea across Central African Repulic and Congo to Sudan, Uganda and Kenya.

HABITAT. A weedy species common in wasteland, clearings, plantations and along roadsides; 60–1200 m.

SELECTED COLLECTIONS

IVORY COAST: Mont Momi, 29 October 1966, *Ake Assi* 9136 (G). GHANA: Atewa Range N. of Kibi, 3 November 1990, *Manktelow, Steiner & Amponsah* 89 (UPS). CAMEROON: N'Kolbisson, 3 November 1963, *de Wilde & de Wilde-Duyfjes* 1130 (K, MO, WAG, YA); Nkolbison, 8 km W. of Yaounde, Mount Minloua, 19 November 1964, *Raynal* 11964 (P); 17 km along Kribi-Lolodorf road, 22 September 1969, *Bos* 5387 (C, K, MO, PRE, UPS, WAG, YA); Chutes de Ntem, 40 km ESE of Campo, 10 December 1979, *Letouzey* 15340 (P); Sao Nicolau, 9 January 1980, *de Wilde, Arends & Groenendijk* 3 (WAG); crossing of road from S. Joao dos Angolares to Ribeira Peize, 12 January 1980, *de Wilde, Arends & Groenendijk* 95 (WAG); Kumba area, 13 October 1984, *Thomas & Nemba* 4048 (MO). BIOCCO: October 1911, *Mildbraed* 7028 (H). CENTRAL AFRICAN REPUBLIC: 27 km S. of Nola, 29 November 1965, *Leeuwenberg* 7100 (BM, C, K, LISC, WAG). CONGO: Sulongo, 22 March 1959, *Everard* 6002 (PRE); Piste Meya – Mpassa, 28 April 1965, *Farron* 4085 (P). SÃO TOMÉ: Famosa, 5 January 1949, *Espirito Santo* 68 (BM); Monte Cape, 5 March 1968, *Espirito Santo* 4298 (LISC); road from Nora Moka to Manuel Jorge River, 15 October 1993, *Figueiredo & Arriegas* 33 (FHO, K, LISC). GABON: Belinga Mines de Fer, 25 June 1966, *Halle* 4058 (P); Boka-Boka, Mount Bengoue, 4 March 1979, *Florence* 1706 (P); Woleu-Ntem, 2 May 1986, *Louis* 2077 (WAG); 10 km from Belinga, 5 December 1986, *Bos, van der Laan & Nzabi* 10755 (K, US, WAG). DEMOCRATIC REPUPUBLIC OF THE CONGO: Dyuma, Parc National Albert, 11 October 1955, *de Witte* 12827 (MO). SUDAN: Imatong Mountains, Talanga, 1 December 1980, *Friis & Volleson* 612 (C). UGANDA: Budongo forest, December 1935, *Eggeling* 3323 (K); Mabira forest, 8 November 1938, *Loveridge* 25 (K). KENYA: Kakamega forest, 11 December 1956, *Verdcourt* 1683 (K).

Brillantaisia vogeliana is often locally abundant as a weed along road and path sides and in clearings in secondary vegetation, small farms, plantations, etc. It is readily identified by leaves that are often cordiform, characteristically irregularly toothed and often with a toothed petiole; the highly branched inflorescence; relatively small flowers which are usually a clear mauve-violet and paler in the throat, and the pubescent fruit which have numerous seeds per locule. This species might be confused with *B. owariensis*, on the basis of the lax inflorescence and toothed leaves, and Vollesen tends to place East African specimens with rounded teeth and a wider inflorescence into that species. Plants of *B. vogeliana* differ, from those of *B. owariensis,* in possessing thinner, papery leaves with a more dentate, irregular leaf margin and pronounced dentate margin at the apex of the petiole wing; a more highly branched, slender inflorescence; smaller flowers and fruit with more seeds. A few specimens of *B. vogeliana* from the Congo basin have small flowers but larger leaves than typical *B. vogeliana* and seem to approach *B. owariensis*. White-flowered forms of this species are fairly common. Exell (1944: 261) noted the two colour forms and stated 'They seem to be identical except for the flower-colour and they always grow together, the purple-flowered form being rather more common'.

8. **Brillantaisia lamium** (Nees) Benth. in *Hooker, Niger Fl.*: 477 (1849); Burkill in *Fl. trop. Afr.* **5**: 38 (1899); Hiern in *Cat. afr. pl.* **1**: 807 (1900); Durand & Durand, *Syll. fl. congol.*: 417 (1909); Benoist in *Bull Soc. Bot. France* **60**: 334 (1913); Chevalier, *Explor. bot. Afrique occ. franç.* **1**: 493 (1920); Mildbraed, *Wiss. Erg. zweit. deut. Zentr.-Afr. Exped., Bot.* **2**: 90 (1922); Hutchinson & Dalziel in *Fl. W. trop. Afr.* **2**: 254 (1931); Exell in *Cat. pl. S. Tome*: 260 (1944); Heine, in *Fl. W. trop. Afr.* 2nd ed., **2**: 406 (1963); Heine in *Fl. Gabon* **13**: 88 (1966). Type: *Ansell* 1842 (K!-lectotype) (P!-isolectotype).

Fig. 14.

Leucoraphis lamium Nees in DC., *Prodr.* **11**: 97 (1847). Type: As for *Brillantaisia lamium.*

Brillantaisia palisotii Lindau in *Bot. Jahrb. Syst.* **17**: 99 (1893); Henriques in *Bol. Soc. Brot.* **10**: 146 (1893). Lindau in *Nat. Pflanzenfam.* **4**(3b): 296, fig. 119 (1895). Syntypes: Sierra Leone, Freetown, *Preuss* 16 (B); Sierra Leone, Freetown, *Afzelius* s.n. (UPS!); Togo, Bismarksburg, *Büttner* 231 (B), *Büttner* 320 (B); Cameroon, Mungo, *Bucholz* s.n. (BM!); São Tomé, *Quintas* 1235(88) (BM!, BR!, COI, Z!), *Quintas* 1132(89) (COI); Angola, Luanda, *Pogge* 1123 (?).

B. eminii Lindau in *Bot. Jahrb. Syst.* **17**: 103 (1893); Lindau in Pflanzenw. Ost-*Afr.* C: 366 (1895*d*); Burkill in *Fl. trop. Afr.* **5**: 38 (1899); Jex-Blake, *Wild fl. Kenya*: 103, fig. 84 (1948); Brenan & Greenway, *Checklist brit. empire 5 Tangan. Terr.* **2**: 5 (1949); Andrews, *Fl. pl. Sudan* **3**: 172 (1956); Synnott, *Comm. forest. inst. occ. papers* **27**: 68 (1985). Syntypes: Tanzania, Bukoba, *Stuhlmann* 3664 (K!); *Stuhlmann* 3995 (B†).

B. owariensis sensu Hook. in *Bot. Mag.*: t. 4717, fig. 3 (1853); T. Anderson in *Journ. Linn. Soc. Bot.* **7**: 339 (1863); Engler in *Bot. Jahrb. Syst.* **7**: 339 (1886), non P. Beauv. (1818).

B. subcordata De Wild. & T. Durand in: T. Durand & De Wild. *Bull Soc. Roy. Bot. Belgique* **38**: 44–45 (1899); De Wild. & Durand *Ann. Mus. Congo* **1**: 175–176 (1901); De Wild. *Miss. Ém. Laurent* **1**: 182, t. 45 (1905); Durand & Durand, *Syll. fl. congol.*: 418 (1909). Type: Zaire, Bokakata, *Dewevre* 802 (BR!-syntypes).

B. subcordata var. *macrophylla* De Wild. & T. Durand. in *Contrib. fl. Congo* **1, 2**: 47 (1900). Type: Locality uncertain, village on the Congo river, *Duchesne* 13 (BR!-holotype).

Icones: Lindau in *Nat. Pflanzenfam.* **4**(3b): fig. 119A-G (1895); Heine, in *Fl. W. trop. Afr.* 2nd ed., **2**: fig. 300 (1963); Heine, *Fl Gabon*: **13**: pl. 17 figs 4–8 (1966).

Perennial herbs (7–)20–100(–200) cm tall, creeping to erect, occasionally climbing with adventitious roots at nodes. *Stems* 4.5 mm in diameter, occasionally with longitudinal wings on angles, glabrous to velvety-tomentose. *Leaves* ovate to broadly ovate (12–)25–80(–110) × (20–)45–100(–180) mm or rarely oblong and 55–90 × 20–30 mm, sparsely pilose to tomentose with white silky trichomes above, pilose to velvety-tomentose below; leaf base cordate, subcordate or truncate occasionally shortly attenuate; apex acute with short acuminate tip or obtuse and abruptly contracted to acuminate tip; margin entire, rarely subentire to slightly crenate; lateral veins 6–10(–13) each side of midrib; upper pair of leaves at base of terminal inflorescence sessile, petiole (0–)8–80(–110) mm long, unwinged or lamina decurrent close to apex of petiole. *Inflorescence* a terminal, open, branching thyrse, 12.5–35 cm long,

Fig. 14 *Brillantaisia lamium* (Nees) Benth. A. Habit × 0.7; B. Corolla dissection showing androecium × 2; C. Gynoecium × 2; D. Calyx × 2.5; E. Capsule × 1.5; F. Bract and bractlets × 1.

often with smaller lateral panicles below, primary branches of inflorescence spreading almost at right angles to main axis, rachis usually sparsely covered in capitate glandular trichomes. *Bracts* ovate, adaxial surface pilose, often with slender multicellular trichomes, abaxial surface glabrous; bractlets rhomboid to linear, sessile, margin entire, adaxial surface covered with multicellular non-glandular trichomes, abaxial surface glabrous; becoming smaller and linear towards ends of lateral branches. *Sepals* sub-equal, linear, apex rounded, 4–7 mm long, green often tinged purplish; glabrous or with a few long glandular trichomes. *Corolla* deep bright blue-purple or violet occasionally pale lilac, one lip, often the upper; may be paler than the other; tube 5–8 × 2–4 mm, pale than lips, flushed inside with yellow, rarely completely white; upper lip (15–)22–30(–35) mm long, outer surface finely covered in glandular multicellular trichomes; lower lip (13–)19–27(–30) mm long, inner surface occasionally sparsely pubescent; apical lobe to 2 × 3 mm. *Androecium* with filaments 12–35 mm long, usually white; anthers 4.5–6 mm long; staminodes exserted for 4–5 mm from corolla tube, small vestigial anther. *Gynoecium* with style to 40 mm long, sparsely pubescent at base, stigma 3–5 mm long; ovary 3–4 mm long. Capsule 22–30 × (2–)3–5 mm with 14–16 seeds per locule, blunt tipped, green, tinged red at apex when immature, brown-black when mature and/or dried; glabrous or with a few erect, non-glandular trichomes at the apex, covered in black gland dots.

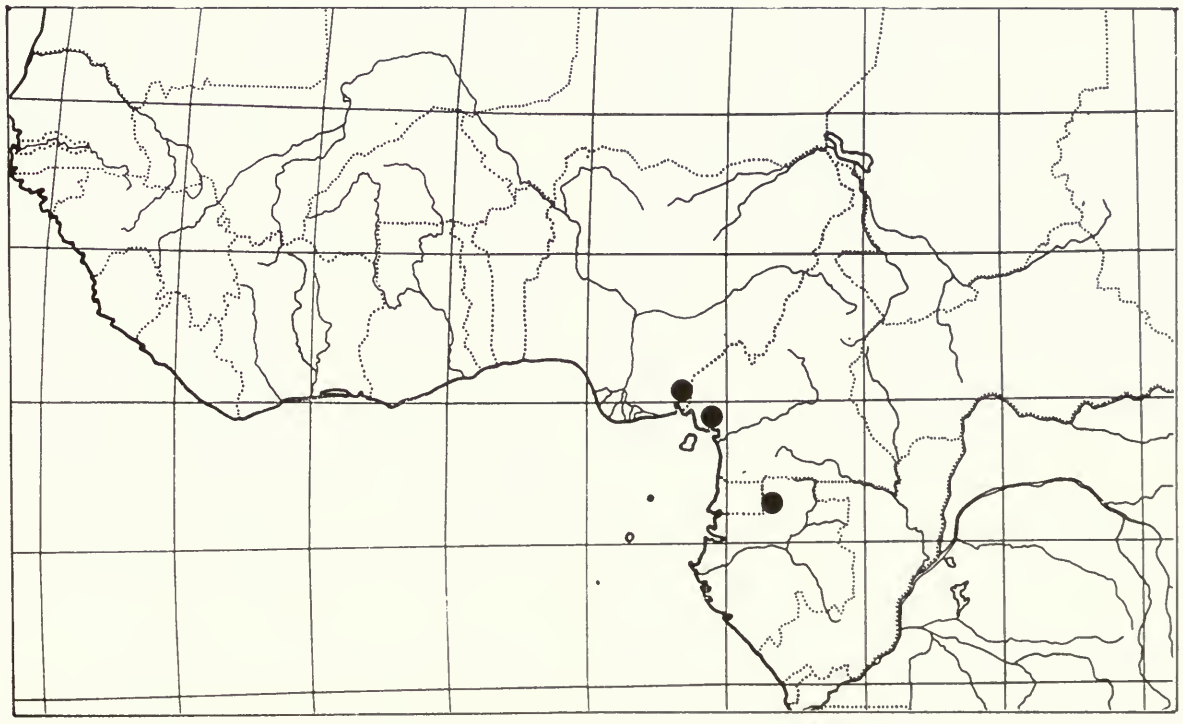
DISTRIBUTION. Throughout wet forest regions of west and central Africa, east to southern Sudan, through Zaire to northern Angola and through Uganda to northwest Tanzania.

HABITAT. Forest clearings, shade beside rivers or streams, on lake shores or in swamps, often waterlogged/with roots in water, disturbed areas, roads, paths and plantations. In west Africa often very weedy. 'In moist exposed woody situations almost everywhere' (on Princes Island, *Hiern*, 1900: 807). Common; 200–1600 m.

SELECTED COLLECTIONS

SIERRA LEONE: Njala, 30 October 1928, *Deighton* 1419 (BM, K, MO). LIBERIA: Louisiana, 11 November 1966, *Bos* 2310 (WAG); 10 miles N. of Monrovia, September 1970, *Jansen* 2207 (WAG). IVORY COAST: Sassandra, 18 June 1963, *de Wilde* 280 (K, WAG, Z); Foret de YAPO, 8 km S. of Becedi-Bugnan, 6 August 1963, *de Wilde* 641 (WAG); 27 October 1976, *Fabrigues* 3306 (P). GHANA: Banyimade, 10 September 1956, *Cudjoe*, 161 (WAG). TOGO: Kpandu, 1924, *Robertson* 62 (BM). NIGERIA: Oban, 1911, *Talbot* 981 (BM, K); Bauchi Plateau, August 1930, *Lely* 652 (MO); Cross River, 27 September 1985, *Gbile* 27 (MO). CAMEROON: Bibundi, October 1891, *Junger* 248 (UPS); Bipindi, 1896, *Zenker* 1104 (BM); NW of Tibati, 9 September 1963, *Letouzey* 5666 (P); Bakaka forest, 27 August 1971, *Leeuwenberg* 8206 (H, LISC, MO, UPS, WAG); Moundjo, 27 October 1975, *de Wilde* 8522 (WAG). BIOCCO: Malabo, near Baé Basula, 13 September 1986, *Carvalho* 2445, (BM); Sooyé, S. of Mamon, 16 February 1945, *Roberty* 6590 (G, Z). CENTRAL AFRICAN REPUBLIC: Koumbala, 25 October 1983, *Fay* 6055 (MO); Bambari, November 1923, *Tisserant* 1352 (P); *Tisserant* 3167 (BM, P). SÃO TOMÉ: 18 March 1968, *Espirito Santo* 4312 (LISC); Monte Cape, 14 August 1956, *Monod* 11681 (BM). DEMOCRATIC REPUPUBLIC OF THE CONGO: 26 June 1914, *Bequaert* 4836 (BR). BURUNDI: Ruyigi, 3 May 1980, *Reekmans* 9060 (MO, SRGH). SUDAN: Imatong mountains, Talanga, 2 December 1980, *Friis & Vollesen* 619 (C); Imatong Mountains, Acholi Hills, November 1981, *Howard* UTT 16 (C). ETHIOPIA: *Bidgood* s.n. (K). UGANDA: shores of Lake Nabugabo, 13 November 1934, *Taylor* 1660 (BM); Malabigambo forest, 15 August 1950, *Dawkins* D616 (BM). KENYA: Itare river, October 1940, *Copley* B1188 (G); Nairobi, 12 October 1972, *Hansen* 713 (C). ANGOLA: Loanda, 1903, *Gossweiler* 131 (BM).

Brillantaisia lamium is a widespread species that is readily recognized by the cordate leaves with an entire margin and unwinged petiole. The inflorescence is open and rather sparsely flowered with



Map 3 The distribution of *Brillantaisia lancifolia* Lindau.

Fig. 15 *Brillantaisia lancifolia* Lindau. A. Habit × 0.7; B. Corolla dissection showing androecium × 2; C. Gynoecium × 2; D. Calyx × 2; E. Bract and bractlets × 2; F. Capsule × 2.2.

few lateral branches that tend to be at right angles to the central axis. Fruit are characteristically glabrous but occasionally with a tuft of trichomes at the apex.

East African specimens of *Brillantaisia lamium* are often far more robust and pubescent than West African representatives, which tend to be slender herbs; however, the variation appears to be continuous and there are no morphological and/or geographical data to support subdivision of the species. Vollesen (in prep. *a*) notes 'A similar pattern where eastern plants from higher altitudes have larger flowers than western lowland plants is known from other Acanthaceae, e.g. *Anisosepalum alboviolaceum*'. *Brillantaisia lamium* can form large weedy populations in areas of recently cleared vegetation or plantations of oil palm, cocoa or bananas, and in open grassy areas at higher altitude. In Cameroon slender low growing forms with very deep purple flowers were cultivated as an ornamental in small village compounds on Mount Cameroon. Collections from Kenya are of naturalized plants from Uganda and in swamp areas around Nairobi the species is now quite common.

9. **Brillantaisia lancifolia** Lindau in Engl. *Bot. Jahrb. Syst.* **17**: 98 (1893); Burkill in *Fl. trop. Afr.* **5**: 40 (1899); Benoist in *Bull. Soc. Bot. France* **60**: 335 (1913); Heine in *Fl. W. trop. Afr.* 2nd ed., **2**: 406 (1963); Heine in *Fl. Gabon* **13**: 86 (1966). Type: Gabon, Sierra del Crystal, *Mann* 1688 (B†-holotype, K!-lectotype, P!-isotype).

Fig. 15. Map 3.

B. talbotii S. Moore *Cat. pl. Talbot Oban distr.*: 75 (1913); Hutchinson & Dalziel in *Fl. W. trop. Afr.* **2**: 254 (1931). Type: S. Nigeria, Oban *Talbot* 2000 (BM!, K!-syntypes).

Icon: Heine, *Fl Gabon*, Acanthacées: **13**: pl. 19 figs 1–3 (1966).

Perennial herb to 0.3–0.5 m tall. *Stems* 2–3 mm in diameter, glabrous to densely pubescent, petiole bases fused forming ridge across nodes. *Leaves* ovate-elliptic to lanceolate 25–130(–190) × 8–30(–50) mm, smaller on axillary shoots, glabrous or very sparsely pubescent; base cuneate; apex acute; margin entire to very shallowly serrated or crenate, subentire towards apex, entire towards base; main lateral veins 5–8 on each side; petiole 5–22 mm long, unwinged, lamina decurrent at apex. *Inflorescence* a delicate, open, few-flowered panicle 50–150 mm long, rachis glandular pubescent. *Bracts* often caducous, linear-lanceolate, bractlets if present linear lanceolate with rounded apex, sparsely pubescent. *Sepals* unequal, linear, tapering gradually towards the apex, larger upper sepal 6–10 mm long, smaller lateral sepals to 5–8 mm long, pubescent, with capitate glandular trichomes. *Corolla* deep blue to violet, often with brown marking in throat; corolla tube 5–10 × 2 mm, pale purple sometimes tinged green; upper lip 10–15(–20) × 2–3 mm, glandular pubescent, particularly of edge of upper lip; lower lip 10–18 × 6–8 mm, apical teeth rounded-triangular 1–2 × 1 mm. *Androecium* with filaments to 20 mm long, anthers 3–4 mm long; staminodes usually prominent, around half length of the corolla lips. *Gynoecium* with style 15–28 mm, stigma 1 mm, ovary 3 mm long, shortly glandular pubescent. *Capsule* 15 × 1–1.5 mm with *c.* 9–10 seeds per locule, brown when dry, evenly glandular pubescent.

DISTRIBUTION. Restricted to a few montane regions in Nigeria, Cameroon and Gabon.

HABITAT. On damp rocks, in dark ravines or at edges of waterfalls; 300–700 m.

SELECTED COLLECTIONS

NIGERIA: Oban, 1912, *Talbot* 2000 (BM, K). CAMEROON: Ebone-Yabassi, 27 December 1967, *Bamps* 1632 (BR); Mount Cameroon, above Baioke, *Thomas* 2775 (MO). GABON: Crisial Mts, 21 January 1968, *Halle & Villiers* 4626 (P); Haute-Ngounye, 7 June 1926, *Le Testu* 5943 (BM, BR, P).

Very few specimens have been collected of *Brillantaisia lancifolia*. However, from available material and without further opportunity for field study, I maintain this species as clearly distinct from all other species of *Brillantaisia*. *Brillantaisia lancifolia* has lanceolate leaves unlike any other species in the genus, the plants tend to be delicate and leafy, with numerous axillary vegetative shoots. The nodes are regularly spaced and the internodes rarely exceed 40 mm. The inflorescence is also very delicate with few flowers. Few of the specimens studied have fruit and additional counts of seeds per locule are needed. Two collections from Cameroon (*Leeuwenberg* 8994, WAG; *Hepper* 1332, S) are intermediate in leaf shape between *B. lancifolia* and the less woody forms of *B. owariensis*; these specimens have ovate-elliptic leaves with a cuneate leaf base. However, the flowers on these specimens are far larger than those of typical *B. lancifolia* and have been provisionally determined as part of the large and variable *B. owariensis* group.

10. **Brillantaisia debilis** Burkill in *Fl. trop. Afr.* 5: 39 (1899); Benoist in *Bull. Soc. Bot. France* **60**: 335 (1913). Type: Cameroon, Efulen, Batanga, *Bates* 350 (K!-lectotype, BM!, MO!, Z!-isotypes).

Fig. 16. Map 4.

Icon: Heine, *Fl Gabon*, Acanthacées: **13**: pl. 16 figs 1–3 (1966).

B. soyauxii sensu Heine in *Fl. Gabon* **13**: 84, pl. 17, figs 1–3 (1966) non Lindau (1893); non Burkill (1899).

Leafy herbs 0.2–1 m tall. *Stems* 2–5 mm in diameter, often highly branched, rooting at nodes. *Leaves* elliptic-ovate to rhomboid, 45–110 × 25–58 mm, dull green, veins pale green to white; glabrous; lateral branches with smaller leaves 18–40 × 11–16 mm; leaf base cuneate; apex acuminate; margin entire to shallowly crenate; lateral veins 4–8 on each side of midrib; petiole 22–40(–80) mm, lamina decurrent towards base of petiole. *Inflorescence* a few flowered terminal panicle (50–)80–140(–180) mm long; rachis glabrous to glandular pubescent. *Bracts* ovate-obovate, 4–22 × 3–10 mm, rounded at apex; bractlets 1–5 mm long, narrowly oblong-obovate, glabrous to glandular pubescent, pedicel 1–2 mm long. *Sepals* subequal, linear, rounded at apex, 5–10 × 0.5–1 mm, pale green, fringed with unequal, purple, glandular trichomes. *Corolla* violet to deep bright purple with pale green or yellow spots in throat; tube 2–3 × 5–12 mm; upper lip 20–28 × 7–10 mm long, outer surface of upper lip covered in short entangled, glandular trichomes, more so at apex; lower lip 19–25 mm long, glabrous above, sparsely glandular pubescent below; apical lobes triangular to 2 × 2 mm. *Androecium* with filaments whitish to 20 mm long; anthers 3–4 mm long; staminodes 5 mm long, densely glandular with a small vestigial anther at apex. *Gynoecium* with style 25 mm long; stigma 2 mm long; ovary to 4 mm long, glabrous. *Capsule* 18–22 × 1–2 mm with 18–28 seeds per locule, brown, glabrous.

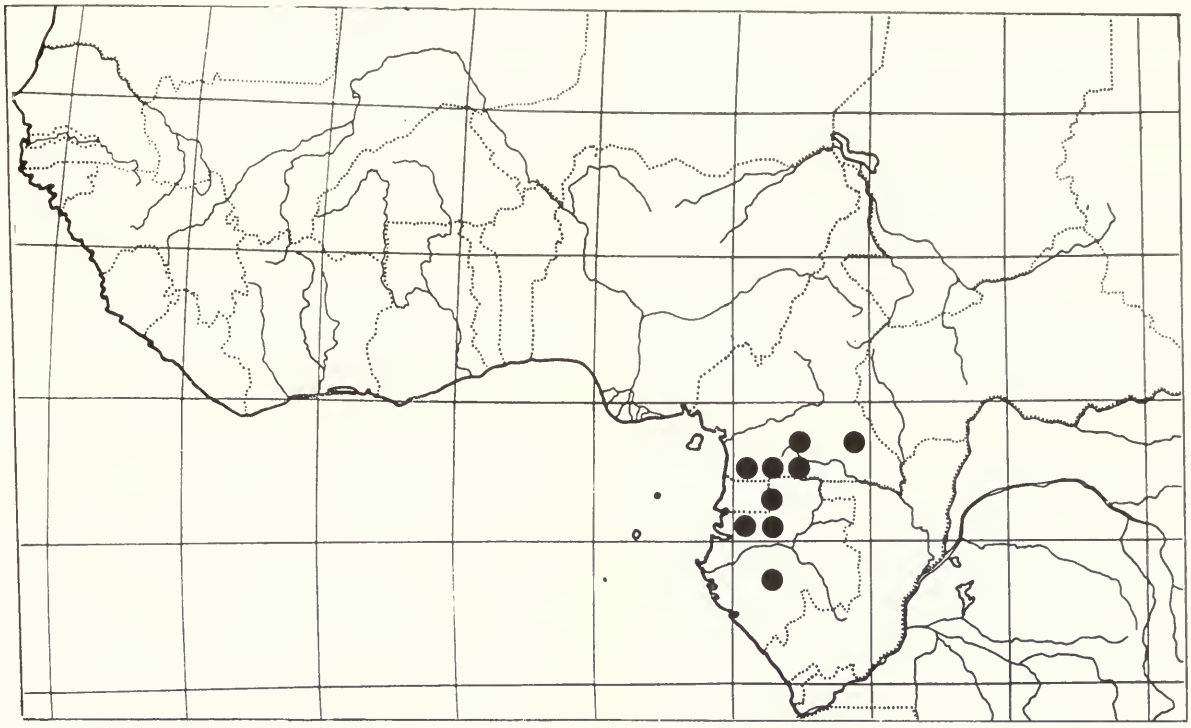
DISTRIBUTION. Cameroon and Gabon.

HABITAT. Along rivers in primary forest in rocky, mossy places. 400–500(–900) m.

SELECTED COLLECTIONS

CAMEROON: Yaounde, Bitye, *Bates* 1004 (BM, MO); Lolodorf, 1896, *Staudt* 240 (G, K, NY, S, WAG); Akoakas, 15 February 1963, *Raynal & Raynal* 9719 (P); near Molobo, 50 km S. of Baiouri, 24 July 1963, *Letouzey* 5472 (P); Kwoeinvom, 4 March 1964, *de Wilde & de Wilde-Duyfies* 2072 (BR, MO, SRGH, WAG, Z); 3 km N. of Lomie, 8 September 1965, *Leeuwenberg* 6560 (LISC, MO, WAG); Nvem, near Bitye, 20 October 1967,

Fig. 16 *Brillantaisia debilis* Burkill. A. Habit × 0.7; B. Corolla dissection showing androecium × 1.8; C. Capsule × 2; D. Gynoecium × 1.8; E. Bract and bractlets × 1.



Map 4 The distribution of *Brillantisia debilis* Burkill.

Letouzey 8159 (P); 5 km E. of Meyo Centre, 24 March 1970, *Letouzey* 10229 (P); N'Koemvon, 11 October 1974, *de Wilde* 7635 (WAG); Rocher de Akoakas, 27 March 1981, *Meijer* 15307 (MO); Cult. WAG, 20 December 1985, *van der Laan* 986 (WAG). GABON: near lake Moudiboubacoudou, 6 April 1927, *Le Testu* 6478 (BM); *Le Testu* 9135 (BM); Monts de Cristal, 3 February 1968, *Halle & Villiers* 4897 (P); Akoga, 8 February 1968, *Halle & Villiers* 5047 (P); Cristal Mountains, 15 km NE of Asok, 21 August 1978, *Breteler & de Wilde* 187 (MO, WAG); Cristal Mountains, 21 January 1983, *de Wilde* et al. 133 (WAG); W. of Belinga, 18 July 1985, *Bos, van der Laan & Nzabi* 10696 (BR, WAG); 24 km SE of Medouneu, 5 February 1986, *Reitsma, Reitsma & Louis* 1880 (NY, WAG); Wolou-Ntem province, Chantier Oveng near Mitzic, 6 May 1986, *Louis* 2161 (WAG).

Plants of *Brillantisia debilis* have few flowers and are often very leafy, the vegetative parts of plants of this species are entirely glabrous and the leaves are often purple underneath. The inflorescence may be glandular-pubescent on the rachis, peduncles, calyx and corolla. Many collections of this species have been mistakenly determined as *B. soyauxii*. In *Flore du Gabon*, Heine (1966) used the name *B. soyauxii* to describe a species which is glabrous except for the pedicels, calyx and, occasionally, the peduncles. The illustration of *B. soyauxii* in that work (Heine 1966: 87, 1–3) clearly fits the description of *B. debilis* given here. The type specimen of *B. soyauxii* has pubescent fruit, and a highly branched, many flowered inflorescence unlike *B. soyauxii* described in the *Flore du Gabon* (Heine 1966: 84–85) with few flowers and glabrous fruit. Other characters on the type specimen of *B. soyauxii* are inconsistent with the description of Heine (1966), including the larger, broader, spathulate upper calyx lobe and lower number of seeds in the fruit. *Soyaux* 454 is certainly a plant belonging to *B. vogeliana.*

11. **Brillantaisia grottanellii** Pichi-Sermoli in *Miss. Stud. Lago Tana 7. Recherche Botaniche* **1**: 254–255 (1951); Cufodontis, *Enum. pl. Aeth.*: 930 (1964). Type: Ethiopia, Tucur Dinghia forest, *Pichi-Sermoli* 2099 (FT-holotype, BM!-photo).

Map 5.

Erect aromatic herb to 1–2(–2.5) m tall. *Stems* 2–4 mm in diameter, rooting at nodes, covered in rather dense short, weak trichomes. *Leaves* ovate to broadly-ovate (35–)90–225(–250) × (10–)40–110(–150) mm, olive green to dull dark green above, paler below, glabrous to pubescent above and below; base cuneate; apex acuminate; margin crenate to serrate, occasionally serrulate; 8–13 veins each side of the midrib; petiole (10–)20–70(–110) mm, lamina decurrent along ½–¾ length of petiole. *Inflorescence* a terminal spike (60–)80–200(–340) mm long with smaller lateral spikes below, flowers in distinct verticillate whorls, rachis often visible between verticillasters. *Bracts* ovate to linear-lanceolate, entire or crenate, rounded at apex, densely pubescent with glandular and eglandular trichomes, bractlets linear, trichomes as for bracts. Sepals subequal, linear rounded at apex, 0.5–1 × 12–20 mm, densely covered in long glandular and eglandular trichomes. *Corolla* dark blue-purple to violet or bright blue-lilac; tube 8–13 × (2–)3–5 mm; upper lip 20–30 × 4–6 mm covered in short glandular trichomes, which are slightly longer at the apex of the petals; lower lip 22–30 × 14–20 mm; apical lobes to 7 mm long, acute. *Androecium* with filaments 35–40 mm long; anthers 6–7 mm long; staminodes 5–10 mm long *Gynoecium* with style 35 mm long pubescent to stigma, stigma 4 mm long. *Capsule* 20–22 × 2–3 mm with 8 seeds per locule, brown-black, covered with sparsely glandular trichomes.

DISTRIBUTION. Ethiopia and possibly Sudan.

HABITAT. Montane forest, beside streams in shade, in disturbed ground, occasionally collected from plantations; 1500–2000 m.

SELECTED COLLECTIONS

ETHIOPIA: Kaffa Prov., Beletta forest, 13 February 1957, *Mooney* 6725 (ETH); Wellega region near Dembidollo, Anfilo, 6 March 1957, *Mooney* 6890 (S); 7 km NW of Tippi airstrip, 14 January 1962, *Meyer* 7995 (US); 35 km W. of Lekemeti, 13 April 1966, *de Wilde & de Wilde-Duyfjes* 10768 (MO, WAG); Kaffa Prov., Bonga, 9 January 1972, *Ash* 1454 (ETH, MO, UPS, WAG);. Kaffa Prov., 57 km from Jimma on Sheki-Gogeb river track, 8

Table 5 Six characters which differ between plants of *Brillantaisia grottanellii* and *B. madagascariensis*.

Character	*B. grottanellii*	*B. madagascariensis*
Bract shape	lanceolate-ovate	broadly ovate-ovate
Glandular trichomes on bract	present	absent
Trichomes on style	along more than half length of style	at base of style only
Leaf margin	subentire-serrate	entire or crenate
Upper sepal shape	linear-spathulate	linear
Pollen ornamentation	smooth	irregularly spiny

December 1972, *Friis* et al. 1677 (C); Mt. Karkarha, 18 February 1976, *Ash* 3402 (MO, UPS); Gofa region, 10 km from Sawla, 27 December 1983 *Ensermu & Zerihun* 649 (C, ETH); 43 km from Mizan Teferi on road to Tepi, 27 January 1984, *Ensermu* et al. 745 (ETH); 37–41 km on the track from Gore to Masha, 1 February 1984, *Ensermu* et al. 821 (ETH); 27 km from Bebeka coffee plantation on road to Guraferda, 7 November 1985 *Puff & Ensermu* 861107-4/6 (ETH); Wellega Region, Bedelle/Arjo road–Didessa road crossing, 16 January 1990, *Friis* et al. 6023 (ETH); Kaffa Prov., Beletta forest, 18 January 1990, *Friis* et al. 6041 (ETH); SUDAN: Torit Distr., near Katire, 9 February 1950, *Jackson* 1144 (BM, MO), identity uncertain.

This species is clearly very closely related to *Brillantaisia madagascariensis* and, early in this study, was thought to be the same species. However, after detailed study of gross morphology and pollen characters, I recognize this species as distinct. Discussion with Dr Ensermu Kelbessa from Addis Ababa University who has studied these plants in the field convinces me that the *madagascariensis-grottanellii* group is best divided. Characters differentiating *B. grottanellii* from *B. madagascariensis* are shown in Table 5 and Figure 5.

12. **Brillantaisia madagascariensis** T. Anderson ex Lindau in *Bot. Jahrb. Syst.* **17**: 103 (1893); Burkill in *Fl. trop. Afr.* **5**: 43 (1899); Palacky, *Cat. pl. Madag.* **3**: 57 (1907); Chevalier, *Explor. bot. Afrique occ. franç.* **1**: 493 (1920); Hutchinson & Dalziel in *Fl. W. trop. Afr.* **2**: 254 (1931); Brenan & Greenway, *Checklist brit. empire 5 Tangan. Terr.* **2**: 5 (1949); Heine *in Fl. W. trop. Afr.* 2nd ed., **2**: 406 (1963); Cufodontis, *Enum. pl. Aeth*: 930 (1964); Benoist in *Fl. Madag. fam. 182* **1**: 29 (1967); Agnew in *Upl. Kenya wild fls*: 583 (1974); Champluvier in *Fl. Rwanda* **3**: 446 (1985). Type: Madagascar, Betsileo, Nandihizana, *Hildebrandt* 3901 (B†-holotype; BM!-lectotype; G!, M!, P!, W!, Z!-isolectotypes).

Brillantaisia spicata Lindau in *Bot. Jahrb. Syst.* **20**: 4 (1894); in *Abh.. Preuss. Akad. Wiss.* **50** & **54** (1894); in *Wiss. Erg. deut. Zentr.-Afr. Exped., Bot.* **2**: 293 (1911). Syntypes: Tanzania, Usambara Mountains, Bangarra Lutindi, *Holst* 3316 (COI, K!); Usambara Mountains, Gonja, Handei, *Holst* 4216 (COI, G!, K!, M!, P!, W!, WAG!, US!, Z!).

B. verruculosa Lindau in *Bot. Jahrb. Syst.* **22**: 113 (1897); Burkill in *Fl. trop. Afr.* **5**: 43 (1899); Mildbraed, *Wiss. Erg. zweit. deut. Zentr.-Afr. Exped., Bot.*: 192 (1922); Robyns *Fl. parc. nat. Albert* **2**: 269 (1947); Heine in *Fl. Gabon* **13**: 89 (1966). Type: Cameroon, Yaounde, *Zenker & Staudt* 166 (B†-holotype).

B. bagshawei S. Moore in *J. Bot.* **46**: 312–313 (1908). Type: Uganda, Bugoma forest, *Bagshawe* 1387 (BM!-holotype).

B. majestica Wernham in *J. Bot.* **54**: 229 (1969). Type: Cameroon, Buea, Mount Cameroon, *Bates* 817 (K!-holotype).

Icones: Heine, *Fl Gabon*, Acanthacées: **13**: pl. 18 figs 7–15 (1966); Benoist in *Fl. Madag. fam. 182,* Acanthacées: fig. IV 8–13 (1967).

Erect or scrambling much branched herb 0.2–2 m tall. *Stems* 2–5(–8) mm in diameter, shortly pubescent, more densely so at nodes, glabrous below. *Leaves* ovate to broadly ovate, 40–150(–180) × 30–90(–130) mm, lower leaves becoming much larger, to 400 × 500 mm, usually sparsely pubescent, with short white or translucent trichomes on midrib and main veins, occasionally densely pilose; leaf base attenuate, occasionally truncate or cordate; apex acute-acuminate; margin entire, occasionally slightly crenate; 8–12(–14) main lateral veins each side of midrib; petiole 6–90 mm long, winged for ⅔ of length. *Inflorescence* a terminal spike with smaller lateral spikes below (20–)40–220(–350) mm long, flowers crowded into dense verticillate whorls, rachis densely pubescent, not usually visible between verticillasters. *Bracts* ovate to elliptic, apex rounded to acuminate, green with purple tinge, persistent. Sepals subequal, slender tapering to apex or linear and rounded at the apex, occasionally spathulate, larger upper sepal 10–30 × 1–2 mm, very slightly longer than the other four; lateral sepals 8–25 × 1–2 mm; green, red to purple at apex, densely pubescent on abaxial surface, trichomes white, less dense shorter trichomes on adaxial surface. *Corolla* variable shades of blue-purple, violet, magenta or white, with lateral yellow spots in the throat; corolla tube to 15 mm long; upper lip 15–30 × 5–8 mm, glandular pubescent outside occasionally with long trichomes; lower lip 15–25 × 10–12 mm, apical lobes 2–5 × 2–3 mm,

often short, rounded-blunt but can be longer, narrowly triangular with acute apex. *Androecium* with filaments 20–22 mm long, white; anthers 3–6(–8) mm long, creamy yellow or brown, pubescent along one side; staminodes 5–10 mm long. *Gynoecium* with style 25 mm long, often persistent when corolla has fallen, stigma 2.5 mm long; ovary 3–5 mm long. *Capsule* 18–30 × 3–5 mm with 6–8 seeds per locule, black-brown, glandular puberulous with longer scattered eglandular trichomes.

DISTRIBUTION. Throughout West Africa through the Congo basin to Ethiopia and south into Tanzania, also in Madagascar.

HABITAT. Montane forest, often weedy in plantations, recently logged areas, clearings or pathsides; 500–1200 m.

SELECTED COLLECTIONS

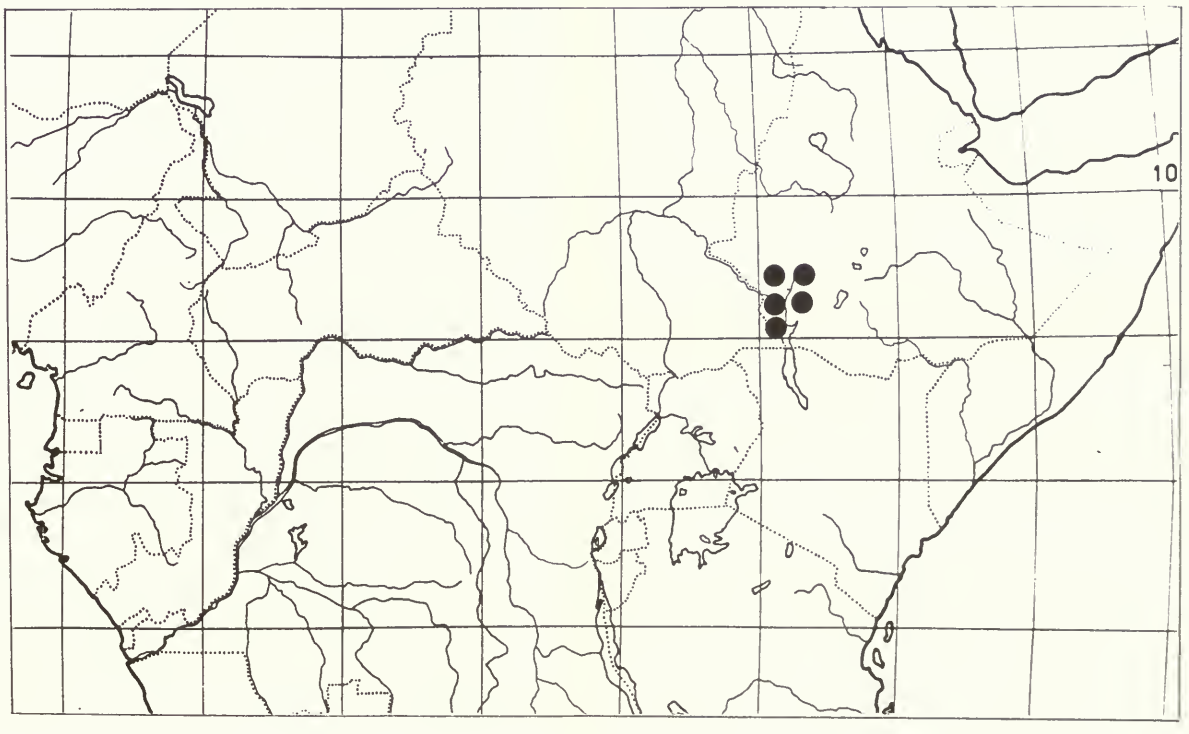
LIBERIA: Yéképa, Yiti village, 24 January 1965, *Adam* 20734 (K, MO). BIOCCO: November 1911, *Mildbraed* 7126 (H). CAMEROON: 2°00'N 12°15'E, 2 January 1911, *Mildbraed* 4147 (H). GABON: Haute-Ngounyé, 1924–1927, *Le Testu* 6431 (BM, MO); Lastoursville region, 1929–1931, *Le Testu* 8853 (BM, P). RWANDA: Nyungwe forest, near Rukuzi, 4 May 1972, *Bouxin* 1577 (BR). BURUNDI: Mabaya-Hua on Rwandan border, 22 June 1969 *Lewalle* 3783 (BR, G, SRGH); Mabayi valley, Bubanza, 16 October 1971, *Reekmans* 1136 (BR). SUDAN: Torit District, Lotti forest, 2 January 1950, *Jackson* 1023 (BM); Talanga, 1 December 1980, *Friis & Vollesen* 613 (C). ETHIOPIA: Kaffa Prov., Abetu valley, near Belita, 18 October 1954, *Mooney* 6071 (ETH, K, S); 10 km E. of Bonga along Jimma road, 22 December 1965, *de Wilde* 9415 (C, DSM, ETH, MO, UPS, WAG); Kaffa Prov., Bonga, 20 November 1970, *Friis, Hounde & Jacobsen* 369 (C); Illubabor Prov., 22 km S. of Gore, 19 December 1972, *Friis* et al. 1882 (C); UGANDA: Budongo Forest, 7 February 1935, *Taylor* 3327 (BM, MO); Mabira Forest, 8 November 1938, *Loveridge* 26 (MO). DEMOCRATIC REPUPUBLIC OF THE CONGO: Kasongo-Kindu road, km 60, 29 June 1952, *Germain* 7826 (PRE); Valley de la Mbizi, near Burora, 10 May 1957, *Gutzwiller* 841 (BR); Kivu, W. of Kaluzi Mts, 26 April 1978, *Lambinon* 78/321 (BR). KENYA: Kakamega forest, 17 November 1975, *Cunningham* s.n. (LISC). TANZANIA: Mt Meru, Surra Forest, 10 November 1969, *Richards* 24663 (C, M); Mshituni, above tea estate N. of Derema, 5 October 1979, *Kibuwa* 5191 (UPS). MADAGASCAR: August 1902, *Perrier* 9227 (P); near Doanyanala, 25 January–25 February 1949, *Humbert* 23090 (P); 6 December 1963, *Rakotozafy* 287 (P).

Plants of this species are very distinctive in flower and fruit, with a narrowly spicate inflorescence, flowers in verticillasters, persistent bracts and linear, pubescent calyx lobes. *Brillantaisia verruculosa* has been upheld as a species by several recent workers, notably Heine (1966), solely on the basis of the floral colour being white rather than purple. White flowers are found in three other species of *Brillantaisia* and as this is the only character on which Heine split *B. madagascariensis*, I maintain this variation under the earliest name.

NOMEN DUBIUM

Brillantaisia cicatricosa Lindau in *Bot. Jahrb. Syst.* **20**: 4 (1895) nomen dubium; Lindau in *Pflanzenw. Ost-Afr.* **C**: 366 (1895); Burkill in *Fl. trop. Afr.* **5**:39 (1899); Mildbraed, *Deutch Zent. Afr. Exped.* (1922); Robyns, *Fl. parc. nat. Albert* **2**: 270 (1947); Troupin, *Fl. pl. lign. Rwanda*: 84 (1982); Champluvier in *Fl. Rwanda* **3**: 446 (1985); Fischer & Hinkel, *Nat. Env. Rwanda*: 81, fig. 68 (1992). Type: Zaire, W. slope of Ruwenzori Mountains, Buhtahu Valley, *Stuhlmann* 2301 (B†-holotype). Problems with the application of this name are described in detail above (p. 95).

Brillantaisia hirsuta T. Anderson in *Journ Agric.-Hort. Soc. NS* **1**: 267 (1868). This name refers to a plant introduced to the Royal Botanic Gardens, Calcutta from Kew and which cannot now be traced. Anderson wrote of this species that 'It is common on the



Map 5 The distribution of *Brillantaisia grottanellii* Pichi-Sermoli.

banks of streams in Western equatorial Africa. It differs from *B. owariensis* in its very prostrate habit, much smaller non decurrent leaves and in the smaller size of its flowers which are not glandular'. This description may refer to *Brillantaisia vogeliana* which has sparsely pubescent flowers, however, as this is the only information regarding the the identity of the plant in Calcutta, application of this name remains uncertain.

Species transferred to *Hygrophila*

Brillantaisia borellii Lindau in *Bot. Jahrb. Syst.* **33**: 186 (1904). This species was considered to be very different from all other *Brillantaisia* species due to the presence of four fertile stamens, very narrow leaves and the lack of an upper corolla lip.

Brillantaisia didynama Lindau in *Bot. Jahrb. Syst.* **24**: 313 (1898). Considered by Lindau to be clearly distinct from all other species of *Brillantaisia* by virtue of having four fertile stamens and very distinctive pollen, Lindau maintained this species within the genus and placed it close to *B. lancifolia* due to the few-flowered inflorescence and lanceolate leaves.

Brillantaisia thwaitesii Cramer in *Kew Bull.* **46**: 335–338 (1991). Cramer transferred *Plaesianthera thwaitesii* (C.B. Clarke) Livera to *Brillantaisia* as he considered it close to *Brillantaisia pubescens*. Recent studies (Sidwell, in press *a*) have shown that the species is best placed in *Hygrophila* until a greatly needed monograph of that genus is undertaken.

Species transferred to Eremomastax

Brillantaisia fulva Lindau in *Bot. Jahrb. Syst.* **24**: 313–314 (1898).

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REFERENCES

Ahmad, K.J. 1976. Epidermal studies in some species of *Hygrophila* and *Dyschoriste* (Acanthaceae). *Journal of the Indian Botanical Society* **55**: 41–52.

——— 1978. Epidermal hairs of Acanthaceae. *Blumea* **24**: 101–117.

Anderson, T. 1875. *Brillantaisia alata* and *Brillantaisia pubescens*, *In* D. Oliver (Ed.), The Botany of the Speke and Grant Expedition. *Transactions of the Linnean Society of London* **29**: 125–126.

Baden, C. 1981. The genus *Anisotes* (Acanthaceae): a taxonomic revision. *Nordic Journal of Botany* 1: 623–664.

Baillon, H. 1891. Acanthaceés. *In* H. Baillon, *Histoire des plantes*: **10**: 403–466. Paris.

Balkwill, K. & Getliffe-Norris, F. 1985. Taxonomic studies in the Acanthaceae; the genus *Hypoestes* in southern Africa. *South African Journal of Botany* **51**: 133–144.

——— **Getliffe-Norris, F. & Balkwill,M-J.** 1996. Systematic studies in the Acanthaceae; *Dicliptera* in southern Africa. *Kew Bulletin* **51**: 1–61.

Bateman, R.M., DiMichele, W.A. & Willard, D.A. 1992. Experimental cladistic analysis of anatomically preserved arborescent lycopsids from the carboniferous of Euramerica: an essay on palaeobotanical phylogenetics. *Annals of the Missouri Botanical Garden* **79**: 500–559.

Benoist, R. 1967. Acanthacées. *In* H. Humbert (Ed.), *Flore de Madagascar et des Comores*: 182e famille. Paris.

Bentham, G. 1849. *Brillantaisia*. *In* W. J. Hooker, (Ed.) *Niger Flora*: 477–478. London.

——— 1876. Acanthaceae. *In* G. Bentham, & W. J. Hooker (Eds), *Genera plantarum*: **2**: 1060–1122. London.

Blackmore, S. & Tootill, E. (Eds) 1984. *The Penguin dictionary of botany*. Middlesex.

Bremekamp, C.E.B. 1944. Materials for a monograph of the Stobilanthinae (Acanthaceae). *Verhandelingen der Nederlandse Akademie van Wetenschappen Afdeeling Natuurkunde* **41**: 1–305.

——— 1953. The delimitation of the Acanthaceae. *Proceedings Koninkijke Nederlandse Akademie van Wetenschappen* **56**: 533–546.

——— 1965. Delimitation and subdivision of the Acanthaceae. *Bulletin of the Botanical Survey of India* **7**: 21–30.

Burkill, L.H. 1899. *Brillantaisia*. *In* W.T. Thistleton-Dyer, (Ed.), *Flora of Tropical Africa*: **5**: 37. London.

Carlquist, S.& Zona, S. 1988. Wood anatomy of Acanthaceae: a survey. *Aliso* **12**: 201–227.

Champluvier, D. 1985. *Brillantaisia*. *In* G. Troupin, (Ed.) *Flore du Rwanda: Spermatophytes* **3**: 444–448. Tervuren.

Chappill, J.A. 1989. Quantitative characters in phylogenetic analysis. *Cladistics* **5**: 217–234.

Cramer, L.H. 1991. *Brillantaisia* P. Beauv. (Acanthaceae), a new generic record for Asia. *Kew Bulletin* **46**: 335–338.

Cranston, P.S. & Humphries, C.J. 1988. Cladistics and computers: a chironomid conundrum? *Cladistics* **4**: 72–92.

Daniel T.F. 1984. Revision of *Stenandrium* (Acanthaceae) in Mexico and adjacent regions. *Annals of the Missouri Botanical Garden* **71**: 1028–1043.

De, A. 1960. Cytological, anatomical and palynological studies as an aid in tracing affinity and phylogeny in the family Acanthaceae. IV. *Transactions of the Bose Research Institute Calcutta* **31**: 17–29.

De Pinna, M.C.C. 1996. Comparative biology and systematics, some controversies in retrospective. *Journal of Comparative Biology* **1**: 3–16.

Doyle, J.A. & Donoghue, M.J. 1986. Seed plant phylogeny and the origin of angiosperms: an experimental cladistic approach. *The Botanical Review* **52**: 321–431.

Ensermu, K. 1990. *Justicia* sect *Ansellia* (*Acanthaceae*). *Acta Universitatis Upsaliensis Symbolae Botanicae Upsaliensis* **29**: 1–96.

Erdtman, G. 1960. The acetolysis method. A revised description. *Svensk Botanisk Tidskrift* **54**: 561–564.

Exell, A.W. 1944. *Catalogue of the vascular plants of S. Tomé (with Principe and Annobon)*. London.

Ezcurra, C. 1993. Systematics of *Ruellia* (Acanthaceae) in southern south America. *Annals of the Missouri Botanical Garden* **80**: 787–845.

Farris, J.S. 1988. *Hennig86: version 1.5*. Published by the author, Jamaica Plains.

Furness, C.A. 1994. The pollen morphology of *Hygrophila* and *Brillantaisia* (Acanthaceae: Ruellieae). *Acta Botanica Gallica* **141**: 267–278.

Gift, N. & Stevens, P.F. 1997. Vagaries in the delimitation of character states in quantitative variation – an experimental study. *Systematic Botany* **46**: 112–125.

Graham, V.A.W. 1988. Delimitation and infra-generic classification of *Justicia* (Acanthaceae). *Kew Bulletin* **43**: 551–624.

Grubert, M. 1974. Studies on the distribution of myxospermy among seeds and fruits of angiospermae and its ecological importance. *Acta Biologica Venezuela* **8**: 315–551.

Hauser, D.L. & Presch, W. 1991. The effect of ordered characters on phylogenetic reconstruction. *Cladistics* **7**: 243–265.

Hedrén, M. 1989. *Justicia* sect. *Harnieria* (Acanthaceae) in tropical Africa. *Acta Universitatis Upsaliensis Symbolae Botanicae Upsaliensis* **29**: 1–141.

Heine, H. 1966. Acanthacées. *In* A. Aubreville (Ed.), *Flore du Gabon*: **13**. Paris.

Hennig, W. 1950. *Grundzüge einer Theorie der Phylogenetschen Systematik*. Berlin.

——— 1979. *Phylogenetic systematics*. Translated by D. D. Davis & R. Zangerl. Chicago.

Hiern, W.P. 1900. *Catalogue of the African plants collected by Dr Friedrich Welwitch in 1853–1861*. London.

Hobein, M. 1884. Über den systematischen werth der cystolithen bei den Acanthaceen. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* **5**: 422–440.

Holmgren, P.K., Holmgren, N.H. & Barnett, L.C. 1990. *Index Herbariorum*. New York.

Hooker, W.J. 1853. *Brillantaisia owariensis* P. Beauv. *Curtis's Botanical Magazine*. **79**: t.4717.

Immelman, K.L. 1989. Studies in the southern African species of *Justicia* and *Siphonoglossa* (Acanthaceae): palynology. *Bothalia* **19**: 151–156.

——— 1990. Studies in the southern African species of *Justicia* and *Siphonoglossa* (Acanthaceae): seeds. *Bothalia* **21**: 49–59.

Inamdar, J.A., Chaudhari, G.S. & Ramana Rao, T.V. 1990. Studies on the cystoliths of Acanthaceae. *Feddes Repertorium* **101**: 417–424.

Kippist, R. 1845. On the existence of spiral cells in the seeds of Acanthaceae. *Transactions of the Linnean Society of London* **19**: 65–76.
Lester, R.N. & Ezcurra, C. 1991. Enzyme etching treatment as an aid in the study of seed surface sculpture in *Justicia* and *Ruellia* (Acanthaceae). *Botanical Journal of the Linnean Society* **105**: 285–288.
Lindau, G. 1893. Acanthaceae Africanae 1. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* **17**: 89–113.
—— 1894. Beitrage zur systematik der Acanthaceen. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* **18**: 36–64.
—— 1895*a*. Acanthaceae. *In* A. Engler & K. Prantl (Eds), *Die Natürlichen Pflanzenfamilien*: **4**(3b): 274–354. Leipzig.
—— 1895*b*. *Brillantaisia anomala* and *B. cicatricosa*. *In* A. Engler (Ed.), *Die Pflanzenwelt Ost-Afrikas und der Nachbargebiete. Geographische Verlagshandlung*: 366. Berlin.
—— 1895*c*. Acanthaceae Africanae 2. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* **20**: 1–76.
—— 1895*d*. *Brillantaisia ulugurica*. *In* A. Engler (Ed.), *Die Pflanzenwelt Ost-Afrikas und der Nachbargebiete. Geographische Verlagshandlung*: 91. Berlin.
—— 1896. *Brillantaisia kirungae*. *In* G. A. von Götzen (Ed.), *Verzeichniss der auf der Graf. v. Götzen'schen Expedition bei der Besteigung des Kirunga gesammelten pflanzen*: 9.
—— 1897. Acanthaceae Africanae 3. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* **22**: 112–127.
—— 1898. Acanthaceae Africanae 4. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* **24**: 310–325.
—— 1904. Acanthaceae Africanae 6. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* **33**: 183–193.
Lindley, J. 1847. *The vegetable kingdom*. London.
—— 1853. Notices of new or rare garden plants. *Journal of the Horticultural Society of London* **8**: 128–130.
Luckow, M. 1995. Species concepts: assumptions, methods and applications. *Systematic Botany* **20**: 589–605.
Mabberley, D.J. 1987. *The plant book*. Cambridge.
McDade, L.A. 1995. Species concepts and problems in practice: insight from botanical monographs. *Systematic Botany* **20**: 606–622.
Maddison, W.P. 1993. Missing data versus missing characters in phylogenetic analysis. *Systematic Biology* **42**: 576–581.
Manktelow, M. 1996. *Phaulopsis* (Acanthaceae) – a monograph. *Acta Universitatis Upsaliensis Symbolae Botanicae Upsaliensis* **31**: 1–184.
Manning, J.C. & Getliffe-Norris, F. 1985. Taxonomic studies in the Acanthaceae: A reappraisal of the genera *Duvernoia* and *Adhatoda* in southern Africa. *South African Journal of Botany* **51**: 475–484.
Mayr, E. 1942. *Systematics and the origin of species*. New York.
Mickevich, M.F. & Lipscomb, D. 1991. Parsimony and the choice between different transformations for the same character set. *Cladistics* **7**: 111–139.
Mildbraed, J. 1946. *Brillantaisia cicatricosa* Lindau var. *kivuensis* Mildbraed var. nov. *Bulletin du Jardin Botanique de l'Etat* **17**: 86.
Nees von Esenbeck, C.G. 1832. Acanthaceae. *In* N. Wallich (Ed.), *Plantae Asiaticae Rariores*: **3**. London.
—— 1847. Acanthaceae. *In* A. de Candolle (Ed.). *Prodromus Systematis Naturalis Regni Vegetabilis*: **11:** 46–519. Paris.
Nelson, G.J. & Platnick, N.I. 1981. *Systematics and biogeography: cladistics and vicariance*. New York.
Nixon, K.C. 1992. *CLADOS: version 1.38.1*. New York.
—— **& Davis, J.I.** 1991. Polymorphic taxa, missing values and cladistic analysis. *Cladistics* **7**: 233–241.
—— **& Wheeler, Q.D.** 1990. An amplification of the phylogenetic species concept. *Cladistics* **6**: 211–223.
Palisot de Beauvois, A.M.F.J. 1818. *Flore d'Oware et de Benin en Afrique*. 67–68, t.100. Paris.
Pimentel, R.A. & Riggins, R. 1987. The nature of cladistic data. *Cladistics* **3**: 201–209.
Platnick, N.I., Griswold, C.E. & Coddington, J.A. 1991. On missing entries in cladistic analysis. *Cladistics* **7**: 337–343.
Pleijel, F. 1995. On character coding for phylogeny reconstruction. *Cladistics* **11**: 309–315.
Punt, W., Blackmore, S., Nilsson, S. & Le Thomas, A. 1994. Glossary of pollen and spore terminology. *LPP Contributions series No.1*. Utrecht.
Quicke, D.L.J. 1993. *Principles and techniques of contemporary taxonomy*. London.
Radlkofer, L. 1883. Ueber die systematischen Werth der Pollenbeschaffenheit bei den Acanthaceen. *S. B. bayer. Akademie der Wissenschaften., math-phys. Cl.* **13**: 256–314.
Raj, B. 1961. Pollen morphological studies in the Acanthaceae. *Grana Palynologica* **3**: 1–108.
Ramos, T. 1997. *Tree Gardener: version 2.2*. São Paolo.
Rickett, H.W. 1944. The classification of inflorescences. *Botanical Review* **10**: 187–231.
—— 1955. Materials for a dictionary of botanical terms–III, Inflorescences. *Bulletin of the Torrey Botanical Club* **82**: 419–445.
Schaffnit, E. 1906. Beiträge zur anatomie der Acanthaccen-samen. *Beiliefte zum Botanischen Zentralblatt* **19**: 453–484.
Scotland, R.W. 1991. A systematic analysis of Acanthaceae genera with contorted corollas. *In* S. Blackmore & S.H. Barnes (Eds), *Pollen and Spores, Patterns of Diversification*: Systematics Association special volume No. **44**: 269–289. Oxford.
—— 1992*a*. Pollen morphology and taxonomic characters in Acanthaceae. *Systematic Botany* **17**: 337–340.
—— 1992*b*. Systematics, similarity and Acanthaceae pollen morphology. *Botanical Journal of the Linnean Society* **109**: 529–541.
—— 1992*c*. Chapter 2 – Character coding. *In* P.L. Forey, C.J. Humphries, I.J. Kitching, R.W. Scotland, D.J. Siebert & D.W. Williams (Eds), *Cladistics: A Practical Course in Systematics*: Systematics Association Publication No. **10**: 14–21. Oxford.
—— 1993. Pollen morphology of Contortae (Acanthaceae). *Botanical Journal of the Linnean Society* **111**: 471–504.
—— **Endress, P.K., & Lawrence, T.J.** 1994. Corolla ontogeny and aestivation in the Acanthaceae. *Botanical Journal of the Linnean Society* **114**: 49–65.
—— **Sweere, J.A., Reeves, P.A. & Olmstead, R.G.** 1995. Higher-level systematics of Acanthaceae determined by chloroplast DNA sequences. *American Journal of Botany* **82**: 266–275.
Sell, Y. 1969*a*. Les complexes inflorescentiels de quelques Acanthacées étude particulère des phénomènes de condensation, de racemisation d'homogéneisation et de troncature. *Annales des Sciences Naturelles Botanique, Paris Séries 12* **10**: 225–300.
—— 1969*b*. La dissémination des Acanthacées: Variations sur le type xérochasique fondamental. *Revue Générale Botanique* **76**: 417–453.
Selvaraj, R. & Subramanian, D. 1983. Epidermal studies in some species of Acanthaceae. *Journal of the Indian Botanical Society* **62**: 253–258.
Sidwell, K.J. 1997. A revision of *Brillantaisia* P. Beauv. (Acanthaceae). Unpublished PhD. thesis. University of Oxford.
—— In press *a*. The taxonomic position of the anomalous Sri Lankan species *Brillantaisia thwaitesii* (T. Anderson) Cramer (Acanthaceae) from Sri Lanka. *Kew Bulletin*.
—— In press *b*. Monographing *Brillantaisia* P. Beauv. (Acanthaceae): How to delimit species and higher taxa? *Proceedings of the 15th AETFAT Congress*. Harare.
Singh, V. & Jain, D.K. 1975. Trichomes in Acanthaceae 1: General structure. *Journal of the Indian Botanical Society* **54**: 116–127.
Stevens, P.F. 1984. Homology and phylogeny, morphology and systematics. *Systematic Botany* **9**: 395–409.
—— 1991. Character states, morphological variation and phylogenetic analysis: a review. *Systematic Botany* **16**: 553–583.
Thiele, K. 1993. The holy grail of the perfect character: the cladistic treatment of morphometric data. *Cladistics* **9**: 275–340.
Troll, W. 1964. *Die Infloreszenzen: Typologie und Stellung im Aufbau des Vegetationskörpers 1*. Stuttgart.
Vollesen, K. In prep *a*. Acanthaceae. *The Flora of Tropical East Africa*.
—— In prep *b*. Acanthaceae. *Flora Zambesiaca*.
—— **& Brummitt, R.K.** 1981. Notes on *Brillantaisia pubescens* (Acanthaceae) with particular reference to discontinuity in flower size. *Kew Bulletin* **36**: 569–573.
Weberling, F. 1989. *Morphology of flowers and inflorescences*. Cambridge.
White, F. 1962. Geographic variation and speciation in Africa with particular reference to *Diospyros*. *In* D. Nichols (Ed.), *Taxonomy and geography*: Systematics Association Publication No. **4**: 71–103. London.
—— 1984 *Unpublished fieldnotes*. Department of Plant Sciences, University of Oxford.
Wilkinson, M. 1995. A comparison of two methods of character construction. *Cladistics* **11**: 297–308.
Wood, J.R.I. 1995. Notes on *Strobilanthes* (Acanthaceae) for the flora of Ceylon. *Kew Bulletin* **50**: 1–24.

EXSICCATAE

Abdallah & Vollesen 95/176, *pubescens* (K).
Achien 524, *lamium* (BR).
Adam 2968, *owariensis* (K, MO); 4782, *lamium* (BR, K); 4830, *lamium* (MO); 5286, *lamium* (MO); 6910, *lamium* (MO); 7351, *lamium* (MO); 16325, *lamium* (K, P); 16453, *lamium* (K); 20464, *lamium* (K); 20549, *owariensis* (BR, K, MO, P, UPS); 20734, *madagascariensis* (K, MO); 22019, *owariensis* (MO, P); 22262, *lamium* (MO); 22916, *owariensis* (MO, P); 23291, *lamium* (MO, PRE); 24116, *lamium* (MO); 24302, *lamium* (MO); 24663, *lamium* (MO); 24795, *lamium* (MO, PRE); 25258, *owariensis* (MO); 26520, *lamium* (MO); 26558, *lamium* (MO, PRE); 27084, *owariensis* (MO); 30140, *lamium* (MO).
Adames 73, *lamium* (K); 694, *lamium* (K); 791, *owariensis* (K, UPS).
Adebusuyi FHI 43972, *lamium* (K).
Afzelius s.n., *lamium* (UPS).

Ake Assi 3244, *lamium* (G); 3333, *owariensis* (G); 5502, *owariensis* (G); 7186, *lamium* (G); 9136, *vogeliana* (G); 9243, *lamium* (G); 12211, *owariensis* (G, Z); 15745, *lamium* (G); 17170, *owariensis* (G).
Alluard 309, *owariensis* (P); 390, *owariensis* (P).
Anderson 1383, *lamium* (K).
Andrada 1811, *kirungae* (LISC).
Ansell 1842, *lamium* (K).
Archibold 2589, *kirungae* (C).
Arends & Groenendijk 3, *vogeliana* (WAG); 95, *vogeliana* (WAG).
Ariwaodo 33, *owariensis* (MO); 77, *owariensis* (MO).
Ash 1454, *grottanellii* (ETH, MO, UPS, WAG); 3402, *grottanellii* (MO, UPS).
Auquier 2684, *owariensis* (BR).
Babault s.n. *owariensis* (P); s.n. *kirungae* (P).
Bagshawe 1131, *owariensis* (BM); 1270, *kirungae* (US); 1342, *owariensis* (BM); 1381, *madagascariensis* (BM); 1506, *owariensis* (BM).
Baldwin 10182, *owariensis* (K, MO); 10778, *owariensis* (K, MO); 5993, *lamium* (K, MO); 6175, *lamium* (K); 6339, *lamium* (K); 7070, *lamium* (K, MO).
Ball 62, *kirungae* (MAL, SRGH).
Bamps 1632, *lancifolia* (BR); 2592, *lamium* (K).
Banda & Kaunda 3452, *riparia* (MO).
Banda & Salubeni 1571, *riparia* (MO, SRGH).
Barbosa 1812, *riparia* (LISC); 2042, *pubescens* (LISC); 2395, *pubescens* (LISC).
Barker 1131, *lamium* (K); 1418, *lamium* (K).
Barton (?) 103, *lamium* (K).
Bates 216, *vogeliana* (BM, E, K, G, Z); 350, *debilis* (BM, K, MO, Z); 435, *owariensis* (BM); 1004, *debilis* (BM, MO).
Batten-Poole 209, *owariensis* (K).
Bauer 175, *vogeliana* (K).
Baumann 67, *lamium* (K).
Bayliss s.n. *owariensis* (MO).
Beddome s.n. *lamium* (K).
Beguin & Gautier 266, *lamium.*
Bequaert 154, *pubescens* (BR); 1781, *owariensis* (BR); 1813, *madagascariensis* (US); 1905, *owariensis* (BR); 2640, *cf. vogeliana* (BR); 2927, *owariensis* (BR); 3934, *kirungae* (BR); 4836, *lamium* (BR); 5926, *kirungae* (BR); s.n. *owariensis* (US).
Bernardi 8677, *lamium* (K).
Bidgood & Keeley 334, *kirungae* (MO, UPS).
Bilolong 291, *owariensis* (P, YA); 317, *lamium* (K, YA).
Bille 1350, *lamium* (P).
Bingham 309, *pubescens* (LISC).
Binuyo FHI 45407, *vogeliana* (K).
Binuyo & Daramola FHI 35484, *owariensis* (K).
Bisset 1747, *kirungae* (SRGH).
Boissier 106, *lamium* (G).
Borhidi & Poçs 86763, *madagascariensis* (UPS).
Borhidi & Steiner 86427, *madagascariensis* (UPS).
Borhidi, Iversen, & Mziray 85214, *madagascariensis* (UPS).
Borhidi, Iversen, & Tenu 86187, *madagascariensis* (UPS).
Bos 2310, *lamium* (WAG); 2359, *owariensis* (K); 2397, *owariensis* (WAG); 2444, *lamium* (K, WAG); 2552, *owariensis* (K, WAG); 3335, *lamium* (C, K, UPS, WAG, YA); 5387, *vogeliana* (C, K, MO, PRE, WAG, YA); 5626, *owariensis* (WAG).
Bos, van der Laan & Nzabi 10696, *debilis* (BR, WAG); 10755, *vogeliana* (K, US, WAG).
Bouglwy 7, *vogeliana* (K); 18882, *lamium* (K); GC11188, *owariensis* (K).
Bouxin 420, *owariensis* (BR); 799, *kirungae* (PRE); 1577, *madagascariensis* (BR).
Bouxin & Radoux 625, *kirungae* (BR).
Bowdich 374, *owariensis* (BM).
Brass 17021, *oligantha* (NY); 17042, *oligantha* (K, MO, NY); 17442, *riparia* (BM, MO, NY, US, SRGH); 17942, *pubescens* (MO, US, NY).
Braun 47, *vogeliana* (BM); 1316, *madagascariensis* (BM); 1925, *cf. lanium* (M); s.n. *owariensis* (M).
Brenan 8458, *owariensis* (K); 8534, *owariensis* (K).
Breteler 5303, *lamium* (M, MO, PRE, WAG).
Breteler & de Wilde 187, *debilis* (MO, WAG).
Breteler et al. 283, *owariensis* (K).
Bridson 610, *madagascariensis* (K, MO).
Bridson & Lovett 544, *kirungae* (MO).
Brodhurst-Hill 693, *owariensis* (Z).
Brown 2107, *owariensis* (MU).
Brown & Brown 33a, *lamium* (US); 316/b *lamium* (US).
Brunt 167, *owariensis* (K).
Brynaert 406, *pubescens* (BR).
Bunting s.n., *lamium* (BM, MO).
Burbidge 473, owariensis (K).
Burrows 769, *kirungae* (SRGH).
Burtt 9, *lamium* (K); B16, *owariensis* (K).
Burtt Davy 1228, *kirungae* (FHO).
Butayo s.n., *owariensis* (BM).
Buttner 353, *owariensis* (W).
Cambridge Congo Expedition 146, *kirungae* (BM, LISC, US).
Cardosode Matos 152, *owariensis* (LISC).
Carmichael 102, *kirungae* (FHO).
Carpenter 312, *owariensis* (K).
Carvalho 2359, *vogeliana* (K); 2445, *lamium* (BM, K, MO, S); 3766, *owariensis* (K, MO).
Casas 11471, *owariensis* (K); 11723, *owariensis* (K, MO); 11790, *owariensis* (K).
Chaloner 342c *owariensis* (K).
Chapman HNC191, *owariensis* (K); 827, *oligantha* (BM); 5053, *owariensis* (K); 5141, *owariensis* (K); 5258, *owariensis* (K).
Chapman & Chapman 8862, *kirungae* (E, FHO, MO, PRE); 9271, *kirungae* (E, FHO, MO).
Chase 854, *kirungae* (US); 2547, *pubescens* (BM); 2801, *pubescens* (BM); 2977, *kirungae* (MO); 6634, *kirungae* (S).
Chevalier 22, *owariensis* (P); 6296, *vogeliana* (K); 13362, *owariensis* (P); 22421, *owariensis* (P).
Chikuni & Tawakali 267, *kirungae* (MO).
Chipp 560, *owariensis* (K).
Christiansen 554, *madagascariensis* (BR).
Cole EAC187, *lamium* (K); 2394, *lanium* (K).
Coll. ign s.n., *kirungae* (WAG).
Compere 40321, *owariensis* (BR).
Cook 153, *lamium* (US).
Copley B1188, *lamium* (G).
Cours 4149, *madagascariensis* (P).
Cremers 1138, *lamium* (G).
Cribb & Grey-Wilson 10104, *madagascariensis* (DSM).
Croat 53479, *lamium* (K, MO).
Crockewit 249, *kirungae* (WAG).
Cudjoe 161, *lamium* (WAG).
Cultivated s.n., *owariensis* (P).
Cummins 245, *owariensis* (K).
Cunningham s.n., *madagascariensis* (LISC).
Dale U60, *kirungae* (S); 3208, *owariensis* (BR, FHO); 15538, *owariensis* (G).
Dalziel 148, *owariensis* (C, E, K, M, MO, PRE); 149, *lamium* (C, E, K, M, MO); 994, *lamium* (K); 1139, *owariensis* (K); 8232, *owariensis* (US); 8233, *owariensis* (K).
Daramola FH62407, *owariensis* (K); FHI 40467, *owariensis* (K); FHI 40574, *owariensis* (K); FHI 72304, *lamium* (K, MO).
Daramola & Adebusuyi FHI 38430, *lamium* (K).
Daramola & Emwiogbon FHI 32774, *owariensis* (K).
Darker s.n., *lamium* (MO, NY).
Darko 897, *owariensis* (K).
Davies 643, *kirungae* (H, SRGH); 1426, *pubescens* (MO).
Davis & Jeffrey 186, *debilis* (K).
Dawkins D616, *lamium* (BM); 762, *madagascariensis* (BM).
de Briey s.n., *owariensis* (BR).
de Kruif 850, *owariensis* (WAG).
de Wilde 280, *lamium* (K,WAG, Z); 641, *lamium* (WAG); 859, *owariensis* (WAG); 7543, *lamium* (K, WAG); 7544, *owariensis* (WAG); 7635, *debilis* (WAG,YA); 8522, *lamium* (WAG, YA); 9415, *madagascariensis* (C, DSM, ETH, MO, UPS, WAG).

de Wilde, Arends & Groenendijk 3, *vogeliana* (WAG); 95, *vogeliana* (WAG).
de Wilde & de Wilde-Dufjes 1130, *vogeliana* (K, MO, YA); 2072, *debilis* (BR, K, MO, SRGH, WAG, YA, Z); 9415, *madagascariensis* (UPS, WAG); 10768, *grottanellii* (MO, WAG).
de Wilde & Voorhoeve 3772, *lamium* (K).
de Wilde, de Wilde & de Wilde-Duyfjes 1152, *owariensis* (MO, PRE, WAG, YA); 3912, *owariensis* (H, MO, WAG); 4146, *owariensis* (K, WAG); 4198, *owariensis* (WAG); 4513, *owariensis* (WAG); 4557, *owariensis* (WAG).
de Wilde et al. 133, *debilis* (WAG).
de Witte 1434, *kirungae* (BR); 1508, *kirungae* (BR); 1539, *kirungae* (BR); 3986, *pubescens* (BR, K); 9697, *owariensis* (BR); 10747, *kirungae* (MO); 10872, *owariensis* (BR); 11065, *kirungae* (MO); 11640, *kirungae* (BR); 11862, *owariensis* (BR); 12148, *kirungae* (C); 12437, *owariensis* (BR); 12681, *madagascariensis* (BR); 12827, *cf. vogeliana* (BR, MO); 12907, *owariensis* (BR, MO); 12919, *owariensis* (BR).
Decary 2047, *madagascariensis* (P); 7782, *pubescens* (P); 8208, *pubescens* (MO, NY); 14.278, *madagascariensis* (P); s.n., *madagascariensis* (US).
Deighton 356, *owariensis* (K); 1419, *lamium* (BM, K, MO); 3571, *owariensis* (K); 5169, *lamium* (K); 5897, *owariensis* (K); 6141, *lamium* (K); 6152, *lamium* (K); 1419, *lamium* (K).
Demeuse 23, *owariensis* (BR).
Demoulin 61, *lamium* (K).
Dennett 34, *owariensis* (K).
Dent Young 194, *lamium* (K).
Devred 297, *owariensis* (BM, BR); 3429, *cf. vogeliana* (BR).
Dinklage 2624, *lamium* (H).
Don s.n., *vogeliana* (BM); s.n., *owariensis.*
Dowsette-Lemaire 999, *kirungae* (MAL).
Drummond & Hemsley 4556, *madagascariensis* (S); 4584, *lamium* (S); s.n., *kirungae* (S).
Dschang College 1712, *owariensis* (K).
Duchesne 13, *lamium* (BR).
Dujandin 409, *owariensis* (BR).
Dümmer 247, *owariensis* (MO, US, Z); 587, *cf. owariensis* (P, US); 1048, *lamium* (US, Z); 3975, *madagascariensis* (US).
Dundas FHI 15323, *lamium* (K).
Dunlap 25, *owariensis* (K).
Dusen s.n., *lamium* (S).
Eckendorf 73, *owariensis* (P).
Eggeling 402, *lamium* (FHO); 1380, *lamium* (FHO); 1487, *owariensis* (FHO); 3323, *vogeliana* (K).
Eijnatten 2130, *lamium* (WAG).
Ekwuno, Osanyinlusi & Okoro 124, *owariensis* (MO).
Elskens 7, *owariensis* (BR); 76, *owariensis* (BR); s.n., *owariensis* (BR).
Emwiogbon FHI 87191, *lamium* (MO); 66079, *owariensis* (K).
Emwiogbon & Osanyinlusi FHI 87313, *lamium* (MO).
Ensermu et al. 745, *grottanellii* (ETH); 821, *grottanellii* (ETH).
Ensermu & Zerihun 649, *grottanellii* (C, ETH).
Espirito-Santo 67, *lanium* (PRE); 68, *vogeliana* (BM); 3870, *lamium* (LISC); 4312, *lamium* (LISC); 4727, *lamium* (LISC); 4298, *vogeliana* (LISC); 5118, *lamium* (LISC).
Etuge & Thomas 442, *owariensis* (K, MO); 451, *owariensis* (MO).
Evrard 2681, *lamium*; 6002, *vogeliana* (BR, K); 6004, *vogeliana* (PRE).
Exell 88, *vogeliana* (BM, K); 100, *vogeliana* (BM, K); 533, *lamium* (K).
Exell & Mendonça 3139, *owariensis* (BM); 3149, *owariensis* (BM); 3193, *owariensis* (BM).
Eyles 3601, *kirungae* (SRGH).
Fabrigues 3306, *lamium* (P).
Faden & Faden 77/919, *kirungae* (BR, US, WAG).
Fairbairn 1934, *owariensis* (MO).
Fanshawe F11642, *kirungae* (FHO).
Farquhar 42, *lamium* (K).
Farron 4085, *vogeliana* (P); 4582, *vogeliana.*
Fay 1844, *lamium* (K); 6055, *lamium* (K, MO).
Federicq 8116, *kirungae* (BR).
Figueiredo & Arriegas 31, *lanium* (FHO, K, LISC); 32, *vogeliana* (K); 33, *vogeliana* (FHO, K, LISC); 66, *vogeliana* (K).
Fischer 81, *lanium* (K).
Fishlock 16, *lamium* (K); 55, *owariensis* (BM, K).
Flanigan 193, *owariensis* (NY).
Florence 1706, *vogeliana* (P).
Fotius 2485, *owariensis* (P, YA).
Frederick 8439, *madagascariensis* (BR); 9491, *owariensis* (BR).
Friedberg 1, *vogeliana* (K).
Friis & Vollesen 58, *kirungae* (C); 483, *owariensis* (C); 612, *vogeliana* (C); 613, *madagascariensis* (C); 619, *lamium* (C); 1299, *owariensis* (C).
Friis et al. 1677, *grottanellii* (C); 1882, *madagascariensis* (C, ETH); 1908, *madagascariensis* (C, ETH); 6023, *grottanellii* (ETH); 6041, *grottanellii* (ETH).
Friis, Gilbert & Vollesen 4109, *madagascariensis* (ETH, UPS).
Friis, Hounde & Jacobsen 369, *madagascariensis* (ETH).
Froment 385, *owariensis* (BR).
Garley 464, *kirungae* (LISC).
Garrett s.n., *owariensis* (K).
Gassy Leon 2002, *lamium* (K).
Gbile 27, *lamium* (MO).
Geerling & Bockdam 1533, *lamium* (C, MO, WAG); 1739, *lamium* (K, MO, WAG); 1859, *owariensis* (C, MO, WAG); 1951, *lamium* (C, MO, WAG).
Gelinger 2869, *kirungae* (Z).
Gentry 11720, *madagascariensis* (MO).
Geo Watt 7049, *lamium* (BM, MO
Gerard 1954, *lamium* (K); 3626, *lamium* (K); 5341, *lamium* (BR, K).
Gereau et al. 5561, *lamium* (K); 5629, *owariensis* (K); 5657, *owariensis* (K).
Germain 1952, *madagascariensis* (PRE); 3915, *kirungae* (BR); 4934, *madagascariensis* (BR); 7826, *madagascariensis* (BR); 8141, *owariensis* (BR).
Gilbert & Mesfin 6612, *kirungae* (PRE).
Gilli 519, *kirungae.*
Gocker 2, *vogeliana* (MO, US).
Goldsmith 54161, *kirungae* (MO).
Gomes & Sousa 4137, *riparia* (PRE).
Goosens 1313, *owariensis* (BR); 2369, *owariensis* (BR); 6030, *lamium* (K).
Gossweiler 131, *lamium* (BM); 500B *owariensis* (BM); 1048, *owariensis* (BM).
Goudot s.n., *madagascariensis* (G).
Greenway & Brenan 8044, *pubescens* (PRE).
Greenway & Eggeling 8394, *kirungae* (PRE); 8594, *kirungae* (FHO).
Greenway & Farquhar 8634, *madagascariensis* (NY, PRE).
Greenway & Kanuri 12107, *madagascariensis* (PRE).
Greve 26, *pubescens* (P).
Groenendijk & Dunge 466, *riparia* (SRGH).
Guile 1733, *owariensis* (MO).
Guinea 482, *vogeliana* (K).
Gutzwiller 841, *madagascariensis* (BR); 1612, *madagascariensis* (BR).
H.V.L. P652, *lamium* (K).
Haaren 2483, *lamium* (G).
Hall-Martin 819, *pubescens* (PRE).
Hallam 128, *lamium* (K).
Halle 2382, *owariensis* (P); 3130, *owariensis* (P); 3337, *vogeliana* (P); 3282, *owariensis* (P); 4058, *vogeliana* (K, P).
Halle & Villiers 4626, *lancifolia* (P); 4806, *debilis* (K); 4897, *debilis* (P); 5047, *debilis* (P).
Hambler 108, *owariensis* (K); 696, *lamium* (K, SRGH).
Hanke 415, *lamium* (G, Z).
Hansen 713, *lamium* (C); 937, *kirungae* (C).
Harley 678, *lamium* (K); 1631, *owariensis* (K).
Harris 116, *kirungae* (DSM).
Harris & Mwasumbi 2462, *madagascariensis* (DSM).
Harris & Poços 3227, *pubescens* (DSM); 3274, *kirungae* (DSM, US).
Head 16, *owariensis* (K); 60, *lamium* (K).
Hedin s.n., *owariensis* (P).
Hedrén, Iversen, Mziray & Pocs 84118, *madagascariensis* (UPS).
Hendrickx 77, *owariensis* (BR); 4067, *owariensis* (PRE); 7226, *owariensis* (BR).

Hepburn 71, *lamium* (K).
Hepper 1094, *owariensis* (K); 1151, *lamium* (K); 1332, *owariensis* (K, S); 1651, *owariensis* (K, S, UPS); 1972, *owariensis* (FHO, K, S, UPS); 6806, *lamium* (K).
Hildebrandt 3901, *madagascariensis* (BM, G, M, W, Z).
Holst 3316, *madagascariensis* (H); 4216, *madagascariensis* (G, US, Z).
Hornby 2773, *kirungae* (PRE).
Howard UTT 16, *lamium* (C).
Humbert 2670, *pubescens* (BM, G, US); 11390, *pubescens* (P); 20729, *madagascariensis* (P); 23090, *madagascariensis* (P).
Humbert & Swingle 4385, *pubescens* (S).
Humbolt 645, *madagascariensis* (P).
Hutchinson & Metcalfe 122, *owariensis* (K).
Irian FHI 23095, *lamium* (K).
Irvine 4881, *owariensis* (K); 5147, *owariensis* (K).
Irving s.n., *lamium* (K).
Iversen & Steiner 86667, *madagascariensis* (UPS).
Jackson 1023, *madagascariensis* (BM); 1144, *cf. grottanellii* (BM, MO).
Jacques-Felix 1246, *owariensis* (K, P); 1188, *lamium* (P); 2600, *owariensis* (P); 8087, *lamium* (K, YA); 9135, *vogeliana* (K, YA); 9136, *lamium* (P, YA).
Jaeger 7770, *lamium* (K).
Jansen 975, *lamium* (WAG); 1062, *lamium* (WAG); 2207, *lamium* (WAG); 2398, *lamium* (WAG); 2514, *lamium* (WAG).
Jardin Butenzorg 68, *owariensis* (P).
Jeffrey 109, *vogeliana* (K).
Johnson 965, *lamium* (K).
Johnston s.n., *lamium* (K).
Jones 127, *owariensis* (K).
Jongkind, Schmitt & Abbiw 1799, *owariensis* (K).
Jordan 375, *lamium* (K).
Jungner 181, (S, UPS); 229, *lamium* (UPS); 248, *lamium* (S, UPS); 258, *vogeliana* (UPS).
Juniper, Jefford & Mgaza 256, *owariensis* (MO).
Kaluurananga, Kibuwa & Mungai 2631, *owariensis* (M, UPS).
Kanneh 601, *lamium* (MO, NY, UPS).
Kassner (1)2908, *vogeliana* (E, H, Z); 3113, *kirungae* (H).
Katende 831, *vogeliana* (BM); K522, *kirungae*; 969, *lamium* (MO); K2503, *kirungae* (MO); 2824, *vogeliana* (MO).
Kaudern s.n., *pubescens* (S).
Kaunda & Usi 429, *riparia* (MAL).
Kayombo 1072, *owariensis* (MO).
Keay FHI 28233, *owariensis* (K); FHI 28264, *owariensis* (K).
Keay & Keay FHI 20068, *lamium* (FHO).
Keay & Onochie FHI 20245, *lamium* (K).
Kennedy 1571, *lamium* (FHO, K, US); 2672, *lamium* (K).
Kerfoot 3735, *owariensis* (PRE); 4374, *kirungae* (SRGH).
Kersting A108, *owariensis* (BM).
Kibuwa 5191, *madagascariensis* (UPS).
King 39B *lamium* (K); 114B *owariensis* (K).
Kitson s.n., *owariensis* (BM, MO, NY).
Koechlin 2891, *owariensis* (P).
Kruif 850, *owariensis* (WAG).
La Croix 3122, *pubescens* (MO); 3114, *riparia* (MO); 4083, *kirungae* (MO); 4600, *kirungae* (MO).
Lamb 66, *owariensis* (K); s.n., *lamium* (UPS).
Lambinon 78/321, *madagascariensis* (BR).
Lane Poole 392, *lamium* (K).
Lang Brown 9, *kirungae* (FHO); 81, *owariensis* (FHO).
Latilo 97, *owariensis* (K); FHI 43460, *lamium* (K); FHI 67539, *lamium* (K).
Latilo & Daramola FHI 28926, *owariensis* (FHO, K); FHI 28969, *owariensis* (K); FHI 28992, *owariensis* (FHO).
Latilo & Fagbemi FHI 64782, *lamium* (K).
Lawlor & Hall 659, *lamium* (K).
Le Testu 9, *owariensis* (BM); 1010, *owariensis* (FHO); 3541, *owariensis* (BM, P); 3557, *lamium* (K); 5943, *lancifolia* (BM, BR, P); 6431, *madagascariensis* (BM, MO); 6478, *debilis* (BM, P); 8853, *madagascariensis* (BM, P); 9135, *debilis* (BM); s.n., *lamium* (BM); 9395, *owariensis* (BR).
Leach & Brunton 10069, *kirungae* (SRGH).
Leach & Cannell 14324, *pubescens* (LISC).
Leach & Schelpe 11470, *kirungae* (LISC, SRGH).
Lebrun 309, *vogeliana* (BR); 459, *owariensis* (BR); 1858, *madagascariensis* (BR); 3278, *lamium* (K); 3515, *lamium* (K).
Leeuwenberg 1808, *lamium* (K); 2948, *owariensis* (WAG); 4198, *owariensis* (P, WAG); 6238, *vogeliana* (WAG); 6494, *lamium* (K, YA); 6496, *vogeliana* (K, LISC, MO, PRE, YA); 6560, *debilis* (K, LISC, MO, PRE, WAG,YA); 6870, *vogeliana* (K, LISC, MO, WAG, YA); 6964, *lamium* (LISC, MO, PRE); 6967, *vogeliana* (K, YA); 7100, *vogeliana* (BM, C, K, LISC, WAG); 7655, *owariensis* (K, LISC, MO, WAG, YA); 8206, *lamium* (H, LISC, MO, UPS, WAG); 8419, *vogeliana* (H, K, LISC, M, MO, PRE, UPS, WAG, YA); 8554, *owariensis* (MO, PRE, WAG, YA); 8994, *lancifolia* (C, H, LISC, PRE, UPS, WAG, YA); 6870); 9244, *owariensis* (LISC, PRE, UPS, WAG, YA); 9245, *owariensis* (H, LISC, MO, PRE, UPS, WAG, YA); 10628, *vogeliana* (K, MO, WAG, YA).
Lejoly 2281, *kirungae* (BR); 84/409, *kirungae* (BR).
Lely 129, *owariensis* (FHO, K); 469, *lamium* (K); 652, *lamium* (MO).
Leonard 771, *lamium* (MO); 1678, *kirungae* (BR).
Letouzey 1178, *madagascariensis* (H); 3561, *owariensis* (P, YA); 5472, *debilis* (K, P, YA); 5474, *vogeliana* (K); 5666, *lamium* (P); 7920, *lamium* (K, NY, YA); 8159, *debilis* (K, P, YA); 8241, *lamium* (K, P, YA); 8393, *lamium* (K, YA); 8446, *madagascariensis* (P); 10229, *debilis* (K, P); 10909, *owariensis* (K, YA); 13252, *owariensis* (P, YA); 15340, *vogeliana* (P).
Lewalle 795, *kirungae* (BR); 3575, *kirungae* (BR, NY); 3640, *kirungae* (BR, G); 3778, *kirungae* (BR, NY); 3783, *madagascariensis* (BR, G, SRGH); 3795, *owariensis* (BR); 5613, *lamium* (K); 5740, *kirungae* (BR).
Liben 2989, *lamium* (PRE).
Linder 859, *lamium* (K, MO, WAG); 3441, *owariensis* (K, PRE).
Longfield 21, *owariensis* (BM); 66, *kirungae* (BM, US).
Louis 118, *vogeliana* (WAG); 1307, *cf. vogeliana* (BR, MO); 1672, *owariensis* (BR); 2077, *vogeliana* (WAG); 2161, *debilis* (WAG); 4404, *lamium* (K); 4632, *kirungae* (BR); 7656, *madagascariensis* (BR); 8993, *owariensis* (BR, PRE); 10839, *madagascariensis* (C); 10841, *cf. vogeliana* (BR); 12194, *madagascariensis* (BR, C, MO); 12350, *owariensis* (BR);
Loveridge 25, *vogeliana* (K); 26, *madagascariensis* (MO).
Lovett & Lovett 2062, *kirungae* (MO).
Lowe 1804, *lamium* (K); 1809, *lamium* (K); 2955, *owariensis* (K).
Ludanga 1337, *pubescens* (C).
Luxen 373, *owariensis).*
Lye 1657, *owariensis* (MHU); 2768, *lamium* (UPS); 5555, *kirungae* (SRGH).
M. I. B. 629, *owariensis* (BR).
Mabberley 1403, *kirungae* (DSM, K).
MacGregor 265, *lamium* (K); 333, *lamium* (K); 402, *owariensis* (K).
Magnus s.n., *owariensis* (H).
Maitland 110, *vogeliana* (K); 199, *owariensis* (K); 207, *owariensis* (K); 757, *vogeliana* (K); 1619, *lamium* (K).
Malaisse & Goetghebeur 242, *owariensis* (BR).
Manktelow, Steiner & Amponsah 89, *vogeliana* (UPS).
Mann 36, *vogeliana* (K); 1688, *lancifolia* (K); 1861, *lamium* (K); 1959, *owariensis* (K).
Manning 67, *lamium* (K, MO); 398, *lamium* (K, MO); 441, *vogeliana* (MO); 1045, *owariensis* (MO); 1046, *lamium* (K, MO); 1049, *owariensis* (K, MO).
Marmo 114, *owariensis* (K); 251, *lamium* (K).
Mathey & Scholz 312, *lamium* (K).
Mbago 1030, *owariensis* (DSM).
McClintock 222, *owariensis* (K).
McEdery 7627, *owariensis* (BM).
Mearns 2465, *owariensis* (US).
Meijer 15307, *debilis* (MO).
Meikle 590, *lamium* (K); 953, *lamium* (K).
Melville & Hooker 85, *lamium* (K); 357, *lamium* (K).
Mendonça 680, *riparia* (LISC); 1219, *riparia* (LISC); 2110, *kirungae* (LISC).

Methuen 80, *kirungae* (LISC).
Meurillon 402, *lamium* (K, P); 521, *owariensis* (P); 859, *owariensis* (BR); 886, *owariensis* (BR); 1998, *vogeliana* (K).
Meurillon et al., 1970, *lamium* (K); 2031, *lamium* (K).
Meyer 7995, *grottanellii* (US); 8131, *madagascariensis* (US).
Michel 2370, *owariensis* (MO); 5522, *kirungae* (BR).
Migeod 27, *owariensis* (K); 359, *owariensis* (BM); *Migeod* s.n., *owariensis* (BM).
Mildbraed 3866, *vogeliana* (H); 4147, *madagascariensis* (H); 5487, *owariensis* (BR); 5782, *owariensis* (H); 7028, *vogeliana* (H); 7126, *madagascariensis* (H); 7353, *owariensis* (K).
Milne 140, *lamium* (W).
Mocquery 9, *lamium* (G, Z); 96, *vogeliana* (G, Z); 115, *owariensis* (G, Z).
Monod 11681, *lamium* (BM); 11718, *vogeliana* (BM); 11857, *vogeliana* (BM); 11881, *vogeliana* (BM).
Montiero 46, *riparia* (LISC).
Montiero & Murta 198, *owariensis* (PRE); 205, *owariensis* (PRE).
Montiero, Santos & Murta 205, *owariensis* (PRE).
Mooney 6071, *madagascariensis* (ETH, K, S); 6725, *grottanellii* (ETH); 6890, *grottanellii* (S).
Moriarty 18, *kirungae* (MAL).
Morton A36, *vogeliana* (K); A114, *lamium* (K); 327, *lamium* (BM, FHI , GC, K, SL, WAG); K416, *owariensis* (K, WAG); A1032, *lamium* (K); A1643, *lamium* (K); *Morton* GC8213, *vogeliana* (K); GC9378, *lamium* (K).
Morton & Gledhill SL242, *owariensis* (K).
Morton & Jarr SL2394, *lamium* (K).
Mucke 257, *madagascariensis* (PRE).
Mullenders 2087, *lamium* (BR).
Müller 802, *kirungae* (SRGH); 2353, *kirungae* (LISC).
Mwasumbi 11874, *kirungae* (DSM).
Mwasumbi & Munyenyembe 13883, *pubescens* (DSM).
Nannan 33, *owariensis* (BM); 164, *lamium* (BM, BR).
Napper 1515, *lamium* (PRE).
Nemba & Mambo 622, *vogeliana* (MO).
Newberry s.n., *lamium* (K).
Newbold & Harley 4289, *owariensis* (MO).
Newman & Whitmore 574, *kirungae* (NY).
Nkongmeneck 201, *owariensis* (P, YA).
Nolde 227, *owariensis* (BM).
Norman 103, *owariensis* (S); s.n., *madagascariensis* (MHU
Offerman et al. 648, *lanium* (BR, K).
Okafor FHI 35870, *lamium* (K).
Oldeman 108, *lamium* (K, WAG).
Onochie FHI 34064, *lamium* (K); FHI 40410, *owariensis* (K); FHI 40416, *lamium* (K).
Osmaston 2497, *owariensis* (BM).
Overlaet 544, *madagascariensis* (BR); 1052, *madagascariensis* (BR).
Paget-Wilkes 594, *kirungae* (MO).
Patel & Kwatha 2856, *pubescens* (MAL).
Paulo 646, *kirungae* (BR).
Pawek 6978, *kirungae* (MO, PRE, SRGH, UPS); 10135, *kirungae* (MO); 11717, *pubescens* (LISC, MO, SRGH); 12984, *oligantha* (K, LISC, MAL, MHU, MO, SRGH).
Pearson 2273, *owariensis* (BM).
Perdue & Kibuwa 9242, *kirungae* (LISC); 9435, *kirungae* (LISC).
Perrier 1066, *pubescens* (P); 9227, *madagascariensis* (P); 9261, *madagascariensis* (P); 9416, *pubescens* (P); 9345, *madagascariensis* (P).
Peter & Tuley 58, *owariensis* (K).
Peyre de Fabrigues 3306, *lamium* (P).
Phillips 2836, *oligantha* (MO); 2846, *kirungae* (MO, Z); 3507, *kirungae* (MAL, MO).
Pierlot 146, *owariensis* (PRE); 1649, *madagascariensis* (BR).
Pilz 2069, *lamium* (K); 2190, *lamium* (K); 2658, *lamium* (K).
Pimenta s.n., *kirungae* (LISC).
Plowes 2261, *kirungae* (LISC, SRGH); 2456, *kirungae* (LISC, PRE).
Poçs et al. 8722, *stenopteris* (UPS).
Pole Evans & Erens 1796, *kirungae* (BR, E).
Pope 1987, *pubescens* (MO, SRGH).
Poulsen et al. 523, *kirungae* (C, FHO, K, MU).
Preuss s.n., *owariensis* (BM); 998, *vogeliana* (BM); 1029, *owariensis* (BM, M).
Price & Evans 69, *debilis* (K); 71, *debilis* (K).
Procter 428, *owariensis* (PRE).
Puff & Ensermu 861107-4/6, *grottanellii* (ETH).
Pyne 11, *lamium* (K); 109, *owariensis* (K); 138, *lamium* (K, P, S).
Quintas 1235(88) *lamium* (BM, Z).
Raimano, Matos & Figueira 254, *owariensis* (LISC).
Rakotozafy 287, *madagascariensis* (P).
Ratabu 17, *madagascariensis* (MO).
Rattray s.n., *lamium* (K).
Raynal 11964, *vogeliana* (P); 20477, *kirungae* (K).
Raynal & Raynal 9719, *debilis* (P, YA); 10009, *vogeliana* (P, YA); 12167, *owariensis* (P, YA); 12966, *owariensis* (P, YA).
Reekmans 1136, *madagascariensis* (BR); 1986, *kirungae* (MO); 5237, *kirungae* (C, MO); 5918, *lamium* (K, MO, PRE); 7028, *lamium* (K, MO); 8288, *owariensis* (MO, PRE, SRGH); 9060, *lamium* (K, MO); 9408, *kirungae* (K, MO, UPS); 10009, *kirungae* (K, MO); 10017, *kirungae* (K, MO, PRE, UPS); 10073, *kirungae* (K, MO, UPS); 10604, *kirungae* (K, MO, PRE, S, UPS).
Reitsma & Reitsma 1048, *vogeliana* (WAG).
Reitsma, Reitsma & Louis 1880, *debilis* (NY, WAG).
Reynders 411, *kirungae* (PRE).
Richards 3108, *owariensis* (BM, MO, NY); 12983, *kirungae* (SRGH); 24663, *madagascariensis* (C, M).
Robertson 62, *lamium* (BM).
Roberty 6590, *lamium* (G, Z); 6652, *owariensis* (G); 6946, *lamium* (G, Z); 10695, *owariensis* (G, Z); 12613, *lamium* (G, MO, Z); 13020, *vogeliana* (G); 15849, *lamium* (G); 15991, *owariensis* (G); 16148, *owariensis* (G); 16202, *lamium* (G); 16210, *owariensis* (G, Z); 16412, *owariensis* (G).
Robevazalia 11530, *madagascariensis* (P).
Robson & Fanshawe 537, *kirungae* (LISC, SRGH).
Robyns 151, *owariensis* (BR); 2098, *owariensis* (BR).
Rodgers-Hall 1484, *kirungae* (DSM).
Rosevear 41-29, *lamium* (K); 68-31, *owariensis* (FHO); 82-29, *lamium* (K).
Saeger 1431, *lamium* (C, MO).
Safy 6312, *madagascariensis* (P).
Salubeni 1485, *oligantha* (SRGH); 1487, *oligantha* (MAL, PRE, SRGH); 1489, *kirungae*; 1803, *pubescens* (MO, SRGH); 1842, *pubescens* (MO).
Salubeni & Kaunda 4523, *pubescens* (MAL).
Salubeni & Tawakali 2334, *riparia* (MO).
Samai 579, *lamium* (K).
Sanford 4617, *lamium* (MO); 5812, *lancifolia* (K).
Satuble 953, *lamium* (G).
Savory FHI 36599, *owariensis* (K).
Savory & Keay FHI 25015, *owariensis* (K); FHI 25056, *owariensis* (K); FH25017, *owariensis* (K).
Saxer 248, *lamium* (G, K, Z).
Scaetta 3112, *lamium* (P); 3284, *lamium* (P).
Schlieben 1358, *kirungae* (G, M, LISC, S, Z); 2767, *kirungae* (G, S, Z); 4068, *stenopteris* (LISC, MO, PRE); 4069, *madagascariensis* (G, H, LISC, M, P, S, Z); 4108, *kirungae* (G, LISC, M, S, Z); 5323, *pubescens* (G, H, LISC, M, MO, PRE, S, Z).
Schmidt et al. 2090, *lamium* (K).
Schnell 6513, *lamium* (K).
Schweich 2423, *kirungae* (LISC, PRE).
Scott Elliot 3990, *owariensis* (BM); 3990a *owariensis* (K).
Scurlock 17, *lamium* (K).
Seret 97, *cf. vogeliana* (BR); 346, *vogeliana*; 716, *owariensis* (BR).
Sharland 362, *owariensis* (K); 1155, *owariensis* (K); 1202, *owariensis* (K); 1411, *lamium* (K); 1736, *owariensis* (K); 1802, *lamium* (K).
Sharpe B8833, *kirungae* (G).
Shaw 26, *owariensis* (K).
Sita 670, *lamium* (P).
Small 212, *lamium* (K); 243, *lamium* (K, P).
Smeyers 32, *kirungae* (BR); 54, *lamium*).

Smith s.n., *owariensis* (K).
Smythe 240, *owariensis* (K).
Snowden 954, *kirungae* (G, MO); 1847, *owariensis* (G).
Soyaux 118, *owariensis* (M, W); 454, *vogeliana* (E, H, US).
Stanton 38, *owariensis* (BM, SRGH).
Stauble 952, *lamium* (G).
Staudt 240, *debilis* (G, K, NY, S, WAG).
Stauffer 46, *kirungae* (PRE, UPS, Z).
Stolz 152, *kirungae* (G, M, MO, NY, S, W, Z).
Stone 63, *lamium* (K); 86, *lamium* (K).
Strid 2916, *kirungae* (S).
Stubbings 200, *lamium* (K).
Swarbrick 293, *vogeliana* (E, YA); TS2822, *lamium* (K).
Synge 31395, *kirungae* (BM, MO, S, US).
Talbot s.n., *lamium* (K, Z); 981, *lamium* (BM, K, Z); 993, *owariensis* (K); 1393, *owariensis* (MO); 1912, *owariensis* (MO); 2000, *lancifolia* (BM, K).
Talbot & Talbot s.n., *owariensis* (K); 1270, *owariensis* (K).
Taton 1172, *lamium* (BR).
Taylor s.n., *madagascariensis* (MO); 1660, *lamium* (BM, MO, S); 2477, *owariensis* (BM, MO); 2516, *owariensis* (BM); 3156, *kirungae* (BM, MO, S); 3203, *owariensis* (BM); 3284, *owariensis* (S); 3327, *madagascariensis* (BM, MO); 3384, *owariensis* (BM).
Thera & Kaunda 313, *pubescens* (PRE).
Thijsen 276, *lamium* (WAG).
Thoen 4829, *pubescens* (BR).
Thomas, A.S. 1595, *owariensis* (BM); 1768, *owariensis* (BM); 2845, *owariensis* (MO); 2952, *owariensis* (MO, PRE, YA).
Thomas, D.W. 1722, *lamium* (K); 2091, *lamium* (K); 2096, *lamium* (S); 2320, *lamium* (K); 2502, *lamium* (BM, MO, NY); 2609, *vogeliana* (MO, YA); 2762? *lamium* (W); 2775, *lancifolia* (MO); 2845, *owariensis* (MO); 2935, *lamium* (K); 2952, *owariensis* (K, MO, PRE); *D.W.* 3790, *kirungae* (MO); 4381, *owariensis* (MO, YA); 7149, *owariensis* (MO); 9005, *owariensis* (MO).
Thomas, D.W. & Macleod 5106, *owariensis* (MO); 5145, *owariensis* (MO).
Thomas, D.W. & Mambo 4235, *lamium* (K, MO, PRE).
Thomas, D.W., Mambo & Nemba 4987, *owariensis* (MO, NY).
Thomas, D.W. & Nemba 4047, *lamium* (MO); 4048, *vogeliana* (K, MO, YA).
Thomas, N.W. 102, *owariensis* (K); 2034, *owariensis* (K); 2285, *owariensis* (K).
Thompson & Rawlins 1460, *lamium* (MO).
Thulin & Mhoro 2904, *kirungae* (UPS); 3181, *kirungae* (MO, UPS).
Tindall 29, *owariensis* (K).
Tinley 2639, *pubescens* (LISC, MO, SRGH).
Tisserant 1352, *lamium* (P); 2346, *lamium* (BM); 2743, *cf. vogeliana* (BM, P); 3167, *lamium* (BM, P); 3245, *owariensis* (P); 3556, *lamium* (LISC, P).
Torre 486, *riparia* (LISC); 4586, *kirungae*; 35354, *kirungae* (LISC).
Torre & Correia 15977, *kirungae* (LISC).
Toussaint 2311, *cf. vogeliana* (BR).
Troupin 392, *owariensis* (BR); 395, *owariensis* (BM); 1442, *lamium* (K); 2468, *vogeliana* (BR); 2986, *kirungae* (BR); 4580, *owariensis* (BR, K); 4711, *owariensis* (BR, K); 7523, *owariensis* (BR); 9332, *owariensis* (BR); 9393, *kirungae* (BR); 10371, *kirungae* (BR); 11058, *kirungae* (BR); 11723, *kirungae* (MO, US).
Tufnell s.n., *owariensis* (BM).
Tuley 1001, *lamium* (K); 1003, *owariensis* (K); 1934, *owariensis* (K).
Tyres 339, *pubescens* (SRGH).
Ujor FHI 30224, *lamium* (K).
Usi & Kaunda 606, *pubescens* (MAL).
van der Ben 648, *owariensis* (BR); 1120, *owariensis* (BR, SRGH).
van der Laan 986, *debilis* (WAG).
van der Veken 10350, *kirungae* (BR).
van Harten 192, *lamium* (H, K, WAG).
van Meer 303, *owariensis* (BM, MO, WAG).
Vanden Hondt 58, *kirungae* (BR).
Vanderijst s.n., *lamium* (BR).
Verdcourt 1674, *kirungae* (PRE); 1683, *vogeliana* (K).
Vermoesen 1852, *cf. vogeliana* (BR); 1854, *owariensis* (BM).
Vogel 17, *lamium* (K).
Vollesen 2392, *pubescens* (C).
Voorhoeve 726, *owariensis* (WAG).
Vuyk 330, *madagascariensis* (WAG).
Watmough 707, *pubescens* (SRGH).
Watt 7384, *vogeliana* (BM).
Welwitsch 5149, *owariensis* (BM); 5150, *owariensis* (BM); 5182, *owariensis* (BM, G); 5205, *lamium* (BM).
White 8520, *owariensis* (FHO); 13908, *kirungae* (FHO).
Whyte s.n., *lamium* (K).
Wild 3566, *kirungae* (NY).
Williams s.n., *owariensis* (US); 33, *kirungae* (MO); 216, *kirungae* (LISC, SRGH).
Winkler 505, *vogeliana* (Z).
Wollaston s.n., *owariensis* (BM).
Wright 2463, *lamium* (FHO).
Wyld 679, *lanium* (BM).
Yamada 261, *lamium* (K).
Yates 35, *owariensis* (K).
Young 651, *kirungae* (BM).
Zenker 286, *owariensis* (C, MO, US, Z); 396, *lamium* (C, G); 513, *vogeliana* (K); 1104, *lamium* (BM, E, K).
Zenker & Staudt 520, *owariensis* (S, Z).

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Seaweeds of the western coast of tropical Africa and adjacent islands: a critical assessment. IV. Rhodophyta (Florideae) 6. Genera [Q] R–Z, and an update of current names for non-geniculate Corallinales

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SYNOPSIS. This paper assembles and, so far as is possible without extended field and herbarium studies, examines critically the validity of records of marine and brackish-water Rhodophyta (Florideae) for the western coast of tropical Africa. The whole mainland coastline from the northern boundary of Western Sahara southwards to the southern boundary of Namibia, the oceanic islands from the Salvage Islands southwards to Ascension and St Helena, and all islands close to the African mainland coast are included in the area covered. Each species entry includes all traced records, the names which have previously been applied to it for the area, and additional comments or evaluation, as necessary. Comments are also provided at generic or generic group levels in very complex cases. All names used for non-geniculate Corallines in earlier papers in the series are updated.

INTRODUCTION

The area dealt with in this final part of the series is identical with that covered in earlier parts (Lawson & Price, 1969; Price et al., 1978, 1986, 1988, 1992; John et al., 1979, 1994; Lawson et al., 1995). Relevant country names employed and their earlier equivalents, and the names of island groups, are either listed in the legend or both listed and shown on the map in Fig. 1. Genera with the initial letters [Q-]R-Z and constituent species are listed alphabetically.

Each main entry in the first part of this paper consists of:

(i) The major bold heading, representing the currently-accepted name and authorities.

(ii) Subsidiary italicized headings. These are in square brackets and essentially subdivide the overall entry. They represent the different ways in which the species has been referred to in past publications for the area. Incorrect citations from past literature have been maintained in these subsidiary heads so that there shall be no doubt as to which record we attribute to which species or lower taxon level; only when clarification was required have changes been made in subhead citation, in which case an explanation is given in intermediary or terminal notes.

(iii) The distributional data, with countries and island groups arranged alphabetically. More generalized statements of distribution follow the specific country list. Complete distribution patterns require a scan of records under all names by which a species is known for this or adjacent areas. Hence, generalized distribution statements are included *verbatim* since it is not always clear for precisely which countries within the area they establish records. In all cases, numbers within parentheses after the names refer to corresponding numbers in the references. In the present reference list, for ease of readjustment from other parts, references have not been renumbered but simply omitted or added and additionally numbered appropriate. However, lists of references are only partially interchangeable between different parts of the overall list since some earlier parts had a different numbering system. Presentation of the references follows that from the previous part in having first a numerical sequence presenting only authors and dates, followed by separate listing of the full references in alphabetical order. Manuscript and expeditionary sources, as well as works currently in press are also included in the 'References'.

(iv) Additional qualifying notes were required in many cases and may be found below whole entries or individual parts of entries to which they specifically refer. References in the notes are

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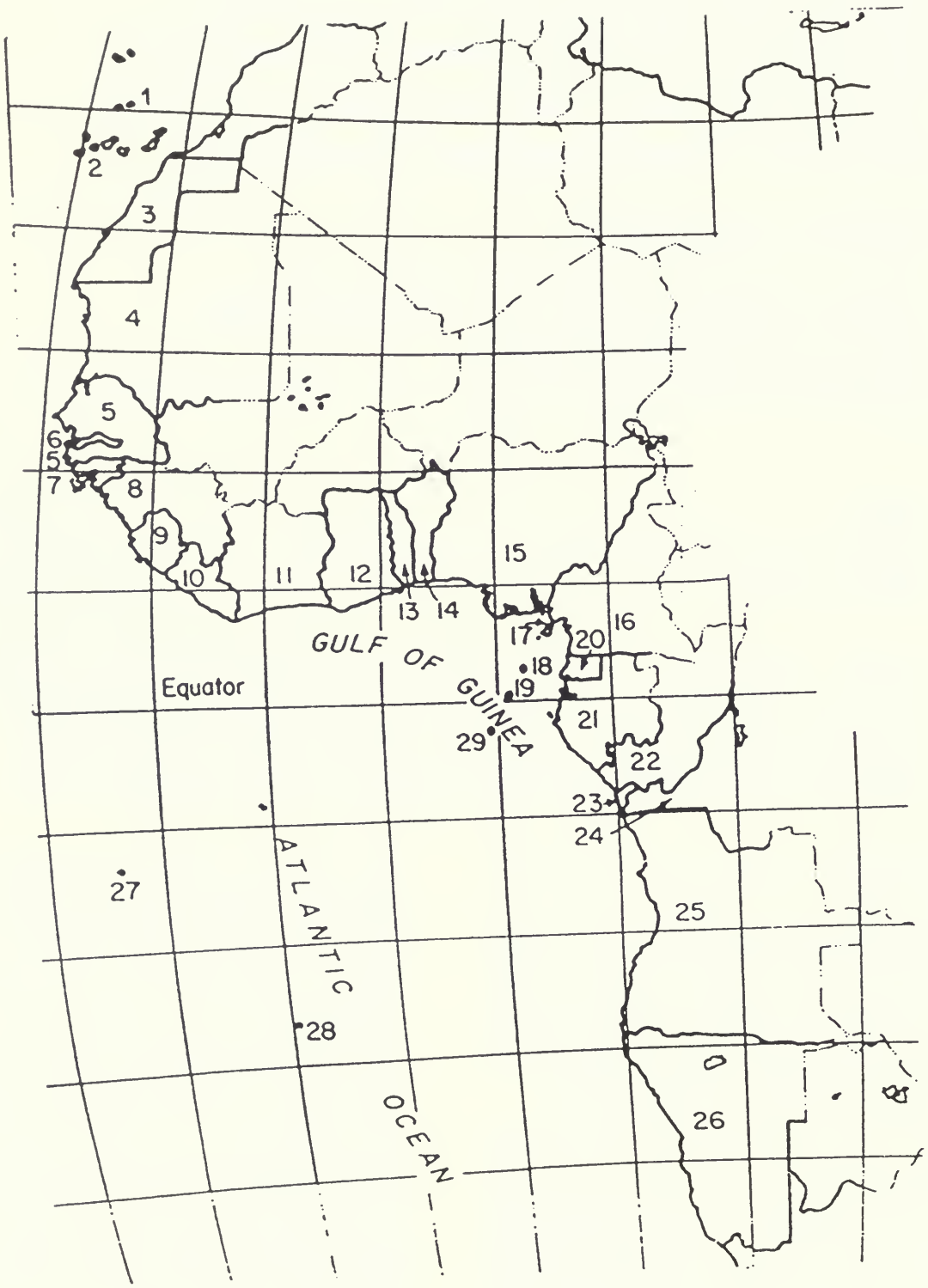
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cited by reference number when they contain species records and by author name, date of publication, and sometimes page numbers (after colon) when they do not.

Species nomenclature has been revised as far as possible and the complete author citation derived from Brummitt & Powell (1992) is given for each currently accepted combination. The subsidiary italicized headings and any other discarded combinations that require reference are included as cross-referencing entries to the currently accepted names in the overall list. The necessarily preliminary nature of all the treatments presented has been emphasized for each previously published part of the list and applies no less to this final contribution to the series. As indicated in previous parts, critical updating is kept firmly in mind for the whole work, although feasibility of that process will remain the final determinant at the appropriate time. We would appreciate notification of any detected errors and omissions in any of the parts.

SPECIES LIST

Reinboldiella poeppigiana (Grunow) J. Feldmann & Feldmann-Mazoyer
See *Ceramium poeppigianum* Grunow.
Additional record: Cape Verde Islands (639).

Rhabdonia decumbens (Grunow) Grunow
Canaries (37;70;71;131;375;493;598).
Cape Verde Islands (37;70;131;375;598).
[As *Meristotheca? decumbens* Grunow]
Canaries (439).
[As *Rhabdonia decunbens* Grunow]
Canaries (191;227;493).

Note. For discussion on names, see *Meristiella echinocarpa* (Areschoug) Cheney & Gabrielson for Cape Verde Island specimens. Prud'homme van Reine et al. (663) have re-investigated the Macaronesian algae studied by Piccone (see 439, 450, 451) and Askenasy (see 37, 38) and concluded that Askenasy had erroneously identified both *Meristiella echinocarpa* (from the Cape Verde Islands) and *Meristotheca? decumbens* (from Madeira, the Canaries and also the Cape Verde Islands) as *Mychodea schrammii*.

Rhabdonia sp.
See *Gigartina flagelliformis* (Sonder) Sonder.

Rhodochorton sp.
See *Audouinella*.
Additional record: Cape Verde Islands (652).

Rhododiscus pulcherrimus P. & H. Crouan
Canaries (232B;598).

Note. Noted by Prud'homme van Reine (598) as '= tetrasporophyte of *Atractophora hypnoides*' on basis on an abstract by Maggs et al. (1983) and a note by Irvine (273:35).

Rhodomela episcopalis Montagne
See *Halopitys incurvus* (Hudson) Batters.

Rhodomela lycopodioides (L.) C. Agardh
See *Fucus lycopodioides* Flor. Dan.

Note. On purely nomenclatural grounds the Bory (90) record for the Canaries would probably be attributable to *Rhodomela lycopodioides*. However, this is biogeographically extremely unlikely to be correct and the record may well represent a report of *Halopitys incurvus* (Hudson) Batters (q.v.).

Rhodomela pinastroides (Gmelin) C. Agardh
See *Halopitys incurvus* (Hudson) Batters.

Rhodomela pinastroides (Gmelin) C. Agardh var. **episcopalis** Montagne
See *Halopitys incurvus* (Hudson) Batters.

Rhodophyllis bifida (Goodenough & Woodward) Kützing
See *Rhodophyllis divaricata* (Stackhouse) Papenfuss.

Rhodophyllis capensis Kützing
See *Rhodophyllis reptans* (Suhr) Papenfuss.

Rhodophyllis divaricata (Stackhouse) Papenfuss
Canaries (18;380;633;745;747).
Mauritanie (624).
[As *Rhodophyllis bifida* (Goodenough & Woodward) Kützing]
Canaries (598).
'Nordwestafrika' (499).

Rhodophyllis gracilarioides M. Howe & W.R. Taylor
Ghana (290;292;299;350;376;377;586).
Sénégal (59;722).
'in tropical parts of the Atlantic Ocean.' (350;586).
'Tropical Africa (N. Gambia – Congo River)' (598).

Note. Bodard & Mollion (59) indicated that this alga is known otherwise only from Brazil, a comment clearly now outdated.

Rhodophyllis reptans (Suhr) Papenfuss
Namibia (36B;707).
[As *Rhodophyllis capensis* Kützing]
Namibia (500).

Rhodophysema africana D.M. John & G.W. Lawson
Angola (217;294;352;532;586).
Gabon (217;294;350;532;586).
'Tropical Africa (N. Gambia – Congo river)' (598).
[As *Rhodophysema* sp.]
Angola (352).

Fig. 1 The coastline of tropical West Africa and the offshore islands.
1, Salvage Islands; 2, Canary Islands; 3, Western Sahara [=former Spanish Sahara, Spanish West Africa](includes the often quoted Rio de Oro, the southern region of the country, but excludes Ifni); 4, Mauritanie; 5, Sénégal; 6, Gambia; 7, Guinea-Bissau [=Portuguese Guinea]; 8, Guinée; 9, Sierra Leone; 10, Liberia; 11, Côte d'Ivoire; 12, Ghana; 13, Togo; 14, Benin [=Dahomey]; 15, Nigeria; 16, Cameroun; 17,* Bioko [=Macias Nguema Biyogo, Fernando Póo]; 18, Príncipe; 19, São Tomé; 20,* Equatorial Guinea [=Spanish Guinea]; 21, Gabon; 22,** Republic of the Congo; 23, Cabinda; 24, Zaire [=Congo Republic]; 25, Angola; 26, Namibia [=South West Africa]; 27, Ascension Island; 28, St Helena; 29, Annobon [Pagalú]. The Cape Verde Islands, which lie immediately to the west of Dakar (Sénégal), have been omitted from this map but are included in the species list that follows.
*Nos 17 (Bioko) and 20 (Spanish Guinea, = Rio Muni) are now jointly administered as Equatorial Guinea. Bioko is entered separately, where appropriate, in the species list.
**Loango, a name much used by earlier collectors such as Welwitsch, was formerly a coastal region of West Africa. Its application appears to have included much of the coastline of the Republic of the Congo (22), as well as of Cabinda (23) and Zaire (24). Because by far the longest and rockiest part of the Loango coast lies now within the Republic of the Congo we have attributed all marine algal records from Loango to the Congo.

Note. This species closely resembles *Rhodophysema elegans* (P. & H. Crouan ex J. Agardh) Dixon: see John & Lawson (294). For further information on the genus see South & Whittick (532) and Masuda & Ohta (1981).

Rhodothamniella codii (Crouan) J. Feldmann
See *Audouinella codii* (P. & H. Crouan) Garbary.

Rhodymenia ardissonei J. Feldmann
Canaries (634;635;648).

Rhodymenia caespitosa P.A. Dangeard
Canaries (635).

Rhodymenia capensis J. Agardh
See *Epymenia capensis* (J. Agardh) Papenfuss.

Rhodymenia corallicola Ardissone
See *Rhodymenia ligulata* Zanardini.

Rhodymenia holmesii Ardissone
Angola (unpublished).
Canaries (663).

Note. Many plants under this name from Angola appear to correspond rather closely to *Rhodymenia pseudopalmetta* var. *pseudopalmetta* [= *R. pseudopalmata*], but a few with narrow fronds often tapering towards the rounded apices have sufficient development of apparent 'stolons' as processes from the frond to show strong resemblance to plants previously known as *R. pseudopalmetta* var. *ellisiae* (Duby) Guiry. This latter taxon is now placed in synonymy with *R. holmesii* Ardissone. Prud'homme van Reine et al. (663) re-examined Piccone's specimens of *R. palmetta* (Esper) Greville and renamed some of them as *R. holmesii*, pointing out that this species was a new record for Macaronesia. In all probability, records for Namibia and Ascension given under *Schottera nicaeensis* (J.V. Lamouroux ex Duby) Guiry & Hollenberg should also be attributed here.

Rhodymenia ligulata Zanardini
'Subtropical Africa [Sénégal (N. of Gambia); Mauritania; former W. Sahara]' (598).
[As *Rhodymenia corallicola* Ardissone]
Mauritanie (269;349;516).

Rhodymenia linearis J. Agardh
Namibia (36B;707).

Note. Wynne (36B) suggested that the general habit of this alga was similar to *Epymenia capensis* (J. Agardh) Papenfuss, save that the tetrasporangia did not occur in special proliferations but rather in rounded sori near the apices of frond segments. Stegenga et al. (707: 363-364), however, regard the differences between this alga and *Rhodymenia natalensis* as insignificant and have included all material in the latter species.

Rhodymenia multipartita (Clemente) Montagne
See *Gracilaria multipartita* (Clemente) Harvey.

Rhodymenia natalensis Kylin
Namibia (36B).
'Southern Africa' (707).

Note. Wynne (36B) expressed some reservations in assigning material to this species, due to the colder water conditions in Namibia compared to those of the eastern African coastline. Thalli are broader, with a more fan-shaped aspect, with larger tetrasporangia, and without the basal stoloniferous growths found in *Rhodymenia pseudopalmetta*, which *R. natalensis* otherwise resembles.

Rhodymenia palmata (L.) Greville
Canaries (401).
'. . . Atlantischen Ocean (Skandinavien bis zu dem Kanaren . . .)' (37).
'Coast of the Gulf of Guinea'. (269).
'. . . from the Canary Islands and Mediterranean Sea to the coasts of Norway and Ireland.' (268).
[As *Rhodymenia palmata* Greville]
Canaries (44).
[As ?*Halymenia clavaeformis* Suhr]
Canaries (401).
[As *Rhodymenia palmata* (Esper) Greville]
Canaries (375).

Note. Montagne (401) commented that the Canarian material was a single juvenile individual sent by Despreaux to Webb under the name *Delesseria lactuca*. Børgesen (70) believed Montagne's record was a case of mistaken identification for *Rhoodymenia palmata*. Possibly all these records relate to *Palmaria palmata* (L.) Kuntze but there are reservations. See the earlier note to *P. palmata*.

Rhodymenia palmetta (Esper) auct.
See *Rhodymenia pseudopalmata* (J.V. Lamouroux) P.C. Silva.

Rhodymenia pseudopalmata (J.V. Lamouroux) P.C. Silva
Angola (273;352).
Canaries (13;38B;38D;108;225;226;227;229;232B;273;306B;379;490;546;633;634;635;662;663;684;685;747).
Cape Verde Islands (38B;38D).
Gabon (294?;350?;586?).
Ghana (299;350;376;377;586;695).
Mauritanie (38B;38D;349;624).
Salvage Islands (38B;38D).
Sénégal (38B;38D;55;56;57;59;399;654;722).
Sierra Leone (295;350;586).
Western Sahara (38B;38D;349).
'. . . Afrique noire . . .' (59).
'. . . Atlantique (de l'Angleterre aux Canaries) . . . (33).
'. . . in warm temperate and tropical seas.' (350;586).
'Subtropical Africa [Sénégal (N. of Gambia); Mauritania; former W. Sahara]' (598).
'Tropical Africa (N. Gambia – Congo river)' (598).
'. . . O. Atlántico (desde I. Británicas hasta Canarias) . . .' (747).
[As *Rhodymenia pseudopalmetta* (J.V. Lamouroux) P.C. Silva var.]
Sénégal (59).
[As *Rhodymenia palmetta* Esper]
Cape Verde Islands (145).
[As *Rhodymenia palmetta* (Esper) Greville]
Canaries (70;191;252;375;390;439 pro parte;499;547;663).
Cape Verde Islands (38;252;411;499).
Ghana (153;338;537).
Mauritanie (252).
Sénégal (123).
'From the English Coast to the Canary Islands . . .' (70).
'Nordwestafrika' (499).
'Westafrika' (499).

Note. Some specimens recorded in 439 are *Rhodymenia holmesii* (see 663).

[As *Rhodymenia palmetta* Greville]
Angola (42).
Guinea-Bissau (529).
[As *Rhodymenia palmetta* J. Agardh]
Angola (41).
[As *Rhodymenia palmetta* Greville var. *fusco-purpurea* P.A. Dangeard]
Sénégal (49;59;122;182).
[As *Rhodymenia palmetta* Greville var.]
Canaries (439).
[As *Rhodymenia palmetta*]
Sénégal (411).

Note. Irvine (273) commented: 'British Isles to at least Morocco; Azores; Canary Isles; Mediterranean and South African records doubtful. Records from elsewhere apply to other species of *Rhodymenia*'. Lawson & John (350,586) noted: 'Many plants from the region appear to correspond closely

with variety *pseudopalmata*, but a few of those with narrow fronds often tapering towards the rounded apices show some resemblance to *R. holmesii* Ardissone (= *R. pseudopalmata* variety *elisiae* (Duby) Guiry in Guiry & Hollenberg)'.

The record from Gabon (294,350,586) is doubtful because the specimens were sterile.

Rhodymenia pseudopalmetta (all varieties)
See *Rhodymenia pseudopalmata* (J.V. Lamouroux) P.C. Silva and *Rhodymenia holmesii* Ardissone.

Rhodymenia sp.
Canaries (633).
Guinée (529).
Namibia (312A;348).

Ricardia montagnei Derbès & Solier
See *Erythrocystis montagnei* (Derbès & Solier) P.C. Silva.

Rissoella verruculosa (Bertolini) J. Agardh
Canaries (646).

Rytiphlaea episcopalia (Montagne) Endlicher
See *Halopitys incurvus* (Hudson) Batters.

Rytiphlaea fruticulosa Harvey
See *Polysiphonia fruticulosa* (Wulfen) Sprengel.

Rytiphlaea [Rytiphloea] pinastroides auct.
See *Halopitys incurvus* (Hudson) Batters.

Rytiphlaea tinctoria (Clemente) J. Agardh
[As *Rytiphlaea tinctoria* (Clemente) C. Agardh]
Canaries (16;26;38B;38D;71;89;128A;133;191;226;227;232B;302;304;306B;375;392;401;439;489;517;556;584;598;634;635;648;662;663;684;717;747).
Mauritanie (38B;38D;349;516;556;624).
Salvage Islands (38B;38D;375;556;598).
Western Sahara (38B;38D).
'. . . African coasts, Canary Islands . . .' (177).
'. . . Atlantique meridional (de Brest et du sud de la Loire a la Mauritanie) . . .' (222).
'. . . Atlantique (de Brest aux Canaries) . . .' (190).
'. . . Atlantique (depuis Brest aux Mauritanie)' . . . (33).
'. . . Atlantico desde Brest a Canarias' (517).
'. . . de Brest aux Canaries . . .' (89).
'From Brest to the Canary Islands . . .' (71).
'Atlantic between the Canaries and the British Isles' (668).
'. . . l'ocean Atlantique . . . de Brest aux Canaries . . .' (517).
'Subtropical Africa [Sénégal (N. of Gambia); Mauritania; former W. Sahara]' (598).
[As *Rythifloea tinctorea*]
Canaries (237).
[As *Rythifloca tinctorea*]
Canaries (237).
[As *Rythifloces tinctores*]
Canaries (237).
[As *Ryptiphloea tinctorea* (Clemente) C. Agardh]
Canaries (229).
[As *Rytiphlaea tinctoria* C. Agardh]
Canaries (547).
[As *Rytiphlaea tinctorea* (Clemente) J. Agardh]
Canaries (663).
[As *Rytiphlafa tinctoria* (Clemente) C. Agardh]
Canaries (21).
[As *Rythyphloea tinctorea* (Clemente) C. Agardh]
Canaries (229).
[As *Rythiphloea tinctoria* (Clemente) C. Agardh]
Canaries (229).
[As *Rytiphloea tinctoria* (Clemente) C. Agardh]
Canaries (13;177).
Salvage Islands (231).
'. . . .Atlantic Ocean (. . . African coasts . . .)' (177).
[As *Rytiphloea tinctoria* C. Agardh]
Canaries (44).

Sarcodia ceylanica Harvey ex Kützing
[As *Sarcodia ceylanica* Harvey]
Sénégal (122;411).

Note. Various authors, including Silva et al. (1987) and Silva et al. (746), consider this variable alga to be equivalent to *Sarcodia montagneana* (J. Hooker & Harvey) J. Agardh.

Sarcomenia intermedia Grunow
Cape Verde Islands (38;191).
'. . . assez communes aux îles du Cap Vert'(38).

Note. Correct name is *Platysiphonia intermedia* (Grunow) Wynne. For nomenclature, see Silva et al. (746).

Sarcomenia miniata (C. Agardh) J. Agardh [or C. Agardh]
See *Platysiphonia delicatula* (Clemente) Cremades.

Sarcodiotheca divaricata W.R. Taylor
Canaries (664).

Schimmelmannia bollei Montagne
Canaries (227;410;502).
Cape Verde Islands (27;38;70;134;191;390;408;500;502;598;625).

Note. Børgesen (70), in explaining the citation of 'Cape Verde' instead of 'Canary' Islands stated: '*Schimmelmannia Bollei* Mont. is in Engler and Prantl, Natürl. Pflanzenfam. l, 2, 1897, p. 507, said to occur "in den Gewässern der canarischen Inseln". Dr. O.C. Schmidt, Bot... Mus..., Dahlem bei Berlin, ... informed me that all the specimens found in the Museum originate from the Cape Verde Islands.'.

Gil-Rodríguez & Afonso-Carrillo (227) indicated that Børgesen (71) had stated the Canaries record to be erroneous, so they listed the record but excluded the species from their catalogue as they believed it to be absent.

De Toni (134: 1527), commenting on the Bolle collections from St. Nicolas (C.V.I.), stated: 'Species tantum sterilis hucusque reperta, ita ut de affinitate vix dijudicare liceat; quoad structuram haec potius ad *S. Frauenfeldii* quam ad *S. ornatum* adpropinquare videtur'.

Schimmelmannia ornata Schousboe
Canaries (389).

Note. This record probably represents the species referred to for the area as *S. bollei* Montagne.

Schizymenia dubyi (Chauvin ex Duby) J. Agardh
'. . . Atlantischer Ozean, von den englischen bis an die nordwestafrikanischen Küsten . . .' (498;499).

Note. The southern limit of this species appears to be Morocco (34;118), but since Schmidt did not define what he meant by North West Africa it is just possible that he was including Western Sahara and/or Mauritanie. Tetrasporic phase is *Haematocelis rubens* J. Agardh (33;34).

Schizymenia obovata (J. Agardh) J. Agardh
Namibia (36B;348).

Note. Seagrief (570) gave *Platymenia undulata* var. *obovata* J. Agardh in synonymy, but Silva et al. (746) suggest *Schizymenia apoda* (J. Agardh) J. Agardh to be the correct name.

Schmitziella endophloea Bornet & Batters
Canaries (9;227;582;584).

Note. After studies of relevant type material, Woelkerling & Irvine (1982) concluded that *Schmitziella*, typified by *S. endophloea*, did not belong in the Corallinaceae and placed it next to the Acrochaetiaceae as a *genus incertae sedis*. Subsequently Pueschel (1989: 634), from studies of pit-plug structure and mode of tetrasporangial cleavage, considered that *Schmitziella* may

belong in the Gigartinales rather than the Corallinales or Acrochaetiales. The taxonomic affinities of *Schmitziella* hence require further investigation. Woelkerling (730) provides information on material of this species in the Thuret-Bornet herbarium in PC.

Schmitziella sp.
Cape Verde Islands (366).
Note. The specimens upon which this record is based need examination in detail to determine their taxonomic disposition.

Schottera nicaeensis (J.V. Lamouroux ex Duby) Guiry & Hollenberg
Namibia (36B).
[As *Phyllophora palmettoides* var. *Nicaeensis* J. Agardh]
Ascension (37).
Note. According to Irvine (273: 94 et seq.) this should be included under *Rhodymenia holmesii*.

Scinaia
For a detailed revisionary treatment of the *Scinaia*-assemblage, see 271A.

Scinaia australis (Setchell) Huisman
Canaries (724).

Scinaia canaliculata J. Feldmann
Sénégal (48;55;59:722).
'. . . l'aire se limite au golfe du Bénin et à la Mauritanie . . .' (59).
'Subtropical Africa [Sénégal (N. of Gambia); Mauritania; former W. Sahara]' (598).
Note. Bodard & Mollion (59: 214) referred to this species as 'Feldmann mscr', stating (p. 198) '...n'est pas décrit...'.

Scinaia (Pseudogloiophlea) capensis
Note. See earlier entry for *Ginnania furcellata* Montagne.

Scinaia caribaea (W.R. Taylor) Huisman
Canaries (633;634;724).
Note. See Reyes et al. (724: 57) regarding the possibility that this record may represent *Scinaia halliae* (Setchell) Huisman.

Scinaia complanata (Collins) Cotton
Canaries (17;128A;598;635;648;662;724).
Salvage Islands (38B;38D;598).
Sénégal (48).
[As *Scinaia complanata* (f. typus)].
Sénégal (182).

Scinaia cottonii Setchell
Ghana (350;586).
Sénégal (722).
'. . . in warm temperate and tropical parts of the Atlantic and Pacific Oceans.' (350;586).
'Tropical Africa (N. Gambia – Congo river)' (598).

Scinaia forcellata Bivona-Bernardi
See *Scinaia furcellata* (Turner) J. Agardh.

Scinaia furcellata (Turner) J. Agardh
[As *Scinaia forcellata* Bivona-Bernardi]
Canaries (13;89;172;227;232B;271A;547;598).
Cape Verde Islands (38).
Salvage Islands (598).
Sénégal (38).
[As *Scinaia furcellata* (Turner) Bivona-Bernardi]
Sénégal (722).
'Subtropical Africa [Sénégal (N. of Gambia); Mauritania; former W. Sahara]' (598).
[As *Scinaia furcellata* (Turner) Bivona]
Annobon (Pagalú) (350;456;586).
Canaries (2;38B;38D;39;68;117;118;128A;191;375;392;489;499;517; 547;584).
Congo (249;250;350;586).
Salvage Islands (38B;38D).
Sénégal (38B;38D;48;55;59).
'Atlántico de Gran Bretaña a Canarias' (517).
'. . . Atlantique (de la Novège aux Canaries) . . .' (33).
'From Great Britain down to the Canary Islands' (68).
'. . . largement répandue dans tout l'Atlantique boréal et dans les eaux tropicales' (59).
'Nordwestafrika', 'Westafrika' (499).
[As *Ginnania furcellata* (C. Agardh) Montagne = *Halymenia furcellata* Agardh]
Canaries (402).
[As *Scinaia furcellata* (Turner) Bivona var. *constricta* Pilger]
Annobon (Pagalú) (139;456;457;496).
[As *Ginnania furcellata* Montagne]
Canaries (401).
'. . . in mari atlantico . . . ad oras . . . Africae meridionalis . . .' (318).
[As *Ginnania furcellata* (Turner)]
Sénégal (408).
[As *Scinaia pseudocrispa* (Clemente) Wynne]
Canaries (724)
Note. Nomenclature of this species has often been discussed. Dixon & Irvine (1970) were of the opinion that the epithets of *Scinaia forcellata* Bivona-Bernardi (1822: 232) and *S. furcellata* (Turner) J. Agardh (1851: 422) are orthographic variants and adopted *S. forcellata* as the correct name. However, according to Silva et al. (746) the two epithets have to be considered as distinct, with the result that the correct name is *S. furcellata*. The combination *Scinaia pseudocrispa* (Clemente) Wynne is therefore superfluous.

Scinaia halliae (Setchell) Huisman
See *Scinaia caribaea* (W.R. Taylor) Huisman.

Scinaia hormoides Setchell
Ghana (350;586).
'Tropical Africa (N. Gambia – Congo river)' (598).
'. . . widespread in tropical seas . . .' (350;586).

Scinaia (?)**johnstoniae** Setchell
Gabon (294;350;586).
Ghana (350).
Sénégal (722).
'. . . in warm temperate and tropical parts of the Atlantic and Pacific Oceans' (350;586).
'Tropical Africa (N. Gambia – Congo river)' (598).
Note. It is possible that the Ghanaian plants may represent more than one entity (see 586).

Scinaia pseudocrispa (Clemente) Huisman or Wynne
See *Scinaia furcellata* (Turner) J. Agardh.

Scinaia verae (C.I. Dickinson) Huisman
Ghana (586).
'. . . in tropical parts of the eastern Atlantic Ocean' (586).
[As *Pseudogloiophloea verae* (C.I. Dickinson) Papenfuss]
Ghana (350;434;718).
'. . . in tropical parts of the eastern Atlantic Ocean' (350).
'Tropical Africa (N. Gambia – Congo river)' (598).
Note. 598 recorded this taxon with '?'.
[As *Gloiophloea verae* C.I. Dickinson]
Ghana (154;338;434)

Scinaia spp.
Canaries (721).
Ghana (299;300;376;491).
Sénégal (59;182;399).

Sebdenia canariensis Soler-Onís, Haroun, Viera-Rodríguez & Prud'homme van Reine
See *Sebdenia macaronesica* Soler-Onís.

Sebdenia dichotoma (J. Agardh) Berthold
Canaries (105;598;714;748).
[As *Sebdenia feldmannii*]
Canaries (584).
Note. Boudouresque et al. (1984) list this taxon as *Sebdenia feldmannii* Codomier (=*Halymenia dichotoma* (J. Agardh) J. Agardh, = *Sebdenia dichotoma* Berthold). For an explanation of this, see Codomier (714). See *Halymenia* [*Chrysymenia*] *dichotoma*.

Sebdenia feldmannii Codomier
See *Sebdenia dichotoma* (J. Agardh) Berthold.

Sebdenia macaronesica Soler-Onís
Canaries (748).
Cape Verde Islands (748).
[As *Sebdenia canariensis* Soler-Onís]
Canaries (749).

Sebdenia rodrigueziana (J. Feldmann) Codomier
Canaries (748).
Cape Verde Islands (748).

Seirospora interupta (J.E. Smith) Schmitz
Canaries (699).

Solieria chordalis (C. Agardh) J. Agardh
See *Solieria filiformis* (Kützing) Gabrielson.

Solieria filiformis (Kützing) Gabrielson
Cape Verde Islands (713).
Gabon (586).
Ghana (586;654).
Sénégal (722).
'. . . in warm temperate and tropical parts of the Atlantic Ocean.' (586).
[As *Solieria chordalis* (C. Agardh) J. Agardh]
Mauritanie (349?;516?).
Sénégal (408).
'Subtropical Africa [Sénégal (N. of Gambia); Mauritania; former W. Sahara]' (598).
[As *Solieria chordalis* J. Agardh]
Sénégal (38).
[As *Solieria tenera* (J. Agardh) Wynne & W.R. Taylor]
Gabon (294;350).
Ghana (187;290;299;300;350;366;376;377;491;732).
Mauritanie (187;349;366;624;732).
Sénégal (187;366;732).
'. . . in warm temperate and tropical parts of the Atlantic Ocean' (350).
'North west Africa' (565A).
'Subtropical Africa [Sénégal (N. of Gambia); Mauritania; former W. Sahara]' (598).
'Tropical Africa (N. Gambia – Congo river)' (598).
'West Africa' (562).
'. . . tropical West Africa . . .' (712).
[As *Agardhiella tenera* (J. Agardh) Schmitz]
Cape Verde Islands (477).
Ghana (153).
Mauritanie (192;252).
Sénégal (49;59;182).
Note. All records of *Solieria chordalis* from tropical West Africa are considered doubtful. On the complexities of nomenclatural interpretation, see Silva et al. (746).

Spermothamnion capitatum (Schousboe) Bornet
See *Tiffaniella capitata* (Bornet) Doty & Meñez.

Spermothamnion flabellatum Bornet
Canaries (646).

Spermothamnion gorgoneum (Montagne) Bornet
See *Tiffaniella gorgonea* (Montagne) Doty & Meñez.

Spermothamnion investiens (P. & H. Crouan ex Schramm & Mazé) Vickers
Cameroun (350?;586?).
Gabon (294;350;586).
Ghana (350?;377;586?).
Mauritanie (624?).
Sénégal (55;59;722).
'Subtropical Africa [Sénégal (N. of Gambia); Mauritania; former W. Sahara]' (598).
'Tropical Africa (N.Gambia – Congo river)' (598).
[As *Spermothamnion* sp.]
Ghana (376).
Note. The plants from Cameroun and Ghana were sterile and determination is doubtful.

Spermothamnion macromeres Collins & Hervey
Mauritanie (624).

Spermothamnion repens (Dillwyn) Rosenvinge
Canaries (5;16;71;191;227;235;306B;490;598).
Mauritanie (624?).
'. . . Atlantique (de la Norvège aux Canaries . . .) . . .' (33).
'. . . Atlantique nord, de la Scandinavie aux Canaries . . .' (190).
'. . . coast of Europe southwards to the Canary Islands' (71).
'. . . N. Atlantic from Scandinavia to Canaries' (97).
'W. Norway to Canaries' (711).
[As *Spermothamnion repens* var. *flagelliferum* De Notaris]
'. . . Atlantique de la Scandinavie aux Canaries . . .' (189).
[As *Spermothamnion repens* (Dillwyn) Rosenvinge var. *turneri* (Mertens)]
Canaries (71).
[As *Spermothamnion repens* var. *turneri* (Mertens) Rosenvinge]
'. . . Atlantique de la Scandinavie aux Canaries . . .' (189).
[As *Spermothamnion repens* var. *variable*]
Canaries (584).
'. . . Atlantique de la Scandinavie aux Canaries . . .' (189).
[As *Spermothamnion repens* var. *variabile* (C. Agardh) J. Feldmann]
'. . . N. Atlantic from Scandinavia to Canaries . . .' (97).
[As *Callithamnion repens* (Dillwyn) Lyngbye]
Canaries (401).
[As *Spermothamnion turneri* Areschoug]
Canaries (71;547).
[As *Spermothamnion turneri* (Mertens) Areschoug]
Canaries (133;239;499).
'. . . in oceano Atlantico ab Helgolandia usque ad Gades Hispaniae et ad Canarias insulas . . .' (133).
'. . . nordlicher Atlantischer Ozean bis zu den Kanaren' (499).
'Nördwestafrika' (499).

Spermothamnion speluncarum (Collins & Hervey) M. Howe
Canaries (13;71;191;227;598).
Ghana (350;586).
'. . . élément Atlantique-tropical' (191).
'. . . in warm temperate and tropical parts of the Atlantic Ocean . . .' (350;586).
'Tropical Africa (N. Gambia – Congo river)' (598).

Spermothamnion turneri Areschoug
See *Spermothamnion repens* (Dillwyn) Rosenvinge.

Spermothamnion sp.
Angola (352).
Canaries (235;489).
Ghana (299;350;376;377;491;586).
Mauritanie (624).
St Helena (644).

Note. There may be other representatives of the genus in Sierra Leone (295;350;586) different from those reported by Lieberman et al. (376) from Ghana (cf. *Spermothamnion investiens*). All specimens found have been sterile so that positive identification, even to genus, has not been possible.

Sphaerococcus acicularis (Wulfen) C. Agardh
See *Gigartina acicularis* (Roth) J.V. Lamouroux.

Sphaerococcus cartilagineus (L.) C. Agardh
See *Gelidium cartilagineum* (L.) Gaillon.

Sphaerococcus confervoides (L.) C. Agardh
and var. ß **procerrimus** (Esper) Turner
See *Gracilaria verrucosa* (Hudson) Papenfuss (now *Gracilariopsis longissima* (Gmelin) Steentoft, L.M. Irvine & Farnham).

Sphaerococcus corneus (Hudson) C. Agardh
See *Gelidium corneum* sensu Børgesen.

Sphaerococcus coronopifolius (Goodenough & Woodward) C. Agardh
Canaries (70;71;140;184;191;207;439;499;517;584;598;635;663;698).
'. . . Atlantico (de Gran Bretaña a Canarias) . . .' (517).
'Du nord de la Grande-Bretagne aux Canaries . . .' (89).
'From Great Britain down to the Canary Islands . . .' (70).
[As *Sphaerococcus coronopifolius* Agardh]
Canaries (439).
[As *Sphaerococcus coronopifolius* C. Agardh f. *gracilior*]
Canaries (547).
[As *Sphaerococcus coronopifolius* (Goodenough & Woodward) Greville]
'. . . in den wärmeren Teilen des atlantischen Oceans . . .' (502).
[As *Sphaerococcus coronopifolium* (Goodenough & Woodward) Stackhouse]
Canaries (392;407).
[As *Gelidium coronopifolius* (Goodenough & Woodward) Lamouroux]
Canaries (44;71;401).
[As *Sphaerococcus coronopifolius* Stackhouse]
Canaries (227;375).
'. . . British Isles to the Canary Isles . . .' (172).

Note. The tetrasporophyte is *Haematocelis* [*Ethelia*] *fissurata* P. & H. Crouan (719).

Sphaerococcus intricatus C. Agardh
See the entries for *Gelidiopsis intricata* (C. Agardh) Vickers and *Gelidiopsis variabilis* (J. Agardh) Schmitz, especially the note to the latter (Price et al., 1988).

Sphaerococcus norvegicus (Gunnerus) C. Agardh
See *Gymnogongrus crenulatus* (Turner) J. Agardh.

Sphaerococcus oligacanthus Kützing
See *Gracilaria dentata* J. Agardh.

Sphaerococcus rangiferinus Kützing
See *Gracilaria dentata* J. Agardh.

Note. This name has been replaced by *Gracilaria rangifera* (Kützing) Piccone, according to Silva et al. (746).

Spondylothamnion multifidum (Hudson) Nägeli
Canaries (17;71;128A;133;191;227;232B;240;306B;390;584;598;635).
'. . . Atlantique (de l'Angleterre aux Canaries) . . .' (33).
'. . . Atlantique nord, de l'Ecosse aux Canaries . . .' (190;196).
'British Isles to Canaries.' (711).
'. . . nell'Atlantico si estende della Gran Bretagna al Marocco, toccando le Canarie . . .' (390).
'. . . English coast southwards to the Canary Islands . . .' (71).
'. . . NE. Atlantic . . . , including the Canaries . . .' (668).
[As *Sphondylothamnion multifidum* Nägeli]
Canaries (547).

Spongites

The concept of *Spongites* adopted in this paper is that of Penrose (1996*b*). Keys showing the relationships of *Spongites* to other genera of the subfamily Mastophoroideae (to which *Spongites* belongs) are provided by Penrose & Chamberlain (1993) and by Woelkerling (1996*b*), while Woelkerling (1985) gives an account of the original collections upon which Kützing (1841) based the genus and the six species he assigned to it. *Paragoniolithon* Adey et al. (1982: 12), based on *P. solubile* (Foslie & Howe) Adey, Townsend & Boykins (Basionym: *Goniolithon solubile* Foslie & Howe) is a heterotypic synonym of *Neogoniolithon* (see Woelkerling, 1988: 141).

Spongites absimile (Foslie & M. Howe) Afonso-Carrillo
Canaries (733).
[*Lithophyllum absimile* Foslie]
Cape Verde Islands (?365).
'Golfe de Guinée' (?366).

Note. Uncertainties surround the generic disposition of the type and of certain records of this taxon from tropical West Africa and adjacent islands.

The species was originally described as *Lithophyllum absimile* Foslie & M. Howe in Foslie (207: 7) based on material from Jamaica and was subsequently transferred to *Pseudolithophyllum* by Adey (1970: 12) and then to *Spongites* by Afonso-Carrillo (733: 98). As noted by Afonso-Carrillo (733: 97), the combination *Neogoniolithon absimile* (e.g., see Notoya, 1976*a*: 137, 1976*b*: 314; Cabioch, 1972: 272; Gil-Rodríguez & Afonso-Carrillo, 227: 36; South & Tittley, 1986: 44) has not been validated in accordance with ICBN Art. 33.2 (see Greuter, 1994); see under *Spongites wildpretii*. Afonso-Carrillo (733: 91-93, figs 1-6) provided an account of holotype material in TRH (see also Woelkerling, 678: 14), but noted (p. 97) that placement in *Spongites* was attended by some uncertainty since only senescent conceptacles were observed. Data on the vegetative thallus of the type provided by Afonso-Carrillo (733) suggest that the species most likely belongs to the Corallinaceae, subfamily Mastophoroideae (see Woelkerling, 1988: 115, 1996*b*: 237), but the absence of data on tetrasporangial conceptacle anatomy from the type precludes certain generic placement within the subfamily. Afonso-Carrillo (733) also concluded that Canary Island specimens referred to *absimile* by Lemoine (362) as well as plants deposited at TFC (Departamento de Botánica, Universidad de La Laguna, Canary Islands) [upon which some other records (Gil-Rodríguez & Afonso-Carrillo, 227: 36; Afonso-Carrillo, 576: 139; Afonso-Carrillo et al., 582: 30) presumably were based] did not belong to *Spongites absimile* but rather to *S. wildpretii* (see below).

Records of *Lithophyllum absimile* from the Cape Verde Islands (Lemoine, 365: 1071) and from the 'Golfe de Guinée' (Lemoine, 366) require verification from examination of relevant voucher material.

Spongites africanum (Foslie) Afonso-Carrillo, Chacana & Sansón
Cape Verde Islands (726).
Sénégal (726).
[As *Lithophyllum africanum* Foslie]
Annobon (Pagalú) (397;455;457;500;535).
Bioko (500).
Canaries (353;366;537).

Cape Verde Islands (6;100;353;365;366;455;535).
Mauritanie (359;366).
São Tomé (6;455;535).
Sénégal (198;212;535).
'. . . Golfe de Guineé . . .' (366).
[As *Lithophyllum africanum* Foslie f. *intermedia* Foslie]
Sénégal (199;211;212;678;730).

Note. Status and disposition uncertain; holotype from Cap Vert, Sénégal in TRH (Woelkerling, 730) and isotype material in PC (Woelkerling, 730) not studied in detail in a modern context; placement under *Spongites africanum* in this paper does not imply synonymy with the type of the species.

[As *Lithophyllum africanum* Foslie f. *truncata* Foslie]
São Tomé (211;212;535).
Sénégal (198;212).

Note. Status and disposition uncertain; holotype from Cap Vert, Sénégal in TRH (Woelkerling, 730) not studied in detail in a modern context; placement under *Spongites africanum* in this paper does not imply synonymy with the type of the species.

[As *Lithophyllum* (cf.) *africanum*]
Cape Verde Islands (598).
'Subtropical Africa [Sénégal (N. of Gambia); Mauritania; former W. Sahara]' (598).
[As *Lithothamnion ponderosum* Foslie]
São Tomé (134?;197;265).
[As *Lithothamnion proboscideum* Foslie]
São Tomé (197).
[As *Porolithon africanum* (Foslie) Foslie]
Annobon (Pagalú) (139).
Bioko (350;586).
Cameroun (350;586).
Cape Verde Islands (598).
Mauritanie (349).
São Tomé (211;350;586).
'. . . in warm temperate and tropical parts of the eastern Atlantic Ocean . . .' (350;586).
'Subtropical Africa [Sénégal (N. of Gambia); Mauritania; former W. Sahara]' (598).
'Tropical Africa (N. Gambia – Congo river)' (598).

Note. Based on examinations of the lectotype from Cap Vert, Sénégal (see Woelkerling, 678: 23-24) and specimens from the Cape Verde Islands, Afonso-Carrillo, Chacana & Sanson (726) transferred *Lithophyllum africanum* Foslie (199: 3) to *Spongites* as delimited by Penrose & Woelkerling (1988) and Woelkerling (1988). This concept of *Spongites* encompassed the genus *Hydrolithon* Foslie. Based on further studies, however, Penrose & Woelkerling (1992) concluded that *Spongites* and *Hydrolithon* should be treated as distinct genera based on differences in tetrasporangial conceptacle anatomy (see also Penrose & Chamberlain, 1993; Penrose, 1996*a*; Woelkerling, 1996*b*). Afonso-Carrillo (pers. comm.) suggested that the species probably belongs to *Hydrolithon* as delimited by Penrose, but formal transfer has not been effected. All specimens upon which published records of *Spongites africanum* and its homotypic synonyms from the West African region are based need to checked to determine their status and disposition. This also applies to the types and other records (listed above) of *Lithophyllum africanum* f. *intermedium* and *L. africanum* f. *truncatum*, established concurrently with *L. africanum* by Foslie (199: 3). The types of both *Lithophyllum africanum* f. *intermedium* (see Woelkerling, 678: 127; 730.) and *L. africanum* f. *truncatum* (see Woelkerling, 678: 226) also come from Cap Vert, Sénégal.

The record under the name *Lithothamnion proboscideum* from São Tomé (Foslie, 197: 14) pertains to material Foslie (199: 3) subsequently referred to *Spongites africanum* (as *Lithophyllum*). Information relating to material identified as *Lithothamnion ponderosum* Foslie has been presented previously (John et al., 1994: 68).

Spongites fruticulosus Kützing
[As *Lithothamnion fruticulosum* (Kützing) Foslie]
Canaries (6).
Cape Verde Islands (210;366;598).
Mauritanie (349;356;359;360;366).
Sénégal (6;366).
[As *Lithothamnion fruticulosum* (Kützing) Foslie f. *crassiuscula*]
Cape Verde Islands (210).

Note. Status and disposition uncertain; TRH neotype (Woelkerling, 678: 66) from Brionic Islands, Adriatic Sea not studied in detail in a modern context; placement under *Spongites fruticulosus* in this paper does not imply synonymy with the type of the species.

[As *Lithothamnion fruticulosum* (Kützing) Foslie f. *clavulata*]
Cape Verde Islands (210).

Note. Status and disposition uncertain; TRH neotype (Woelkerling, 678: 51) from the Adriatic Sea not studied in detail in a modern context; placement under *Spongites fruticulosus* in this paper does not imply synonymy with the type of the species.

[As *Lithothamnium fruticulosum* Foslie]
Mauritanie (354).
'Subtropical Africa [Sénégal (N. of Gambia); Mauritania; former W. Sahara]' (598).

Note. The type of *Spongites fruticulosus*, which is also the type of the genus *Spongites*, has been studied by Woelkerling (1985: 135-139, figs 23–32), who (Woelkerling, 1988) placed the genus in the subfamily Mastophoroideae. As noted by Woelkerling (1985: 139), Kützing's epithet *fruticulosum* has been widely misapplied to a species with multiporate tetrasporangial conceptacles belonging to the Corallinaceae, subfamily Melobesioideae and not to the subfamily Mastophoroideae. More recently, Woelkerling (729) concluded that at least some of the collections to which the epithet *fruticulosus* had been misapplied were conspecific with the type of *Lithothamnion fasciculatum* (Lamarck) Areschoug in J. Agardh. All specimens upon which published records of *Spongites fruticulosus* and its homotypic synonyms from the West African region are based now need to be checked to determine their status and disposition. Whether true *Spongites fruticulosus* occurs in the West African region is uncertain. Penrose (1991) provides an account of *S. fruticulosus* in southern Australia. Babbini & Bressan (753: 246) state 'non '*fruticulosa*' emendavit Penrose 1981; ICBN 1994, art. 62.4'. Specimens from the Cape Verde Islands identified (210: 214) as *Lithothamnion fruticulosum* f. *clavulata* and as *L. fruticulosum* f. *crassiuscula* also need to be checked to determine their status and disposition.

Spongites wildpretii Afonso-Carrillo
Canaries (633;634;657;687;733;747).
[As *Lithophyllum absimile* Foslie]
Canaries (362;363).
[As *Neogoniolithon absimile* (Foslie & Howe) Cabioch nom. invalid]
Canaries (226;227;576;582;733).

Note. Afonso-Carrillo (733) based *Spongites wildpretii* on a series of collections from the Canary Islands, including ones earlier referred to *Lithophyllum absimile* or the invalid name *Neogoniolithon absimile* (see note under *Spongites absimile*). Subsequently, however, Keats & Chamberlain (754: 15, 18) and Chamberlain (702: 126) concluded that *Spongites wildpretii* is a heterotypic synonym of *Hydrolithon samoense* (Foslie) Keats & Y.M. Chamberlain based on examination of European specimens identified by Afonso-Carrillo but not listed by Keats & Chamberlain (754).

Sporolithon

Sporolithon is now placed in a distinct family of Corallinales, the Sporolithaceae Verheij (1993). Comments on the incorrect use of the name *Archaeolithothamnium* for species referable to *Sporolithon* are provided by Papenfuss (1968: 83), Woelkerling (1988: 220) and Moussavian & Kuss (1990: 932-934).

Sporolithon africanum (Foslie) Afonso-Carrillo
Canaries (11;582;726).
[As *Archaeolithothamnion (-ium) africanum* Foslie]
Canaries (6;70;139;191;205;212;227;361;363;365;366;493).
Cape Verde Islands (366).

Note. The combination *Sporolithon africanum* was first validly published by Afonso-Carrillo (11: 142). Wynne (1986: 2258), apparently unaware of the Afonso-Carrillo paper, subsequently proposed the same combination, crediting Tomita, who had first used it in an unpublished thesis in 1976. The combination also appeared in an unpublished thesis of Oliveira in 1977.

The holotype of *Sporolithon africanum* (from the Canary Islands) is divided between PC (Woelkerling, 730) and TRH (Woelkerling, 678: 23). Afonso-Carrillo (11: 142) examined the type but provided no details, and Townsend (1995) included comments on type material in a PhD thesis, but a published account of type material in a modern context has yet to appear. Other published records of the species from the West African region also require verification through re-examination of relevant voucher specimens. As noted by Afonso-Carrillo et al. (726: 133), Lemoine (353: 146), treated *S. africanum* (as *Archaeolithothamnium*) as a heterotypic synonym of *Lithophyllum africanum* Foslie (199: 3) [see account above of *Spongites africanum* (Foslie) Afonso-Carrillo, Chacana & Sanson].

Spyridia aculeata (Schimper) Kützing
See *Spyridia hypnoides* (Bory) Papenfuss.

Spyridia armata Kützing
See *Spyridia hypnoides* (Bory) Papenfuss.

Spyridia clavata Kützing
Angola (41;42;292;535).
Congo (249;250;292).
Gabon (249;586).
Gambia (292;350;535;586).
Ghana (292;350;377;586).
Mauritanie (624).
São Tomé (251;265;292;316;318;323;350;535;586).
Sénégal (50;55;59;99;249;292;350;722).
Senegambia (27;61;133;296;410;535).
'Subtropical Africa [Sénégal (N. of Gambia); Mauritania; former W. Sahara]' (598).
'Tropical Africa (N. Gambia – Congo river)' (598).
[As *Spyridia clavulata* Kützing]
Angola (352).
[As *Spyridia clavifera* J. Agardh]
'. . . ad oras Senegambiae . . .' (25).

Spyridia clavifera J. Agardh
See *Spyridia clavata* Kützing.

Spyridia clavulata auct.
See *Centroceras clavulatum* (C. Agardh) Montagne and *Spyridia clavata* Kützing.

Spyridia filamentosa (Wulfen) Harvey
Note on authorities. De Toni (133: 1427-1429) placed *Conferva pallescens* Bory (90: 306, pl.V, figs 2A,B,C) in synonymy with *Spyridia filamentosa*. From the figures provided, there seems little reason to challenge this. The problem then arising is that of the earliest specific epithet for the taxon. Wulfen's *Cryptogamia Aquatica*, with the recognition of *Fucus filamentosus*, was dated 1803. Bory's work, dated the same year, states on the title page 'Germinal, An XI'. It will be necessary to establish the priority of these two works to assess correct nomenclature.
Annobon (Pagalú) (456;457).
Ascension Island (37).
Canaries (8;13;16;38B;38C;38D;70;71;108;128A;133;177;19:226;227;229;230;235;236;237;295;304;306B;379;390;392;489;490;493;546;547;555;556;584;598;633;634;635;662;663;684;745;747;751;752).
Cape Verde Islands (598;639).
Ghana (290).
Mauritanie (349;516;555;556;624).
St Helena (644).
Salvage Islands (38B;38C;38D;231;375;555;556;598).
São Tomé (251;265).
Sénégal (38B;38C;38D;55;59;555;556;722).
Sierra Leone (30;350;586).
Western Sahara (38B;38D).
'Atlantic Ocean (. . . African and American coasts, Canary Islands . . .)' (177).
'Atlantique tempéré et tropical (côtes d'Europe, d'Afrique . . .)' (190).
'. . . Atlantique, . . . tropical (côtes . . . d'Afrique . . .). . . .' (196).
'. . . in warm temperate and tropical parts of the Atlantic ocean . . .' (350;586).
'Subtropical Africa [Sénégal (N. of Gambia); Mauritania; former W. Sahara]' (598).
'Widely distributed in tropical to temperate regions' (707).
'Océano Atlántico (desde Gran Bretaña hasta Sudáfrica . . .)' (751).
[As *Spyridia filamentosa* Harvey]
Canaries (44;254;306;401;439;547).
São Tomé (261;263;265;269).
'Du sud de la Grande-Bretagne aux Canaries . . .' (89).
[As *Spyridia filamentosa* f. ß *friabilis* (Clemente) J. Agardh]
Canaries (25).
[As *Conferva pallescens* Bory]
Canaries (90).
[As *Hutchinsia filamentosa* (Wulfen) C. Agardh]
'. . . Atlantico ab Anglia ad Teneriffam . . .' (20).

Note. Lawson & John (350;586) remarked that many of the early reports of this species from offshore islands in the Gulf of Guinea have been discounted by Steentoft (535) who believed them misidentifications of *Spyridia hypnoides* (q.v.) They therefore placed all reports of *S. filamentosa* from São Tomé under *S. hypnoides* until re-examination and (if needed) reaffirmation of the original determination is possible.

Spyridia hypnoides (Bory) Papenfuss
Canaries (13;38B;38D;128A;226;227;306B;633;634;635;662;663;751).
Cape Verde Islands (38B;38D;598;652;683;713).
Gabon (586).
Ghana (299;300;346;491;586).
Mauritanie (38B;38D).
Príncipe (586).
Salvage Islands (38B;38D;598).
São Tomé (586).
Sénégal (38B;38D;722).
'Subtropical Africa [Sénégal (N. of Gambia); Mauritania; former W. Sahara]' (598).
'Tropical Africa (N. Gambia – Congo river)' (598).
'Océano Atlántico (desde las costas francesas hasta Senegal . . .' (751).
[As *Spyridia hypnoides* (Bory ex Belanger) Papenfuss]
Ghana (292;377).
Gambia (296).
Mauritanie (349).
Senegambia (296).
Western Sahara (349).
[As *Spyridia hypnoides* var. *typica* (Bory ex Belanger) Papenfuss]
Mauritanie (624).
[As *Spyridia hypnoides* (Bory in Belanger) Papenfuss]
Canaries (745).
[As *Spyridia aculeata* (Schimper) Kützing]
Canaries (72;108;191;235;304;351;535;556).
Cape Verde Islands (37;41;100;183;191;259;535;556;639).
Guinea-Bissau (529).
Príncipe (535).
Salvage Islands (556).
São Tomé (93;535).

Sénégal (59;122;196;529;556).
'. . . Atlantique du Maroc au Sénégal . . .' (196).
[As *Spyridia aculeata* (Schimper) Kützing f. *inermis*]
Príncipe (93;535).
[As *Spyridia aculeata* (Schimper) Kützing f. *typica*, f. *aculeata*]
São Tomé (93;535).
[As *Spyridia hypnoides* (Bory) Papenfuss var. *disticha* (Børgesen) G.W. Lawson & D.M. John f. *inermis* G.W. Lawson & D.M. John]
Canaries (292).
Gabon (294;350).
Ghana (292;350;586).
Sénégal (292).
[As *Spyridia aculeata* Kützing]
Angola (42).
Cape Verde Islands (38;42;49;145;259).
Sénégal (42).
'De Cadiz au Sénégal . . .' (38;89).
'In oceano atlantico tropico.' (320).
'. . . et atlantico tropico' (318).
'Morocco to Sénégal' (97).
[As *Spyridia aculeata* (Schimper) J. Agardh [or Kützing] var. *disticha* Børgesen]
Canaries (71;295).
Sénégal (59;295;529).
[As *Spyridia aculeata* (Schimper) Kützing var. *hypnoides* J. Agardh]
Sénégal (55).
[As *Spyridia aculeata* (Schimper) Kützing var. *hypneoides* Kützing]
Mauritanie (186;535;542).
Sénégal (55;122;186;535).
'S. Atlantic shores of Europe, Morocco to Sénégal . . .' (97).
'Morocco to Sénégal' (97)
[As *Spyridia aculeata* (Schimper) J. Agardh var. *hypnoides* J. Agardh]
Sénégal (59).
[As *Spyridia aculeata* (Un. itin.) Zanardini]
Cape Verde Islands (141A).
[As *Spyridia armata* Kützing]
Canaries (439).
Senegambia (318;320).
[As *Spyridia aculeata* var. *typica* Børgesen]
Canaries (71).
[As *Spyridia filamentosa*]
São Tomé (261;263;264;265).
[As *Spyridia insignis* (J. Agardh) J. Agardh]
Cape Verde Islands (37;138;191;598;625).
Sénégal (408).
'pantropical' (625).
'. . . Afrique méridionale . . .' (38).
'Tropical Africa (N. Gambia – Congo river)' (598;625).
[As *Bindera insignis* J. Agardh]
Cape Verde Islands (528).

Spyridia insignis (J. Agardh) J. Agardh
See *Spyridia hypnoides* (Bory) Papenfuss.

Spyridia sp.
Angola (500).
Canaries (66;214).
Mauritanie (349).
Sénégal (399).
'. . . open shores in West Africa . . .' (347A).

Stenogramme interrupta (C. Agardh) Montagne ex Harvey
Canaries (598;635).
Cape Verde Islands (37;115;172;598).
[As *Stenogramme interrupta* Montagne]
Cape Verde Islands (38;191).

Stichothamnion cymatophyllum Børgesen
Canaries (16;71;128A;191;225;227;253;281;306B;583;598;633;634).
[As *Stichotamnion cymatrophilum* Børgesen]
Canaries (235).
[As *Stichothamnium cymatophyllum* Børgesen]
Canaries (229).
Note. Feldmann (191) considered this alga to constitute a remarkable palaeoendemic in the Canaries flora '. . . C'est, en effet, le seul genre endémique parmi les algues des Canaries. Ses affinités possibles avec d'autres genres de Rhodomélacées sont assez obscures et ne permettent pas de déceler son origine'.

Streblocladia camptocladia (Montagne) Falkenberg
Namibia (36B;348;707).
[As *Orcasia pulla* Simons]
Angola (312A).
Namibia (312A;512).

Streblocladia collabens Falkenberg
Cape Verde Islands (598).
'Subtropical Africa [Sénégal (N. of Gambia); Mauritanie; former W. Sahara]' (598).
[As '*Streblocladia*']
Sénégal (529).

Streblocladia corymbifera (C. Agardh) Kylin
Namibia (36B;707).
[As *Polysiphonia corymbifera* (J. Agardh) Harvey]
Namibia (167;348;523).

Streblocladia fasciculifera (Kützing) Falkenberg
Namibia (348).

Streblocladia glomerulata (Montagne) Papenfuss
[As *Streblocladia neglecta* Schmitz]
Sénégal (122).
'Subtropical Africa [Sénégal (N. of Gambia); Mauritania; former W. Sahara]' (598).

Streblocladia neglecta F. Schmitz
See *Streblocladia glomerulata* (Montagne) Papenfuss.

Suhria vittata (L.) J. Agardh
Namibia (36B;169;348;453;500;569;707;716).
'. . . im südlichen Teile des atlantischen Oceans . . .' (502).
'. . . praesertim ad litora Africae meridionalis vulgatissima . . .' (139).
[As *Fucus vittatus* L.]
Ghana (271).
Note. The record for Ghana (as Danish Guinea) is probably a misdetermination, since, rather surprisingly, no material having been traced, the attribution is by nomenclatural equivalence alone. Original P.E. Isert material from Ghana, perhaps destroyed in a fire in 1807, requires re-examination for certainty, although it is difficult to see how *Suhria*, if present, could have been confused easily with other taxa.

Taenioma macrourum Thuret
See *Taenioma nanum* (Kützing) Papenfuss.

Taenioma nanum (Kützing) Papenfuss
Bioko (346;350;586).
Canaries (17;341).
Cape Verde Islands (639).
Sierra Leone (295;350;432;586;598).
'Tropical Africa (N. Gambia – Congo river).' (598).
'. . . probably widespread in warm temperate and tropical seas.' (350;586).

[As *Taenioma macruorum* Thuret]
Canaries (11;227;489;584).
[As *Taenioma macrourum* Thuret]
Canaries (375;430;543).
[As *Taenioma perpusillum* C. Agardh]
Canaries (71).
[As *Taenioma perpusillum* J. Agardh]
Sierra Leone (336;339).

Taenioma perpusillum (J. Agardh) J. Agardh
Canaries (13;38B;38D;71;108;226;227;304;589;634;635;684;747).
Cape Verde Islands (598).
Côte d'Ivoire (287;288;295;296;350;586).
Ghana (153;288;295;338;344;350;432;487;491;537;586).
Liberia (129;287;288;350;586).
Salvage Islands (38B;38D;598).
'. . . Atlantique tropical et subtropical . . .' (184).
'. . . probably widespread in warm temperate and tropical seas . . .' (350;586).
'Tropical Africa (N. Gambia – Congo river)' (598).
'Virtually worldwide in tropical and subtropical seas . . .' (707).
[As *Taenioma perpusillum* J. Agardh]
Canaries (191;556).
Ghana (336).
Salvage Islands (556).
'. . . widespread in warmer seas.' (336).
'. . . seems to be widely spread in warmer seas.' (63).
[As *Taenioma perpusilla* (J. Agardh) J. Agardh]
Canaries (684).
[As *Taenioma perpusilla*]
Canaries (214).

Note. Cribb (113) commented '. . . *T. nanum* has been distinguished from *T. perpusillum* (J. Agardh) J. Agardh mainly on the basis of its possession of two terminal hairs, *T. perpusillum* having three. However, the number of hairs is variable in some reported populations of the two species, and Hollenberg (1967) has questioned the justification of recognizing *T. nanum* as distinct from *T. perpusillum*.'

Taenioma spp.
Mauritanie (624).

Tayloriella tenebrosa (Harvey) Kylin
Namibia (348;707).

Tayloriella virgata (C. Agardh) Papenfuss
Angola (352).
Namibia (352;487).
[As *Polysiphonia virgata* (C. Agardh) Sprengel]
Namibia (167;348).

Note. Wynne (36B) has argued for the retention of *Tayloriella virgata* under *Polysiphonia virgata* (C. Agardh) Sprengel but as the above records were omitted from our earlier publication (Lawson et al., 1995) they are included here for completeness.

Tenarea Bory
Woelkerling et al. (1985) concluded that *Tenarea* included only one known species (*T. tortuosa* Bory) and that most other species referred to the genus belonged to *Lithophyllum* or *Titanoderma* (see entry for *Titanoderma* below). Further comments on *Tenarea* are provided by Woelkerling (1988: 106-109) and Athanasiadis (1995).

Tenarea adhaerens Me. Lemoine
See *Neogoniolithon hirtum* (Me. Lemoine) Afonso-Carrillo.

Tenarea confinis (P. & H. Crouan) W.H. Adey & P. Adey
See *Titanoderma confinis* (P. & H. Crouan) J.H. Price, D.M. John & G.W. Lawson.

Tenarea corallinae P. & H. Crouan
See *Lithophyllum corallinae* (P. & H. Crouan) Heydrich.

Tenarea hapalidioides (P. & H. Crouan) W.H. Adey & P. Adey
See *Titanoderma hapalidioides* (P. & H. Crouan) J.H. Price, D.M. John & G.W. Lawson.

Tenarea irregularis (Foslie) Me. Lemoine
See *Lithophyllum irregulare* (Foslie) P. Huvé ex Steentoft.
The following are additional references:
[As *Tenarea irregularis* (Foslie) Me. Lemoine]
Canaries (191;362;363).
São Tomé (362;363).
[As *Lithophyllum irregularis* Foslie]
São Tomé (206;212).

Tenarea polycephalum (Foslie) W.H. Adey
See *Titanoderma polycephalum* (Foslie) Woelkerling, Y.M. Chamberlain & P.C. Silva.

Tenarea tortuosa (Esper) Me. Lemoine
Mauritanie (529).
[As Lithophyllum tortuosum (Esper) H. Huvé]
Canaries (107).
Mauritanie (349).

Note. According to Babbini & Bressan (753: 192), this species is an 'espèce méditerranéene' (thus a mediterranean endemic species). Therefore, as also noted by Lawson & John (586: 210), these records appear doubtful but need to be checked against the relevant specimens. Esper's epithet *tortuosum* has been misapplied to a different species (see Huvé, 272; Woelkerling et al., 1985; Woelkerling, 730) commonly referred to *Lithophyllum. Tenarea tortuosa*, the type and only known true species of *Tenarea*, is known with certainty only from the eastern Mediterranean (Woelkerling, 1988: 109; Athanasiadis, 1995: 656). The earlier cross reference to *Lithophyllum cristatum* Meneghini f. *crassa* (Lloyd) Hauck (John et al., 1994: 61) does not involve any published records from the West African region but rather the opinion of Foslie (1898: 15) that f. *crassa*, based on *Melobesia crassa* Lloyd (see Woelkerling, 730), might be a heterotypic synonym of *Tenarea tortuosa*.

Thamnoclonium claviferum J. Agardh
Ghana (290;299;300;350;586;590).
'. . . in warm temperate and tropical seas' (350;586).
'Tropical Africa (N. Gambia – Congo river)' (598).
[As *Thamnoclonium* sp.]
Ghana (292).

Note: May be conspecific with *Thamnoclonium dichotomum* (J. Agardh) J. Agardh. See Scott et al. (1984) and Womersley (712).

Thuretella schousboei (Thuret) F. Schmitz
Canaries (8;38B;38D;227;598;745).
Salvage Islands (38B;38D;598).

Tiffaniella capitata (Bornet) Doty & Meñez
Canaries (240;598;635;747;756).
Mauritanie (624?).
'. . . O. Atlántico (desde del N. Europa hasta Canarias)' (747).
[As *Tiffaniella capitatum* (Bornet) Doty & Meñez]
Canaries (663).
[As *Spermothamnion capitatum* (Schousboe) Bornet]
Canaries (71;189;191;227).
'. . . Tingin Africae borealis . . .' (133).

Note. For data on the genus and species of *Tiffaniella*, see Gordon (240).

Tiffaniella gorgonea (Montagne) Doty & Meñez
Canaries (597;747).
'. . . O. Atlántico Oriental y Occidental' (747).
[As *Tiffaniella gorgoneum* (Montagne) Doty & Meñez]
Canaries (240;598).

Cape Verde Islands (240;597;598;652).
Salvage Islands (598).
[As *Callithamnion gorgonium* Kützing]
'. . . in atlantico ad Africanum . . .' (27).
[As *Callithamnion gorgoneum* Montagne]
Canaries (500).
'In oceano atlantico ad oras Africae. Specimen dedit amic. Montagne.' (320).
Cape Verde Islands (37;408;410;500?;597).
[As *Spermothamnion gorgoneum* (Montagne) Bornet]
Canaries (38B;71;97;133;191;226;227;493).
Cape Verde Islands (713).
[As *Spermothamnion gorgonium* Bornet]
'Plante des Antilles et du Cap Vert, nouvelle pour les Canaries' (547).

Titanoderma Nägeli

Titanoderma is considered here to be a heterotypic synonym of *Lithophyllum*; further comments appear under *Lithophyllum* (John et al., 1994: 59); see also Braga & Aguirre (1995: 270), Verheij (1994: 98) and Basso et al. (1996: 276). By contrast, Chamberlain (737: 204) has continued (see also Chamberlain, 1991 and Chamberlain & Irvine, 736) to maintain *Titanoderma* 'pending more conclusive, probably genetic, data to determine their relationship . . .'. Babbini & Bressan (753: 150) follow Chamberlain & Irvine (736). Chamberlain (737: 204), however, has noted the difficulties in assigning species such as *Lithophyllum johansenii* Woelkerling & Campbell to *Lithophyllum* or *Titanoderma* as delimited in her studies; other examples are given by Campbell & Woelkerling (1990) and Woelkerling & Campbell (1992).

As stated by Chamberlain (737: 204; see also Braga & Aguirre, 1995: 271), two distinct lines of development can be identified in the '*Lithophyllum-Titanoderma* complex': one in which the thallus includes a layer of palisade cells and one in which no such layer is present. In most attached species with a palisade layer, the thallus margin commonly does not immediately thicken while in species lacking a palisade layer, immediate thickening commonly does occur. While such trends may be interpreted in evolutionary terms, investing these with formal taxonomic status at genus level results in a situation where some species cannot be placed with certainty in either one genus or the other. For some attached species, including *Lithophyllum johansenii* and species mentioned by Campbell & Woelkerling (1990) and Woelkerling & Campbell (1992), known infraspecific variation precludes generic placement with certainty. For other species, known only from unattached specimens, information on the characters used by Chamberlain (737) for generic delimitation is lacking altogether, thus making generic placement purely conjectural. Of the eight British species placed by Chamberlain & Irvine (736) in *Lithophyllum* sensu Chamberlain, for example, the diagnostic characters of the genus as delimited by these authors (immediate thickening behind a bistratose margin and a basal layer of non-palisade cells – also see key on p. 30 of Chamberlain & Irvine, 736) are unknown for four (*L. dentatum, L. duckeri, L. fasciculatum, L. hibernicum*).

Investing apparent evolutionary trends in formal taxonomic terms at generic level in cases where it is presently impossible to draw firm boundaries or in cases where data on species are missing or are not apparent in any known specimens serves no useful purpose in either taxonomic or evolutionary terms, and it needlessly complicates the more practical matters of species placement and specimen identification. As noted by Braga & Aguirre (1995: 271), it is possible to recognize that two evolutionary lines are present within a single genus. If one wishes to emphasize in taxonomic terms that two evolutionary lines are present within *Lithophyllum* sensu lato (i.e. sensu Woelkerling & Campbell, 1992 and Woelkerling, 1996*a*) without complicating the matters of species placement and naming as well as specimen identification, it is possible to recognize two subgenera, as has been done by some authors (e.g. Rosenvinge, 1917; Lemoine, 363; Newton, 1931).

Titanoderma byssoides (Lamarck) Y.M. Chamberlain & Woelkerling
See *Lithophyllum byssoides* (Lamarck) Foslie
The following are additional records:
[As *Lithophyllum byssoides* (Lamouroux) Heydrich]
Cape Verde Islands (38B;71;133).
Mauritanie (6).
Salvage Islands (38B).
Sénégal (547).
'Plante des Antilles et du Cap Vert, nouvelle pour les Canaries' (547).

Note. The neotype mentioned under *Lithophyllum byssoides* (John et al., 1994: 60) has been superseded with the discovery of original Lamarck material, an account of which is provided by Woelkerling (729).

Titanoderma confine (P. & H. Crouan) J.H. Price, D.M. John & G.W. Lawson (as *confinis*)

Note. In an earlier paper in this series, John et al. (1994: 64) treated this taxon as a heterotypic synonym of *Lithophyllum pustulatum*, noting that Chamberlain (1991, as *Titanoderma*) recognized it as a distinct variety of that species, and noting that all published records from the West African region required confirmation. The additional record of Chamberlain & Irvine (736: 105, as *Titanoderma pustulatum* var. *confine*) from the Canary Islands also requires confirmation. Earlier West African records are given by John et al. (1994: 64). Woelkerling (1996*a*: 229) reaffirmed the earlier conclusion of Woelkerling & Campbell (1992) that, in contrast to British populations (Chamberlain, 1991), southern Australian populations were highly and continuously variable, making it impossible to recognize distinct varieties in that region.

Titanoderma corallinae (P. & H. Crouan) Woelkerling, Y.M. Chamberlain & P.C. Silva
See *Lithophyllum corallinae* (P. & H. Crouan) Heydrich.
The following are additional records:
[As *Titanoderma corallinae* (P. & H. Crouan) Woelkerling, Y.M. Chamberlain & P.C. Silva]
Canaries (633;736).
'British Isles to Canary Isles . . .' (649).

Titanoderma cystoseirae (Hauck) Woelkerling, Y.M. Chamberlain & P.C. Silva
See *Lithophyllum cystoseirae* (Hauck) Heydrich
The following are additional records:
[As *Dermatolithon cystoseirae* (Hauck) H. Huvé]
Canaries (584).
Mauritanie (367)
'. . . au golfe de Guinée' (367).
[As *Lithophyllum cystoseirae* (Hauck) Heydrich]
Annobon (Pagalú) (455).
[As *Titanoderma papillosum* var. *cystoseirae* (Hauck) Me. Lemoine ex G.W. Lawson & D.M. John]
Annobon (Pagalú) (586).

Note. Woelkerling & Verheij (1995: 45) provide information on the lectotype.

Titanoderma geometricum (Me. Lemoine) J.H. Price, D.M. John & G.W. Lawson
See *Lithophyllum geometricum* Me. Lemoine.
The following are additional records:
Cape Verde Islands (370).

Titanoderma hapalidioides (P. & H. Crouan) J.H. Price, D.M. John G.W. Lawson
See *Lithophyllum pustulatum* (J.V. Lamouroux) Foslie

Note. In an earlier paper in this series, John et al. (1994: 64) treated this taxon as a heterotypic synonym of *Lithophyllum pustulatum*, noting that all published records from the West African region required confirmation. Earlier West African records are given by John et al. (1994: 64).

Chamberlain (1991, as *Titanoderma*) and Chamberlain & Irvine (736, as *Titanoderma*) recognized four distinct varieties of *pustulatum*, listing *T. hapalidioides* as a heterotypic synonym of *T. pustulatum* var. *macrocarpum*. In southern Australia, by contrast, Woelkerling & Campbell (1992, as *Lithophyllum*) and Woelkerling (1996*a*, as *Lithophyllum*) found that populations were highly and continuously variable, making it impossible to recognize distinct varieties for that region, and they listed *hapalidioides* as a heterotypic synonym of *Lithophyllum pustulatum*.

Titanoderma papillosum (Zanardini) J.H. Price, D.M. John & G.W. Lawson
See *Lithophyllum papillosum* (Zanardini ex Hauck) Foslie
The following are additional records:
[As *Lithophyllum papillosum* (Zanardini) Foslie]
Canaries (387).
[As *Lithophyllum (Dermatolithon) papillosum* (Zanardini) Foslie]
Canaries (70).

Note. Afonso-Carrillo et al. (582) considered this taxon (as *Goniolithon papillosum*) to be doubtfully present in the Canaries; records therefore necessitate confirmation, despite references given elsewhere.

Titanoderma polycephalum (Foslie) Woelkerling, Y.M. Chamberlain & P.C. Silva
See *Lithophyllum polycephalum* Foslie
The following are additional records:
[As *Goniolithon polycephalum* (Foslie) Afonso-Carillo]
Cape Verde Islands (11;597).
[As *Lithophyllum* (*Dermatolithon*) *polycephalum* Foslie]
Canaries (70).
Cape Verde Islands (362).
[As *Tenarea polycephalum* (Foslie) Adey]
Canaries (11).
[As *Titanoderma polycephalum* (Foslie) Woelkerling, Y.M. Chamberlain & P.C. Silva]
Canaries (633;737).
Cape Verde Islands (737).

Note. Chamberlain (737, as *Titanoderma*) has provided an account of holotype material in TRH.

Titanoderma polyclonum (Foslie) Woelkerling, Y.M. Chamberlain & P.C. Silva
See *Lithophyllum polyclonum* Foslie

Titanoderma pustulatum (J.V. Lamouroux) Nägeli
See *Lithophyllum pustulatum* (J.V. Lamouroux) Foslie
The following are additional records:
[As *Dermatolithon pustulatum* (J.V. Lamouroux) Foslie]
Canaries (18).
[*Titanoderma hapalidioides* (P. & H. Crouan) J.H. Price, D.M. John & G.W. Lawson]
Canaries (227;362;375;582).
Salvage Islands (35B; 373).
[As *Titanoderma pustulatum* (J.V. Lamouroux) Nägeli]
Canaries (633;634;663;747).
'. . . Canary Islands, Senegal . . .' (649).
[As *Titanoderma pustulatum* (J.V. Lamouroux) Nägeli var. *pustulatum*]
Canaries (736).
Sénégal (736).
[As *Titanoderma pustulatum* (J.V. Lamouroux) Nägeli var. *confine*]
Canaries (736).

Titanoderma sp.
See *Lithophyllum* spp.
The following is an additional record:
[As *Dermatolithon*]]
Canaries (18).

Trailliella intricata Batters
See *Bonnemaisonia hamifera* Hariot.
The following is an additional record:
Canaries (598).

Trematocarpus affinis (J. Agardh) De Toni
See *Trematocarpus flabellatus* (J. Agardh) De Toni

Note. *Trematocarpus affinis* (J. Agardh) De Toni and *T. flabellatus* (J. Agardh) De Toni are considered by Simons (1983: 808) to belong to different species. He is followed in this by Womersley (712).

Trematocarpus flabellatus (J. Agardh) De Toni
Namibia (348;707).

Trichogloeopsis pedicellata (M. Howe) I.A. Abbott & Doty
Canaries (38C;232B;598;635;745).

Tricleocarpa cylindrica (Ellis & Solander) Huisman & Borowitzka
Canaries (663;734).

Note. See under *Galaxaura cylindrica* (Ellis & Solander) Lamouroux and *G. oblongata* (Ellis & Solander) Lamouroux. For further information, see Huisman & Borowitzka (1990) and Huisman & Townsend (1993).

Tricleocarpa fragilis (L.) Huisman & Townsend
[As *Tricleocarpa* (*Galaxaura*) *oblongata* (Ellis & Solander) Huisman & Borowitzka]
Cape Verde Islands (713).

Note. See also under *Galaxaura cylindrica* (Ellis & Solander) Lamouroux and *G. oblongata* (Ellis & Solander) Lamouroux. In Otero-Schmitt (713) the authors are mistakenly given as '(Ellis et Solander) Huisman et Bornet'. Pérez & Afonso-Carrillo (734) state that the occurrence of *Tricleocarpa fragilis* (as *Tricleocarpa oblongata* (Ellis & Solander) Huisman & Borowitzka) has to be confirmed. They did not discover this species in many samples from the Canary Islands. However, they consider *Galaxaura fragilis* (Lamark) Lamouroux ex Decaisne to be synonymous with *Tricleocarpa cylindrica* while Huisman & Townsend (1993) consider *Tricleocarpa fragilis* to be synonymous with, and having priority over, the combination *Tricleocarpa oblongata* (Ellis & Solander) Huisman & Borowitzska.

Vickersia baccata (J. Agardh) Karsakoff
Canaries (240;306B;489;499;598;635;684).
Cape Verde Islands (652;713).
Sénégal (529;598).
'. . . Atlantique (. . . Canaries . . .) . . . (33).
'Lusit.-Africain- Médit.' (529).
[As *Vickersia baccata* (J. Agardh) Karsakoff emend. Børgesen]
Canaries (13;38B;71;189;191;226;227;490;634;745;747).
Salvage Islands (38B;231).
'. . . O. Atlántico (desde Portugal hasta Cabo Verde) . . .' (747).
[As *Vickersia baccata* J. Agardh]
Canaries (5).
[As *Vickersia canariensis* Karsakoff]
Canaries (133;139;311;493;499;538;547).

Vickersia canariensis Karsakoff
See *Vickersia baccata* (J. Agardh) Karsakoff.

Vickersia sp.
Cape Verde Islands (639).
Ghana (377).

Vidalia volubilis (L.) J. Agardh
Canaries(66;71;89;133;179;191;226;227;390;392;439;448;517;584;598;663).
Senegambia (133;179;296).
'. . . an den atlantischen Küsten von Spanien bis zum Senegal . . .' (281;501).
'. . . Atlantique subtropicale (de Cadiz au Sénégal)' (190).
'De Cadiz aux Canaries et au Sénégal (Leprieur)' (89).
'From Cadiz southwards to Senegal' (71).
'Subtropical Africa [Sénégal (N. of Gambia); Mauritania; former W. Sahara]' (598).
'Tropical Africa (N. Gambia – Congo river)' (598).
Note. According to Norris (1991) the correct name is *Osmundaria volubilis* (L.) R.E. Norris. See note under that name.

Waldoia antillana W.R. Taylor
Ghana (286;290;292;299;350;377;586).
'. . . in tropical parts of the Atlantic Ocean . . .' (350;586).
'Tropical Africa (N. Gambia – Congo river)' (598).

Wrangelia argus (Montagne) Montagne
Ascension Island (475).
Cameroun (288;350;586).
Canaries (38B;38C;38D;68;83;89;97;124;191;240;351;407;417A;547;553;559;572?;598;633;634;635;662;663).
Cape Verde Islands (37;38B;38C;38D;598;639;652;713).
Gambia (350;586).
Ghana (154;240;288;338;340;344;350;537;586;590).
Liberia (129;288;350;586).
St Helena (644).
Salvage Islands (38B;38D;598).
Togo (288;293;350;586).
'Tropical Africa (N. Gambia – Congo river)' (598).
[As *Wrangelia argus* Montagne]
Ascension Island (474;475).
Canaries (60;68;83;97;139;227;375;457;547;745).
Cape Verde Islands (191).
Ghana (297;491).
[As *Wrangelia argus* J. Agardh]
Canaries (439).
[As *Wrangelia plebeja* J. Agardh]
Cape Verde Islands (38;150).
[As *Griffithsia argus* Montagne]
Canaries (25;26;44;266;318;320;401).
'. . . tropical and subtropical regions of the world.' (417A).
'. . . widespread on tropical and subtropical coasts . . .' (559).
'. . . widespread in warm temperate and tropical seas . . .' (350;586).

Wrangelia penicillata (C. Agardh) C. Agardh
Canaries (18;38B;38D;68;70;584;598;634;635;662;684;747;752).
Cape Verde Islands (598;639).
Ghana (292;299;350;376;377;586).
Salvage Islands (598).
'Mediterranean and warmer areas of the Atlantic Ocean' (269).
'. . . widespread in warm temperate and tropical seas' (350;586).
[As *Wrangelia penicillata* C. Agardh]
Canaries (13;68;177;191;226;227;375;392;556).
St Helena (644).
Salvage Islands (38B;38D;556).
'. . . Atlantic tropical et subtropical.' (190;196).
'. . . Atlantic Ocean (. . . African and American coasts, Canary Islands . . .)' (177).
'. . . in dem wärmeren Teilen der nordlichen Hälfte des atlantischen oceans . . .' (502).

Wrangelia plebeja J. Agardh
See *Wrangelia argus* (Montagne) Montagne.

Wurdemannia miniata (Sprengel) J. Feldmann & Hamel
[As *Wurdemannia miniata* (Duby) J. Feldmann & Hamel]
Cameroun (350;586).
Canaries (584;598;635;720;747).
Cape Verde Islands (598;713;720).
Salvage Islands (598).
São Tomé (350;535;586).
'Tropical Africa (N. Gambia – Congo river)' (598).
[As *Wurdemannia miniata* (Draparnaud) J. Feldmann & Hamel]
Canaries (38B;177;188;191;194;227;489;535;745).
Cape Verde Islands (38;38B;100;183;191).
São Tomé (535).
'. . . côtes africaines de l'Atlantique tropical et subtropical . . .' (194).
'. . . côtes occidentales d'Afrique et aux Canaries . . .' (184).
[As *Wurdemannia miniata* (Draparnauld ex A.P. DeCandolle) Feldman & Hamel]
Canaries (633;634).
[As *Wurdemannia setacea* Harvey]
Canaries (38C;70;71;375;555;556).
Cape Verde Islands (38;38C;145;555;556).
Salvage Islands (38C;555;556).
[As *Caulacanthus ustulatus* (Martens) Kützing]
São Tomé (251;263;264;265).
Note. Correct citation is *Wurdemannia miniata* (Sprengel) J. Feldmann & Hamel, see Silva et al. (1987) and Silva et al. (746).

Wurdemannia setacea Harvey
See *Wurdemannia miniata* (Sprengel) J. Feldmann & Hamel.

Wurdemannia sp.
Cape Verde Islands (639)

Zanardinia marginata J. Agardh
See *Galaxaura marginata* (Ellis & Solander) Lamouroux.

AN UPDATE OF CURRENT NAMES FOR NON-GENICULATE CORALLINES REPORTED FROM WEST AFRICA

In the second edition of the floristic account complementing this series of critical assessments (Price et al., 1986, 1988, 1992; John et al., 1994; Lawson et al., 1995; this paper), Lawson & John (586: 196) foreshadowed re-alignments and nomenclatural changes in species of coralline algae reported from tropical West Africa as a consequence of renewed taxonomic interest in the group. Since 1987, a number of changes in generic concepts have occurred, new families and subfamilies have been described, and the status and disposition of various species have been reassessed. While the status and disposition of many species reported from tropical west Africa still remain uncertain, and while most earlier records require confirmation, post-1987 studies on non-geniculate corallines have clarified the status and generic disposition of a number of species and infraspecific taxa based on types from or reported to occur in the West African region.

The following list summarizes the current situation for non-geniculate Corallinales mentioned in previous parts of the West African critical assessment series, including the floristic accounts of Lawson & John (350, 586). The list is organized alphabetically by specific epithet, with infraspecific taxa listed alphabetically within species. Generic names associated with specific and infraspecific taxa in the series are given in parentheses after the relevant epithet.

For each taxon, the following data are provided: references to the name in the West African critical assessment series and the floristic accounts (Lawson & John, 350, 586); current placement/name of the taxon; new records; and comments relating to that placement including information on type material. Records based on identifications only at genus level (e.g. *Choreonema* sp., *Mesophyllum* sp.) are not included.

Recently reported/new records are presented for the following taxa: *Hydrolithon boreale* (Foslie) Y.M. Chamberlain; *H. cruciatum* (Bressan) Y.M. Chamberlain; *H. farinosum* (J.V. Lamouroux) Penrose & Y.M. Chamberlain; *H. samoense* (Foslie) Keats & Y.M. Chamberlain; *Leptophytum ferox* (Foslie) Y.M. Chamberlain & Keats; *L. foveatum* Y.M. Chamberlain & Keats; *Lithophyllum lobatum* Me. Lemoine; *L. neoatalyense* T. Masaki; *Lithoporella melobesioides* (Foslie) Foslie; *Lithothamnion corallioides* (P. & H. Crouan) P. & H. Crouan; *L. sonderi* Hauck; *Mesophyllum engelhartii* (Foslie) W.H. Adey; *M. erubescens* (Foslie) Me. Lemoine; *M. lichenoides* (J. Ellis) Me. Lemoine; *Phymatolithon lenormandii* (Areschoug) W.H. Adey; *Pneophyllum fragile* Kützing.

absimile (Lithophyllum, Neogoniolithon, Spongites)

SERIES REFERENCES. John et al., 1994: 60, 77; this paper.

CURRENT PLACEMENT/NAME. *Spongites absimile* (Foslie & M. Howe) Afonso-Carrillo, according to Afonso-Carrillo (733), but see comments.

COMMENTS. Status and disposition of species uncertain; TRH holotype (Woelkerling, 678: 14) from Jamaica examined by Afonso-Carrillo (733) but placed with uncertainty in *Spongites*; see note to *Spongites absimile* (this paper) for further information.

accretum (Goniolithon, Lithophyllum, Neogoniolithon)

SERIES REFERENCES. Price et al., 1988: 230; John et al., 1994: 60, 77.

CURRENT PLACEMENT/NAME. *Neogoniolithon accretum* (Foslie & M. Howe) Setchell & L.R. Mason, according to Adey (1970: 8), but see comments.

COMMENTS. Status and disposition of species uncertain; conclusion of Adey (1970) requires verification via a modern, detailed study of the Florida US holotype in NY (Woelkerling, 678: 14).

accretum f./var. **canariense/canariensis (Lithophyllum, Neogoniolithon)**

SERIES REFERENCES. John et al., 1994: 60, 77 (under *Neogoniolithon accretum*).

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; holotype from Canary Islands divided between PC (Woelkerling, 730) and TRH (Woelkerling, 678) but not studied in detail in a modern context; placement under *Neogoniolithon accretum* (John et al., 1994: 77) in this series follows format conventions (John et al., 1994: 49) without implying synonymy with the type of the species.

adhaerens (Tenarea)

SERIES REFERENCES. John et al., 1994: 78 (under *Neogoniolithon hirtum*); this paper.

CURRENT PLACEMENT/NAME. Heterotypic synonym of *Neogoniolithon hirtum* (Me. Lemoine in Børgesen) Afonso-Carrillo, according to Afonso-Carrillo (11: 131).

COMMENTS. Conclusion of Afonso-Carrillo (11) based on examination of holotype (from Canary Islands) in C.

aequinoctiale (Lithophyllum, Porolithon)

SERIES REFERENCES. Lawson & John, 350: 243; Lawson & John, 586: 215; John et al., 1994: 60; Lawson et al., 1995: 111.

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; TRH holotype (Woelkerling, 678: 20) from São Tomé not studied in detail in a modern context; placement in *Porolithon* in this series based on pragmatic considerations explained under entry for genus (Lawson et al., 1995: 111).

africanum (Archaeolithothamnion, Sporolithon)

SERIES REFERENCES. Price et al., 1986: 17; this paper.

CURRENT PLACEMENT/NAME. *Sporolithon africanum* (Foslie) Afonso-Carrillo, according to Afonso-Carrillo (11: 142).

COMMENTS. Holotype from Canary Islands divided between PC (Woelkerling, 730) and TRH (Woelkerling, 678); conclusion of Afonso-Carrillo (11) based on examination of TRH portion of holotype.

africanum (Lithophyllum, Porolithon, Spongites)

SERIES REFERENCES. Lawson & John, 350: 244; Lawson & John, 586: 215; John et al., 1994: 60; Lawson et al., 1995: 112; this paper.

CURRENT PLACEMENT/NAME. *Spongites africanum* (Foslie) Afonso-Carrillo, Chacana & Sansón, according to Afonso-Carrillo et al. (726: 133), but see notes under main species entry in this paper.

COMMENTS. Conclusion of Afonso-Carrillo et al. (726) based on study of TRH holotype (Woelkerling, 678: 23-24) from Cap Vert, Sénégal.

africanum f. **intermedia (Lithophyllum)**
See under *Spongites africanum*.

africanum f. **truncata (Lithophyllum)**
See under *Spongites africanum*.

amplexifrons (Lithophyllum, Lithothamnion, Melobesia, Pneophyllum)

SERIES REFERENCES. John et al., 1994: 60, 66, 71; Lawson et al., 1995: 105.

CURRENT PLACEMENT/NAME. *Pneophyllum amplexifrons* (Harvey) Y.M. Chamberlain & R.E. Norris), according to Chamberlain & Norris (1994).

Additional records: Cape Verde Islands (625); pantropical (625). COMMENTS. Conclusion of Chamberlain & Norris (1994) based on study of TCD lectotype (Woelkerling & Campbell, 1992: 98) from South Africa.

angolense (Lithothamnion)

SERIES REFERENCE. John et al., 1994: 66.

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; whereabouts of type material uncertain; protologue (Romanes, 677) based on fossil specimens from four localities.

aninae (Lithophyllum)

SERIES REFERENCE. John et al., 1994: 60.

CURRENT PLACEMENT/NAME. *Lithophyllum aninae* Foslie, accord-

ing to Adey (1970: 8), but see comments.

COMMENTS. Status and disposition uncertain; conclusion of Adey (1970) requires verification via a modern, detailed study of the TRH holotype (Woelkerling, 678: 27) from the Cape Verde Islands; holotype fragments in PC (Woelkerling, 730).

antarcticum (Lithothamnion)

SERIES REFERENCE. John et al., 1994: 66.

CURRENT PLACEMENT/NAME. Heterotypic synonym of *Synarthrophyton patena* (Hooker f. & Harvey in Harvey) R.A. Townsend; see May & Woelkerling (1988: 68).

COMMENTS. Delete from flora; no published record of occurrence from West African region found.

applicatum (Lithophyllum, Mesophyllum)

SERIES REFERENCES. John et al., 1994: 60, 73, 78 (under *Neogoniolithon hirtum*).

CURRENT PLACEMENT/NAME. Heterotypic synonym of *Neogoniolithon hirtum* (Me. Lemoine in Børgesen) Afonso-Carrillo, according to Afonso-Carrillo (11: 131), but see comments.

COMMENTS. Conclusion of Afonso-Carrillo (11) based on examination of type material from Canary Islands in C; lectotype, however, apparently not yet designated (Woelkerling, 730, under *Lithophyllum applicatum*) and placement requires confirmation following lectotypification (John et al., 1994: 78).

atlantica (Lithoporella)

SERIES REFERENCE. John et al., 1994: 65.

CURRENT PLACEMENT/NAME. Heterotypic synonym of *Lithoporella melobesioides* (Foslie) Foslie, according to Lemoine (371: 44), but proposed synonymy not based on examination of type material (for data on type material, see Woelkerling, 678, 730).

COMMENTS. Delete from flora; no published record of occurrence from West African region found.

bisporum (Leptophytum, Lithophyllum, Lithothamnion, Phymatolithon)

SERIES REFERENCES. John et al., 1994: 57, 60, 66; Lawson et al., 1995: 102.

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; holotype from Canary Islands in PC (Woelkerling, 730) with fragments in TRH (Woelkerling, 678); not studied in detail in a modern context.

boergesenii (Goniolithon, Hydrolithon, Porolithon)

SERIES REFERENCES. Lawson & John, 350: 235; Lawson & John, 586: 206; Price et al., 1988: 230; Price et al., 1992: 131; Lawson et al., 1995: 112.

CURRENT PLACEMENT/NAME. *Hydrolithon boergesenii* (Foslie) Foslie, according to Woelkerling in Price et al. (1992: 131).

COMMENTS. Conclusion of Woelkerling (in Price et al., 1992) based on examination of TRH lectotype (Woelkerling, 678: 40) from US Virgin Islands.

boergesenii f./var. **africana (Goniolithon, Porolithon)**

SERIES REFERENCES. Price et al., 1992: 131 (under *Hydrolithon boergesenii*); Lawson et al., 1995: 112.

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; TRH holotype (Woelkerling, 678: 23) from São Tomé not studied in detail in a modern context; placement under *Hydrolithon boergesenii* in Price et al., (1992) follows format conventions (see Price et al., 1992: 123) without implying synonymy with the type of the species.

boreale (Hydrolithon)

SERIES REFERENCES. Not previously reported.

CURRENT PLACEMENT/NAME. *Hydrolithon boreale* (Foslie) Y.M. Chamberlain, according to Chamberlain (702: 116).

NEW RECORDS. Canaries (687;702).

COMMENTS. Conclusion of Chamberlain (702) based on study of TRH lectotype from Ireland.

bornetii (Leptophytum, Lithothamnion)

SERIES REFERENCES. John et al., 1994: 57, 66.

CURRENT PLACEMENT/NAME. See comments.

COMMENTS. Based on a detailed study of type material in PC (Woelkerling, 730) and TRH (Woelkerling, 678), Chamberlain (1990) placed the species in *Leptophytum*. Subsequently, Düwel & Wegeberg (1996) concluded from a study of relevant types that *Leptophytum* constitutes a heterotypic synonym of *Phymatolithon*. Babbini & Bressan (753: 312), clearly without knowing the work of Düwel & Wegeberg (1996), considered the genus *Leptophytum* as insufficiently characterized, and the species as dubious and rare. Evidence from the type of *bornetii* presented by Chamberlain (1990) strongly suggests that the species belongs to *Phymatolithon*, but it has yet to be validly transferred into that genus (comments on invalid transfers to *Phymatolithon* are provided under *Lithothamnion bornetii*; see John et al., 1994: 66).

brachycladum (Lithothamnion, Mesophyllum)

SERIES REFERENCES. Lawson & John, 350: 240; Lawson & John, 586: 210; John et al., 1994: 66, 73.

CURRENT PLACEMENT/NAME. *Mesophyllum brachycladum* (Foslie) W.H. Adey, according to Adey (1970: 22), but see comments.

COMMENTS. Status and disposition of species uncertain; holotype (Woelkerling, 678: 14) from St Helena Island mainly in BM with fragments in PC and TRH (Woelkerling, 678, 730) but not studied in detail in a modern context.

brassica-florida (Goniolithon, Lithothamnion, Melobesia, Neogoniolithon)

SERIES REFERENCES. Price et al., 1988: 231; John et al., 1994: 67, 71, 77, 78 (under *Neogoniolithon mamillare*).

Current name: *Neogoniolithon brassica-florida* (Harvey) Setchell & L.R. Mason, according to Woelkerling et al. (678: 324–326).

COMMENTS. Conclusion of Woelkerling et al. (678) based on a study of the BM lectotype from South Africa.

byssoides (Goniolithon, Lithophyllum, Titanoderma)

SERIES REFERENCES. Price et al., 1988: 231; John et al., 1994: 60; this paper.

CURRENT PLACEMENT/NAME. *Lithophyllum byssoides* (Lamarck) Foslie, according to Woelkerling (729).

COMMENTS. Conclusion of Woelkerling (729) based on a study of PC lectotype, said but not confirmed to come from the English Channel.

calcareum (Lithophyllum, Lithothamnion, Lythophyllum, Phymatolithon)

SERIES REFERENCES. John et al., 1994: 60, 67, 71; Lawson et al., 1995: 103.

CURRENT PLACEMENT/NAME. *Phymatolithon calcareum* (Pallas) W.H. Adey & D.L. McKibbin, according to Woelkerling & Irvine (1986*a*).

COMMENTS. Conclusion of Woelkerling & Irvine (1986*a*) based on a detailed study of the designated neotype (from Falmouth harbour, England) in BM.

calcareum f. **crassa (Lithothamnion)**

SERIES REFERENCE. Lawson et al., 1995: 103 (under *Phymatolithon calcareum*).

CURRENT PLACEMENT/NAME. *Lithothamnion calcareum* f. *crassa* (Philippi) Me. Lemoine, considered a heterotypic synonym of *Lithophyllum racemus* (Lamarck) Foslie, according to Basso et al. (1996: 284–286).

COMMENTS. See comments for *Lithophyllum racemus*. Babbini & Bressan (753: 124, 128) listed *Lithophyllum crassum* Philippi as a synonym of *Lithophyllum racemus* (Lamarck) Foslie (with a f. *crassa* (Philippi) Foslie) along with *Phymatolithon calcareum* f. *crassa* Me. Lemoine.

callithamnioides sensu **Falkenberg (Melobesia)**

SERIES REFERENCE. John et al., 1994: 71.

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Application of name uncertain and apparently also commonly misapplied (see comments in Chamberlain, 94: 351–352; John et al., 1994: 71; Chamberlain, 702: 116–117 under *Hydrolithon boreale*). Babbini & Bressan (753: 200) classified this under *Hydrolithon farinosum* (P.V. Lamouroux) Penrose & Y.M. Chamberlain. Relevant collections of Falkenberg require re-investigation as a basis for resolving uncertainties.

canariense/canariensis (Lithophyllum, Lithothamnion, Mesophyllum)

SERIES REFERENCES. Lawson & John, 350: 241; Lawson & John, 586: 211; John et al., 1994: 60, 67, 74.

CURRENT PLACEMENT/NAME. *Mesophyllum canariense* (Foslie) Me. Lemoine, according to Reyes & Afonso-Carrillo (687).

COMMENTS. Conclusion of Reyes & Afonso-Carrillo (687) based on examination of TRH portion (Woelkerling, 678) of holotype (from Canary Islands); major portion of holotype now known to be in PC (Woelkerling, 730).

canariense var. **difformis (Mesophyllum)**

SERIES REFERENCE. John et al., 1994: 74 (under *Mesophyllum canariense*).

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; holotype from Canary Islands presumed to be in C but not studied in detail in a modern context; placement under *Mesophyllum canariense* (John et al., 1994: 74) in this series follows format conventions (John et al., 1994: 49) without implying synonymy with the type of the species.

canariense var. **fasciata (Mesophyllum)**

SERIES REFERENCE. John et al., 1994: 74 (under *Mesophyllum canariense*).

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; holotype from Canary Islands presumed to be in C but not studied in detail in a modern context; placement under *Mesophyllum canariense* (John et al., 1994: 74) in this series follows format conventions (John et al., 1994: 49) without implying synonymy with the type of the species.

capense/capensis (Lithophyllum, Lithothamnion)

SERIES REFERENCE. John et al., 1994: 60, 67.

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; lectotype in CN (Woelkerling & Verheij, 1995: 38) from South Africa not studied in detail in a modern context; isolectotypes present in BM, L, and PC (Woelkerling & Verheij, 1995; Woelkerling, 1998*b*).

caribaeum (Lithophyllum, Neogoniolithon)

SERIES REFERENCE. John et al., 1994: 60, 77.

CURRENT PLACEMENT/NAME. *Neogoniolithon caribaeum* (Foslie) W.H. Adey, according to Adey (1970: 8), but see comments.

COMMENTS. Status and disposition uncertain; conclusion of Adey (1970) requires verification via a modern, detailed study of the TRH lectotype (Woelkerling, 678: 48) from the US Virgin Islands.

confervicola (Melobesia, Pneophyllum)

SERIES REFERENCES. John et al., 1994: 71; Lawson et al., 1995: 106.

CURRENT PLACEMENT/NAME. *Pneophyllum confervicola* (Kützing) Y.M. Chamberlain, according to Chamberlain (94: 385; 702: 137).

COMMENTS. Conclusions of Chamberlain (94;702) based on examination of holotype from Italy in L (Woelkerling & Verheij, 1995: 41).

confervicolum f. **minutula (Pneophyllum)**

SERIES REFERENCE. Lawson et al., 1995: 106 (under *Pneophyllum confervicola*).

CURRENT PLACEMENT/NAME. Heterotypic synonym of *Pneophyllum confervicola* (f. *confervicola*), according to Chamberlain (1994*b*: 140).

COMMENTS. Conclusion of Chamberlain (702) based on examination (Chamberlain, 94: 394) of TRH holotype (Woelkerling, 678: 151) from Norway.

confine/confinis (Dermatolithon, Melobesia, Tenarea, Titanoderma)

SERIES REFERENCES. Price et al., 1986: 86; John et al., 1994: 71; this paper.

CURRENT PLACEMENT/NAME. Heterotypic synonym of *Lithophyllum pustulatum* (Lamouroux) Foslie, according to Woelkerling & Campbell (1992: 79). Although others (Chamberlain, 1991; Babbini & Bressan, 753: 181) list it as *Titanoderma pustulatum* var. *confine* (P. & H. Crouan) Y.M. Chamberlain.

COMMENTS. Conclusion of Woelkerling & Campbell (1992) takes account of study of PC lectotype by Chamberlain (1991, as

Titanoderma); lectotype (Woelkerling, 730) presumed (Chamberlain, 1991) to be from France.

conjuncta (Lithoporella, Mastophora)

SERIES REFERENCE. John et al., 1994: 66, 71.

CURRENT PLACEMENT/NAME. Heterotypic synonym of *Lithoporella melobesioides* (Foslie) Foslie, according to Lemoine (371: 44), but see comments.

COMMENTS. Status and disposition uncertain; conclusion of Lemoine (371) not based on study of lectotype (from Cape Verde Islands) in TRH (Woelkerling, 678); also treated as a distinct species of *Lithoporella* (Adey, 1970: 15).

corallinae (Dermatolithon, Lithophyllum, Melobesia, Tenarea, Titanoderma)

SERIES REFERENCES. Price et al., 1986: 86; John et al., 1994: 60, 72; this paper.

CURRENT PLACEMENT/NAME. *Lithophyllum corallinae* (P. & H. Crouan) Heydrich, according to Woelkerling & Campbell (1992: 41).

COMMENTS. Conclusion of Woelkerling & Campbell (1992) based on an examination of the lectotype (from France) in CO and the earlier detailed study of the lectotype by Chamberlain (1991: 66, as *Titanoderma*).

corallioides (Lithothamnion)

SERIES REFERENCE. John et al., 1994: 67.

CURRENT PLACEMENT/NAME. *Lithothamnion corallioides* (P. & H. Crouan) P. & H. Crouan, according to Chamberlain & Irvine (701: 177).

NEW RECORD. Canaries (701).

COMMENTS. Conclusion of Chamberlain & Irvine (701) based on the selection and study of the neotype; information on isoneotypes in PC provided by Woelkerling (730).

corticiforme/corticiformis (Epilithon, Lithothamnion, Melobesia)

SERIES REFERENCES. Price et al., 1986: 89; John et al., 1994: 67, 72.

CURRENT PLACEMENT/NAME. Heterotypic synonym of *Melobesia membranacea* (Esper) J.V. Lamouroux, according to Chamberlain (94: 300, 306).

COMMENTS. Conclusion of Chamberlain (94) based on examination of the holotype (from an unnamed locality in the Atlantic Ocean) in L; additional information on holotype provided by Woelkerling & Verheij (1995: 42).

crassum (Lithothamnion)

SERIES REFERENCES. John et al., 1994: 67; Lawson et al., 1995: 103 (under *Phymatolithon calcareum*).

CURRENT PLACEMENT/NAME. *Lithothamnion crassum* Philippi considered a heterotypic synonym of *Lithophyllum racemus* (Lamarck) Foslie, according to Basso et al. (1996: 284–286) and Babbini & Bressan (753: 258).

COMMENTS. See comments for *Lithophyllum racemus*.

crispatum (Lithothamnion)

SERIES REFERENCE. John et al., 1994: 67.

CURRENT PLACEMENT/NAME. Not determined. Babbini & Bressan (753: 258), however, listed it as *Lithothamnion crispatum* Hauck; see comments.

COMMENTS. Status and disposition uncertain; lectotype from Adriatic Sea in L (Woelkerling & Verheij, 1995: 44) vegetatively concordant with *Lithothamnion*, but absence of reproductive material precludes certain generic placement; information on PC and TRH isolectotypes provided by Woelkerling (730).

crouanii (Lithophyllum)

SERIES REFERENCE. John et al., 1994: 61.

CURRENT PLACEMENT/NAME. *Lithophyllum crouanii* Foslie, according to Chamberlain et al. (1988).

COMMENTS. Conclusion of Chamberlain et al. (1988) based on examination of lectotype from England in TRH (Woelkerling, 678: 68).

cruciatum (Hydrolithon)

SERIES REFERENCES. not previously reported.

CURRENT PLACEMENT/NAME. *Hydrolithon cruciatum* (Bressan) Y.M. Chamberlain, according to Chamberlain (702: 120).

NEW RECORDS. Canaries (687;702).

COMMENTS. Conclusion of Chamberlain (702) requires confirmation via a study of the TSB holotype from Italy; type not seen by Chamberlain (702).

cystoseirae (Dermatolithon, Lithophyllum, Melobesia, Titanoderma)

SERIES REFERENCES. Price et al., 1986: 86; John et al., 1994: 61, 72; this paper.

CURRENT PLACEMENT/NAME. *Lithophyllum cystoseirae* (Hauck) Heydrich, according to John et al. (1994: 61).

COMMENTS. Conclusion of John et al. (1994) based on data on the lectotype from Italy in L (Woelkerling & Verheij, 1995: 45) provided by Huvé (272) and Athanasiadis (1989).

cystoseirae f./var. **saxicola (Dermatolithon)**

SERIES REFERENCE. John et al., 1994: 61 (under *Lithophyllum cystoseirae*).

CURRENT PLACEMENT/NAME. *Nom. nud.*; see comments.

COMMENTS. Name first coined by Huvé (272: 234) and mentioned by Lemoine (368: 6) but never validated with a description or designation of a type specimen in accordance with Articles 36 and 37 of the ICBN (see Greuter, 1994).

daedaleum (Lithophyllum)

SERIES REFERENCE. John et al., 1994: 61.

CURRENT PLACEMENT/NAME. *Lithophyllum daedaleum* Foslie & M. Howe, according to Adey (1970: 5), but see comments.

COMMENTS. Status and disposition uncertain; NY holotype (Woelkerling, 678: 27) from Puerto Rico not studied in detail in a modern context; information on isotypes and paratype at TRH, L, and PC provided by Woelkerling (678), Woelkerling & Verheij (1995) and Woelkerling (730).

decussatum f. **planiuscula (Lithophyllum)**

SERIES REFERENCE. John et al., 1994: 61 (as '*planiscula*').

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; holotype from Morocco in TRH (Woelkerling, 678: 173) not studied in detail in a modern context; West African record questionable (John et al., 1994: 61).

duckeri (Lithophyllum)

SERIES REFERENCE. John et al., 1994: 61.

CURRENT PLACEMENT/NAME. *Lithophyllum duckeri* Woelkerling (1983*a*: 184), a *nom. nov.* for *Lithothamnion crassum* Philippi, considered a heterotypic synonym of *Lithophyllum racemus* (Lamarck) Foslie, according to Basso et al. (1996: 284–286).

COMMENTS. See comments for *Lithophyllum racemus*.

ectocarpon (Lithothamnion, Mesophyllum)

SERIES REFERENCE. John et al., 1994: 67, 74.

CURRENT PLACEMENT/NAME. *Mesophyllum ectocarpon* (Foslie) W.H. Adey, according to Adey (1970: 23), but see comments.

COMMENTS. Status and disposition uncertain; TRH lectotype (Woelkerling, 678: 27) from Cap Blanc, Sénégal not studied in detail in a modern context; placement in *Mesophyllum* somewhat in question (Adey, 1970: 23); information on isolectotype in L provided by Woelkerling & Verheij (1995: 51).

endophloea (Schmitziella)

See under *Schmitziella endophloea* Bornet ex Batters (see also Woelkerling & Irvine, 1982).

engelhartii (Mesophyllum)

SERIES REFERENCES. not previously reported.

CURRENT PLACEMENT/NAME. *Mesophyllum engelhartii* (Foslie) W.H. Adey, according to Woelkerling & Harvey (1993: 581).

NEW RECORD. Namibia (742).

COMMENTS. Conclusion of Woelkerling & Harvey (1993) based on study of TRH lectotype (Woelkerling (678: 84) from southern Australia.

erubescens (Lithothamnion, Mesophyllum)

SERIES REFERENCES. John et al., 1994: 67, 74.

CURRENT PLACEMENT/NAME. *Mesophyllum erubescens* (Foslie) Me. Lemoine, according to Keats & Chamberlain (755: 175).

ADDITIONAL RECORDS. Cape Verde Islands (625); pantropical (625).

NEW RECORD. Sénégal (755).

COMMENTS. Conclusion of Keats & Chamberlain (755) based on examination of holotype from Brasil in TRH (Woelkerling, 678: 85).

esperi (Lithophyllum, Pseudolithophyllum)

SERIES REFERENCES. John et al., 1994: 61; Lawson et al., 1995: 112.

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; species based on a series of collections from Canary Islands (Lemoine, 362: 63) but not lectotypified and original collections not studied in detail in a modern context (John et al., 1994: 61).

expansa/expansum (Crodelia, Lithophyllum, Pseudolithophyllum)

SERIES REFERENCES. Price et al., 1986: 78; John et al., 1994: 62, 63 (under *Lithophyllum lobatum*), 75 (under *Mesophyllum lichenoides*); Lawson et al., 1995: 112.

CURRENT PLACEMENT/NAME. Heterotypic synonym of *Mesophyllum lichenoides*, according to Woelkerling (1983*b*: 307) and Lawson et al. (1995: 112), but see comments.

COMMENTS. Holotype from Sicily in L (Woelkerling & Verheij, 1995: 51) studied in detail by Woelkerling (1983*b*: 307) who suggested conspecificity with *Mesophyllum lichenoides*; disposition of plants referred to *Pseudolithophyllum expansum* (Philippi) Me. Lemoine sensu Lemoine discussed by Furnari et al. (1996). On the other hand, Babbini & Bressan (753: 130) listed this under *Lithophyllum frondosum* (Dufour) Furnari, Cormaci & Alongi f. *expansum* (Me. Lemoine) Babbini & Bressan, a name which has to be checked against the provisions of ICBN 1994 for acceptability (see Greuter, 1994)

expansum f. exigua (Lithophyllum)

SERIES REFERENCES. John et al., 1994: 75 (under *Mesophyllum lichenoides*); Lawson et al., 1995: 112 (under *Pseudolithophyllum expansum*).

CURRENT PLACEMENT/NAME. Not determined. Babbini & Bressan (753: 131) included this under *Lithophyllum frondosum* (Dufour) Furnari, Cormaci & Alongi without providing a statement on its taxonomic status. See comments.

COMMENTS. Status and disposition uncertain; holotype from Algeria in TRH (Woelkerling, 678) not studied in detail in a modern context; placement under *Mesophyllum lichenoides* in this series follows format conventions (John et al., 1994: 49; Lawson et al., 1995: 99) without implying synonymy with the type of the species.

expansum f. involvens (Lithophyllum)

SERIES REFERENCE. John et al., 1994: 75 (under *Mesophyllum lichenoides*).

CURRENT PLACEMENT/NAME. Not determined. According to Babbini & Bressan (753: 138) f. *involvens* Vinassa = f. *exigua* Foslie under *Lithophyllum frondosum* (Dufour) Furnari, Cormaci & Alongi, but provided no statement on its taxonomic status; see comments.

COMMENTS. Status and disposition uncertain; type material from the Mediterranean Sea (Vinassa, 1892) not studied in detail in a modern context and whereabouts uncertain; placement under *Mesophyllum lichenoides* in this series follows format conventions (John et al., 1994: 49) without implying synonymy with the type of the species.

expansum f. stictaeformis (Lithophyllum)

SERIES REFERENCE. John et al., 1994: 75 (under *Mesophyllum lichenoides*).

CURRENT PLACEMENT/NAME. Not determined. According to Babbini & Bressan (753: 131) this taxon can be included under *Lithophyllum frondosum* (Dufour) Furnari, Cormaci & Alongi. They did not provide a statement on its taxonomic status. See comments.

COMMENTS. Status and disposition uncertain; type material from the Mediterranean Sea (Areschoug, 1852: 517) not studied in detail in a modern context; placement under *Mesophyllum lichenoides* in this series follows format conventions (John et al., 1994: 49) without implying synonymy with the type of the species.

farinacea (Melobesia)

SERIES REFERENCES. Price et al., 1986: 92 (under *Fosliella farinosa*); John et al., 1994: 72.

COMMENTS. Epithet *farinacea* in the binomial *Melobesia farinacea* Lamouroux an orthographic variant of *Melobesia farinosa*; see following entry.

farinosa (Fosliella, Melobesia)

SERIES REFERENCES. Lawson & John, 350: 234; Price et al., 1986: 91; Lawson & John, 586: 205; John et al., 1994: 72.

CURRENT PLACEMENT/NAME. *Hydrolithon farinosum* (J.V. Lamouroux) Penrose & Y.M. Chamberlain, according to Penrose & Chamberlain (1993).

NEW RECORD. Canaries (702).

COMMENTS. Conclusion of Penrose & Chamberlain (1993) based on examination of lectotype (from an unspecified locality in the Mediterranean) in CN.

farinosa f. **callithamnioides (Fosliella)**

SERIES REFERENCES. Price et al., 1986: 91 (under *Fosliella farinosa*); Lawson & John, 586: 205.

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; *Fosliella farinosa* f. *callithamnioides* (Foslie) Y.M. Chamberlain based on *Melobesia farinosa* f. *callithamnioides* Foslie (see Chamberlain, 94: 352 for details); taxon apparently not lectotypified (Chamberlain, 94: 352); name in the sense of Chamberlain (94) subsequently suppressed under *Hydrolithon boreale* (Chamberlain, 702: 116–117).

farinosa var. **solmsiana (Fosliella, Melobesia)**

SERIES REFERENCE. Price et al., 1986: 91, 92 (under *Fosliella farinosa*).

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; whereabouts of type material uncertain; additional comments provided by John et al., (1994: 72, under *Melobesia solmsiana*), Chamberlain (94: 351, under *Fosliella farinosa* f. *callithamnioides*), Taylor (1939, under *Fosliella farinosa* var. *solmsiana*) and Babbini & Bressan (753: 200, under *Hydrolithon farinosum*).

ferox (Leptophytum)

SERIES REFERENCE. Not previously reported.

CURRENT PLACEMENT/NAME. Not determined; see comments.

NEW RECORD. Namibia (743).

COMMENTS. Placed in *Leptophytum* by Chamberlain & Keats (743) based on study of TRH holotype (Woelkerling, 678: 92) from South Africa; *Leptophytum* now considered a heterotypic synonym of *Phymatolithon* (Düwel & Wegeberg, 1996) but *ferox* not formally transferred to that genus; type and other collections cited by Chamberlain & Keats (743) require further study to determine generic placement.

floridanum (Lithothamnion, Mesophyllum)

SERIES REFERENCES. Lawson & John, 350: 241; Lawson & John, 596: 211; John et al., 1994: 67, 74.

CURRENT PLACEMENT/NAME. *Mesophyllum floridanum* (Foslie) W.H. Adey, according to Adey (1970: 24), but see comments.

COMMENTS. Status and disposition uncertain; conclusion of Adey (1970) requires verification via a modern, detailed study of the TRH holotype (Woelkerling, 678: 96) from Florida, U.S.A.; holotype fragment in PC (Woelkerling, 730).

foveatum (Leptophytum)

SERIES REFERENCES. Not previously reported.

CURRENT PLACEMENT/NAME. Not determined; see comments.

NEW RECORD. Namibia (743).

COMMENTS. Originally described as a species of *Leptophytum* (Chamberlain & Keats, 743) based on a holotype from South Africa deposited in L; *Leptophytum* now considered a heterotypic synonym of *Phymatolithon* (Düwel & Wegeberg, 1996) but *foveatum* not formally transferred to that genus; type and other collections cited in protologue require further study to determine generic placement.

fragile (Pneophyllum)

SERIES REFERENCE. Lawson et al., 1995: 106.

CURRENT PLACEMENT/NAME. *Pneophyllum fragile* Kützing, according to Chamberlain (1983: 356) and Penrose & Woelkerling (1991: 495).

NEW RECORDS. Canaries (702;740).

COMMENTS. Conclusions of Chamberlain (1983) and Penrose & Woelkerling (1991) based on study of L holotype (Woelkerling & Verheij, 1995: 53) from an unspecified locality in the Mediterranean Sea; holotype fragment also in PC (Woelkerling, 730).

fruticulosum/fruticulosus (Lithothamnion, Spongites)

SERIES REFERENCES. John et al., 1994: 67; this paper.

CURRENT PLACEMENT/NAME. *Spongites fruticulosus* Kützing, according to Woelkerling (1985: 135) and Penrose (1991).

COMMENTS. Conclusions of Woelkerling (1985) and Penrose (1991) based on study of L holotype (Woelkerling & Verheij, 1995: 54) from an unspecified locality in the Mediterranean Sea.

fruticulosum f. **clavulata (Lithothamnion)**

See under *Spongites fruticulosus*.

fruticulosum f. **crassiuscula (Lithothamnion)**

See under *Spongites fruticulosus*.

geometricum (Dermatolithon, Lithophyllum, Titanoderma)

SERIES REFERENCES. Price et al., 1986: 86; John et al., 1994: 62; this paper.

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; type material from Canary Islands in C (unpublished data) not studied in detail in a modern context; species requires lectotypification (John et al., 1994: 62).

gracile (Lithophyllum)

SERIES REFERENCE. John et al., 1994: 62.

CURRENT PLACEMENT/NAME. *Lithophyllum gracile* Foslie, according to Adey (1970: 5), but see comments.

COMMENTS. Status and disposition uncertain; conclusion of Adey (1970) requires verification via a modern, detailed study of the TRH

holotype (Woelkerling, 678: 108) from the Cape Verde Islands.

hapalidioides (Dermatolithon, Lithophyllum, Tenarea, Titanoderma)

SERIES REFERENCES. Price et al., 1986: 86; John et al., 1994: 62, 64 (under *Lithophyllum pustulatum*); this paper.

CURRENT PLACEMENT/NAME. Heterotypic synonym of *Lithophyllum pustulatum* (J.V. Lamouroux) Foslie, according to Woelkerling & Campbell (1992: 79).

COMMENTS. Conclusion of Woelkerling & Campbell (1992) takes account of study of CHE lectotype from France by Chamberlain (1991: 34, under *Titanoderma pustulatum* var. *macrocarpum*); additional comments under *Titanoderma hapalidioides* in this paper.

hapalidioides f./var. **confinis (Lithophyllum)**

SERIES REFERENCE. John et al., 1994: 64 (under *Lithophyllum pustulatum*).

CURRENT PLACEMENT/NAME. Homotypic synonym of *Melobesia confinis* P. & H. Crouan and thus a heterotypic synonym of *Lithophyllum pustulatum* (J.V. Lamouroux) Foslie, according to Woelkerling & Campbell (1992: 79). Babbini & Bressan (753: 181), however, consider it to belong to variety *confinis* of *Titanoderma pustulatum*.

COMMENTS. Conclusion of Woelkerling & Campbell (1992) takes account of study of PC lectotype by Chamberlain (1991, as *Titanoderma*); lectotype (Woelkerling, 730) presumed (Chamberlain, 1991) to be from France.

hauckii (Lithophyllum)

SERIES REFERENCE. John et al., 1994: 62, 79 (under *Neogoniolithon mamillosum*).

CURRENT PLACEMENT/NAME. Avowed substitute name for *Lithothamnion mamillosum* Hauck, 1883 (non *L. mamillosum* Gümbel, 1871), according to Woelkerling & Verheij (1995: 57); additional data provided by John et al. (1994: 79, under *Neogoniolithon mamillosum*).

COMMENTS. See entry for *mamillosum* below.

hirtum (Lithophyllum, Neogoniolithon)

SERIES REFERENCE. John et al., 1994: 62, 78.

CURRENT PLACEMENT/NAME. *Neogoniolithon hirtum* (Me. Lemoine) Afonso-Carrillo, according to Afonso-Carrillo (11: 131), but see comments.

COMMENTS. Conclusion of Afonso-Carrillo (11) based on examination of type material from Canary Islands in C; lectotype, however, apparently not yet designated and placement in *Neogoniolithon* requires confirmation following lectotypification (John et al., 1994: 78).

hispanum (Lithothamnion)

SERIES REFERENCE. John et al., 1994: 67.

CURRENT PLACEMENT/NAME. Invalid name, according to John et al. (1994: 67).

COMMENTS. Original presentation (Gonzalez Henriquez, 235) lacks a description or diagnosis rendering name a *nomen nudum* and thus invalid in relation to ICBN Art. 32.1 (Greuter, 1994).

illitus (Lithophyllum, Neogoniolithon)

SERIES REFERENCE. John et al., 1994: 62, 78.

CURRENT PLACEMENT/NAME. *Neogoniolithon illitus* (Me. Lemoine) Afonso-Carrillo, according to Afonso-Carrillo (11: 133), but see comments.

COMMENTS. Conclusion of Afonso-Carrillo (11) based on examination of type material from Canary Islands in C, but lectotype apparently not yet designated and placement in *Neogoniolithon* requires confirmation following lectotypification (John et al., 1994: 78); syntype material also occurs in PC (Woelkerling, 730).

incrustans (Lithophyllum, Lithothamnion)

SERIES REFERENCES. John et al., 1994: 62, 65 (under *Lithophyllum vickersiae*), 67; Lawson et al., 1995: 113 (under *Pseudolithophyllum vickersiae*); this paper (under *Spongites africanum*).

CURRENT PLACEMENT/NAME. *Lithophyllum incrustans* Philippi, according to Woelkerling (1983*b*: 313–317).

COMMENTS. Conclusion of Woelkerling (1983*b*) based on study of holotype from Sicily in L (Woelkerling & Verheij, 1995: 58).

indicum (Lithothamnion)

SERIES REFERENCE. John et al., 1994: 67.

CURRENT PLACEMENT/NAME. *Lithothamnion indicum* Foslie, according to Wilks & Woelkerling (1995: 558).

COMMENTS. Conclusion of Wilks & Woelkerling (1995) based on study of TRH lectotype (Woelkerling, 678: 125) from Victoria, Australia.

irregulare/irregularis (Lithophyllum, Lithothamnion, Pseudolithophyllum, Tenarea)

SERIES REFERENCES. Lawson & John, 350: 245; Lawson & John, 586: 217; John et al., 1994: 62, 67; Lawson et al., 1995: 113; this paper.

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; holotype from São Tomé in TRH (Woelkerling, 678: 130, under *Lithothamnion irregulare* Foslie) but not studied in detail in a modern context; additional comments provided by John et al. (1994: 62, under *Lithophyllum irregulare*).

kaiserii (Lithophyllum)

SERIES REFERENCE. John et al., 1994: 63 (as '*kaiseri*').

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; species requires typification and then type requires study in detail in a modern context (John et al., 1994: 63); syntype material present in TRH (Woelkerling, 678: 132).

kotschyanum (Lithophyllum)

SERIES REFERENCE. John et al., 1994: 63.

CURRENT PLACEMENT/NAME. *Lithophyllum kotschyanum* Unger, according to Verheij (1994: 100).

COMMENTS. Conclusion of Verheij (1994) based on examination of holotype from Gulf of Bahrain in TRH (Woelkerling (678: 133).

lejolisii (Fosliella, Heteroderma, Melobesia, Pneophyllum)

SERIES REFERENCES. Lawson & John, 350: 235; Price et al., 1986: 92; Lawson & John, 586: 214; Price et al., 1992: 130; John et al., 1994: 72; Lawson et al., 1995: 106.

CURRENT PLACEMENT/NAME. Heterotypic synonym of *Pneophyllum fragile* Kützing, according to Penrose & Woelkerling (1991: 496).

COMMENTS. Conclusion of Penrose & Woelkerling (1991) based on study of lectotype from France in CHE.

lenormandii (Lithothamnion, Phymatolithon)

SERIES REFERENCES. John et al., 1994: 67; Lawson et al., 1995: 103. Current placement/name: *Phymatolithon lenormandii* (Areschoug) W.H. Adey, according to Chamberlain & Irvine (701: 224) and Düwel & Wegeberg (1996: 476).

NEW RECORDS. Canaries (227;701).

COMMENTS. Conclusions of Chamberlain & Irvine (701) and Düwel & Wegeberg (1996) based on examination of LD lectotype (Woelkerling, 1988: 219) from France.

lenormandii f. squamulosa (Lithothamnion)

SERIES REFERENCE. Lawson et al., 1995: 103 (under *Phymatolithon lenormandii*).

CURRENT PLACEMENT/NAME. Heterotypic synonym of *Phymatolithon lenormandii* (Areschoug) W.H. Adey f. *lenormandii*, according to Chamberlain & Irvine (701: 225, 230), but see comments. Babbini & Bressan (753: 295), however, consider it to belong to a separate forma, *squamulosa*.

COMMENTS. Conclusion of Chamberlain & Irvine (701) apparently not based on examination of TRH holotype from Norway (Woelkerling, 678: 206, under *Lithothamnion squamulosum*) and thus requires verification.

lenormandii f. sublaevis (Lithothamnion)

SERIES REFERENCE. Lawson et al., 1995: 103 (under *Phymatolithon lenormandii*).

CURRENT PLACEMENT/NAME. Heterotypic synonym of *Phymatolithon lenormandii* (Areschoug) W.H. Adey f. *lenormandii*, according to Chamberlain & Irvine (701: 225, 230), but see comments.

COMMENTS. Conclusion of Chamberlain & Irvine (701) apparently not based on examination of TRH lectotype from England (Woelkerling, 678: 211) and thus requires verification.

leptothalloideum (Lithophyllum, Pseudolithophyllum)

SERIES REFERENCES. John et al., 1994: 63; Lawson et al., 1995: 113. Current placement/name: Not determined; see comments.

COMMENTS. Status and disposition uncertain; type material (whereabouts uncertain) from Annobon (Pagalú) (Pilger, 455) not studied in detail in a modern context.

lichenoides (Lithothamnion, Mesophyllum)

SERIES REFERENCE. John et al., 1994: 67, 74.

CURRENT PLACEMENT/NAME. *Mesophyllum lichenoides* (J. Ellis) Me. Lemoine, according to Woelkerling & Irvine (1986*b*).

NEW RECORD. Canaries (701).

COMMENTS. Conclusion of Woelkerling & Irvine (1986*b*) based on a detailed study of the BM neotype from England.

lobatum (Lithophyllum, Mesophyllum, Pseudolithophyllum)

SERIES REFERENCES. John et al., 1994: 63, 75; Lawson et al., 1995: 113.

CURRENT PLACEMENT/NAME. Not determined; see comments.

NEW RECORD. Canaries (744).

COMMENTS. Status and disposition uncertain; type material from Canary Islands in C (unpublished data) not studied in detail in a modern context; species requires lectotypification (John et al., 1994: 63).

mamillare/mamillaris (Goniolithon, Lithothamnion, Melobesia, Neogoniolithon, Porolithon)

SERIES REFERENCES. Lawson & John, 350: 241; Lawson & John, 586: 211; Price et al., 1988: 231; John et al., 1994: 67, 72, 78; Lawson et al., 1995: 112.

CURRENT PLACEMENT/NAME. Not determined; see comments.

Additional record: Cape Verde Islands (625); Pantropical (625).

COMMENTS. Status and disposition uncertain; lectotype (Printz, 212: pl. 47, legend to fig. 15) apparently missing (Woelkerling, 678: 144; John et al., 1994: 78) and thus not studied in detail in a modern context.

mamillosum (Goniolithon, Lithothamnion, Neogoniolithon)

SERIES REFERENCES. Price et al., 1988: 231; John et al., 1994: 67, 78.

CURRENT PLACEMENT/NAME. Current placement for *Lithothamnion mamillosum* Hauck, 1883 (non Gümbel, 1871) not determined; see comments.

COMMENTS. Status and disposition uncertain; lectotype at L (Woelkerling & Verheij, 1995: 64) from the Adriatic Sea not studied in detail in a modern context; see also entry for *'hauckii'* above.

mamillosum f. microcarpa (Goniolithon)

SERIES REFERENCE. John et al., 1994 : 78 (under *Neogoniolithon mamillosum*).

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; TRH lectotype (Woelkerling, 678: 149) from the Cape Verde Islands not studied in detail in a modern context; placement under *Neogoniolithon mamillosum* (John et al., 1994: 78) follows format conventions (John et al., 1994: 49) without implying synonymy with the type of the species.

marlothii (Lithophyllum)

SERIES REFERENCES. John et al., 1994: 63, 74 (under *Mesophyllum canariense*).

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; syntype material occurs in TRH (Woelkerling, 678) and PC (Woelkerling, 730) but lectotype not designated; additional comments provided by Chamberlain (738: 154).

mediterranea (Litholepis)

SERIES REFERENCE. John et al., 1994: 59.

CURRENT PLACEMENT/NAME. Not determined. In Babbini & Bressan (753: 170) as *Titanoderma mediterranea* (Foslie) Woelkerling. See comments.

COMMENTS. Status and disposition uncertain; TRH holotype (Woelkerling, 678) not examined in detail in a modern context; additional comments provided by John et al. (1994: 59) and by Woelkerling (730).

melobesioides (Lithoporella, Mastophora)

SERIES REFERENCE. John et al., 1994: 66, 71.

CURRENT PLACEMENT/NAME. *Lithoporella melobesioides* (Foslie) Foslie, according to Turner & Woelkerling (1982*a*, *b*).

NEW RECORDS. Cape Verde Islands (701), Sénégal (701).

COMMENTS. Conclusions of Turner & Woelkerling (1982*a*, *b*) based on detailed study of TRH lectotype (Woelkerling, 678: 148) from S. Nilandu, Maldive Islands.

membranacea/membranaceum (Epilithon, Lithothamnion, Melobesia)

SERIES REFERENCES. Price et al., 1986: 89; John et al., 1994: 67, 72.

CURRENT PLACEMENT/NAME. *Melobesia membranacea* (Esper) J.V. Lamouroux, according to Chamberlain (1985) and Wilks & Woelkerling (1991).

COMMENTS. Conclusions of Chamberlain (1985) and Wilks & Woelkerling (1991) based on studies of CN neotype (Chamberlain, 1985) from France; additional comments provided by John et al. (1994: 72).

mildbraedii (Lithophyllum, Pseudolithophyllum)

SERIES REFERENCES. Lawson & John, 350: 246; Lawson & John, 586: 217; John et al., 1994: 63; Lawson et al., 1995: 113.

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; whereabouts of type material uncertain; protologue (Pilger, 455) based on a collection from Annobon (Pagalú).

minutula (Fosliella, Melobesia)

SERIES REFERENCES. Price et al., 1986: 92; John et al., 1994: 72; Lawson et al., 1995: 106 (under *Pneophyllum confervicola*).

CURRENT PLACEMENT/NAME. Heterotypic synonym of *Pneophyllum confervicola* (Kützing) Y.M. Chamberlain, according to Chamberlain (702: 137–141).

COMMENTS. Conclusion of Chamberlain (702) based on studies (Chamberlain, 702, 1994*b*) of TRH holotype (Woelkerling, 678) from Norway.

neoatalyense (Lithophyllum)

SERIES REFERENCES. Not previously reported.

CURRENT PLACEMENT/NAME. *Lithophyllum neoatalyense* T. Masaki, according to Chamberlain (737: 210).

NEW RECORD. Namibia (737).

COMMENTS. Conclusion of Chamberlain (737) based on study of HAK holotype from Japan.

nephalidioides (Dermatolithon)

SERIES REFERENCES. Price et al., 1986: 86; John et al., 1994: 64 (under *Lithophyllum pustulatum*).

CURRENT PLACEMENT/NAME. Orthographic variant of *Dermatolithon hapalidioides*, a heterotypic synonym of *Lithophyllum pustulatum*. Comments: See comments under entry for '*hapalidioides*' above.

oligocarpum (Lithophyllum, Porolithon)

SERIES REFERENCES. John et al., 1994: 63; Lawson et al., 1995: 112. Current placement/name: Not determined; see comments.

COMMENTS. Status and disposition uncertain; TRH holotype (Woelkerling, 678: 163) from the Canary Islands not studied in detail in a modern context; PC holotype fragments apparently missing (Woelkerling, 730).

onkodes (Lithothamnion, Porolithon)

SERIES REFERENCES. Lawson & John, 350: 244; Lawson & John, 586: 216; John et al., 1994: 67; Lawson et al., 1995: 112.

CURRENT PLACEMENT/NAME. *Hydrolithon onkodes* (Heydrich) Penrose & Woelkerling, according to Penrose & Woelkerling (1992: 83).

COMMENTS. Conclusion of Penrose & Woelkerling (1992) based on study of TRH lectotype (Woelkerling, 678) from New Guinea and on earlier study of lectotype by Penrose & Woelkerling (1988); data on PC isolectotype provided by Woelkerling (730).

onkodes var. **oligocarpa (Porolithon)**

SERIES REFERENCE. Lawson et al., 1995: 112 (under *Porolithon oligocarpum*).

CURRENT PLACEMENT/NAME. Homotypic synonym of *Lithophyllum oligocarpum* Foslie.

COMMENTS. See comments under entry for *oligocarpum* above.

orbiculare (Crodelia)

SERIES REFERENCE. Price et al., 1986: 79.

CURRENT PLACEMENT/NAME. Epithet *orbiculare* an orthographic variant of *orbiculatum* (see below).

COMMENTS. See comments for following entry.

orbiculatum (Lithophyllum, Lithothamnion, Pseudolithophyllum)

SERIES REFERENCES. John et al., 1994: 63, 68; Lawson et al., 1995: 113.

CURRENT PLACEMENT/NAME. *Lithophyllum orbiculatum* (Foslie) Foslie, according to Chamberlain et al. (1991).

COMMENTS. Conclusion of Chamberlain et al. (1991) based on study of TRH lectotype (Woelkerling, 678) from Norway; the binomial *Crodelia orbiculare* (Foslie) Kylin (in Price et al., 1986: 79) pertains to *Lithophyllum orbiculatum*, but Kylin (281: 208) used the spelling *orbiculare* and not *orbiculatum*.

orotavicum (Goniolithon, Lithophyllum, Neogoniolithon)

SERIES REFERENCES. Price et al., 1988: 231; John et al., 1994: 63, 79.

CURRENT PLACEMENT/NAME. *Neogoniolithon orotavicum* (Foslie) Me. Lemoine, according to Adey (1970: 9) and Afonso-Carrillo (11: 133), but see comments.

COMMENTS. Conclusions of Adey (1970) and Afonso-Carrillo (11) based on examination of TRH portion of holotype (Woelkerling, 678) from the Canary Islands; placement in *Neogoniolithon* as delimited by Penrose (1992, 1996*c*) and by Penrose & Chamberlain (1993), however, requires confirmation; data on PC portion of holotype provided by Woelkerling (678).

papillosum (Dermatolithon, Goniolithon, Lithophyllum, Titanoderma)

SERIES REFERENCES. Price et al., 1986: 86; Price et al., 1988: 231; John et al., 1994: 63; this paper.

CURRENT PLACEMENT/NAME. *Lithophyllum papillosum* (Zanardini ex Hauck) Foslie, according to Huvé (272) and Babbini & Bressan (753: 307), but see comments.

COMMENTS. Conclusion of Huvé (272) based on study of L lectotype (Woelkerling & Verheij, 1995) from the Adriatic Sea; placement in *Lithophyllum* as delimited by Woelkerling & Campbell (1992) and Woelkerling (1996*a*), however, requires confirmation; additional comments provided by John et al. (1994: 63) and Woelkerling (1988: 216–217).

papillosum var. **cystoseirae (Dermatolithon, Titanoderma)**

SERIES REFERENCES. John et al., 1994: 61 (under *Lithophyllum cystoseirae*); this paper (under *Titanoderma cystoseirae*).

CURRENT PLACEMENT/NAME. Homotypic synonym of *Lithophyllum cystoseirae* (Hauck) Heydrich.

COMMENTS. See comments under entry for '*cystoseirae*' above and those by Babbini & Bressan (753: 307).

philippii (Lithothamnion, Mesophyllum)

SERIES REFERENCE. John et al., 1994: 68, 75.

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; TRH lectotype (Woelkerling, 678: 171) from Italy not studied in detail in a modern context; additional comments provided by John et al. (1994: 68).

phyllactidium (Hapalidium)

SERIES REFERENCE. Lawson et al., 1995: 106 (under *Pneophyllum confervicolum*).

CURRENT PLACEMENT/NAME. Superfluous name for *Phyllactidium confervicola* Kützing [basionym of *Pneophyllum confervicola* (Kützing) Y.M. Chamberlain], according to Woelkerling & Verheij (1995: 69).

COMMENTS. Nomenclatural data provided by Woelkerling & Verheij (1995); also see entry under '*confervicola*' above.

polycephalum (Dermatolithon, Goniolithon, Lithophyllum, Titanoderma)

SERIES REFERENCES. Price et al., 1986: 86; Price et al., 1988: 231; John et al., 1994: 64; this paper.

CURRENT PLACEMENT/NAME. *Lithophyllum polycephalum* Foslie, according to Woelkerling & Campbell (1992: 22–23).

COMMENTS. Conclusion of Woelkerling & Campbell (1992) based on examination of TRH holotype (Woelkerling, 678: 174) from the Cape Verde Islands; additional data on holotype provided by Chamberlain (737, as *Titanoderma*).

polyclonum (Dermatolithon, Lithophyllum, Titanoderma)

SERIES REFERENCES. Price et al., 1986: 86; John et al., 1994: 64; this paper.

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; TRH holotype (Woelkerling, 678: 175) fragmentary and not studied in detail in a modern context.

polymorphum (Lithothamnion, Phymatolithon)

SERIES REFERENCES. John et al., 1994: 68; Lawson et al., 1995: 103. Current placement/name: Superfluous name; see comments.

COMMENTS. *Phymatolithon polymorphum* (L.) Foslie, based on *Millepora polymorpha* L., is a superfluous name for *Phymatolithon calcareum* (Pallas) W.H. Adey & D.L. McKibbin; details provided by Woelkerling & Irvine (1986*a*); epithet *polymorphum* widely misapplied (Woelkerling & Irvine, 1986*a*) to plants referable to *Phymatolithon purpureum* (P. & H. Crouan) Woelkerling & L. Irvine (see entry for *purpureum* below).

polymorphum f. **sublaevis (Phymatolithon)**

SERIES REFERENCE. Lawson et al., 1995: 103.

CURRENT PLACEMENT/NAME. Superfluous name for *Phymatolithon polymorphum* f. *papillata* Foslie, according to Woelkerling (678: 211); also see comments.

COMMENTS. Status and disposition of *Phymatolithon polymorphum* f. *papillata* Foslie uncertain; TRH lectotype (Woelkerling, 678: 168) from Helgoland, Germany not studied in detail in a modern context.

ponderosum (Lithophyllum, Lithothamnion)

SERIES REFERENCES. John et al., 1994: 62 (under *Lithophyllum incrustans*), 64, 68; this paper (under *Spongites africanum*).

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; TRH holotype (Woelkerling, 678: 168) from São Tomé not studied in detail in a modern context; additional comments provided by John et al. (1994: 68).

proboscideum (Lithophyllum)

SERIES REFERENCES. John et al., 1994: 64; this paper (under *Spongites africanum*).

CURRENT PLACEMENT/NAME. *Lithophyllum proboscideum* Foslie, according to Adey (1970: 5), but see comments.

COMMENTS. Status and disposition uncertain; conclusion of Adey (1970) requires verification via a modern, detailed study of the lectotype from California, U.S.A. in TRH (Woelkerling, 678: 176); comments on West African record provided in this paper under entry for *Spongites africanum*.

purpureum (Phymatolithon)

SERIES REFERENCE. Lawson et al., 1995: 103.

CURRENT PLACEMENT/NAME. *Phymatolithon purpureum* (P. & H. Crouan) Woelkerling & L. Irvine, according to Woelkerling & Irvine (1986*a*).

COMMENTS. Conclusion of Woelkerling & Irvine (1986*a*) based on study of CO lectotype from France.

pustulata/pustulatum (Dermatolithon, Lithophyllum, Melobesia, Titanoderma)

SERIES REFERENCES. Price et al., 1986: 86; John et al., 1994: 64, 72; this paper.

CURRENT PLACEMENT/NAME. *Lithophyllum pustulatum* (J.V. Lamouroux) Foslie, according to Woelkerling & Campbell (1992: 78).

COMMENTS. Conclusion of Woelkerling & Campbell (1992) based on study of CN lectotype from France and from earlier study of lectotype by Woelkerling et al. (1985).

pustulatum f. **australis (Lithophyllum)**

SERIES REFERENCE. John et al., 1994: 64 (under *Lithophyllum pustulatum*).

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; TRH lectotype (Woelkerling, 678: 35) from Canary Islands not studied in detail in a modern context.

racemus (Lithophyllum, Lithothamnion)

SERIES REFERENCES. John et al., 1994: 64, 67, 74 (under *Mesophyllum brachycladum*).

CURRENT PLACEMENT/NAME. *Lithophyllum racemus* (Lamarck) Foslie, according to Basso et al. (1996).

COMMENTS. Conclusion of Basso et al. (1996) based on the selection and study of a neotype (from Capri, Italy) housed at the Dipartimento di Scienze della Terra, Istituto di Geologia e Paleontologia, Universita di Milano, in Milano, Italy; heterotypic synonyms (according to Basso et al., 1996) include *Lithothamnion crassum* Philippi, *Lithothamnion calcareum* f. *crassa* (Philippi) Me. Lemoine, and *Lithophyllum duckeri* Woelkerling; all West African records under these names require checking to confirm identification as misapplication of epithets likely in some or all cases; further information on the Lamarck species provided by Woelkerling (729) under the basionym (*Millepora racemus*).

retusum (Lithophyllum)

SERIES REFERENCES. Lawson & John, 350: 237; Lawson & John, 586: 207; John et al., 1994: 65.

CURRENT PLACEMENT/NAME. *Lithophyllum retusum* (Foslie) Foslie, according to Adey (1970: 5), but see comments.

COMMENTS. Status and disposition uncertain, conclusion of Adey (1970) requires verification via a detailed modern study of holotype from São Tomé in TRH (Woelkerling, 678: 189); information on PC isotype provided by Woelkerling (730).

samoense (Hydrolithon)

SERIES REFERENCES. Not previously reported.

CURRENT PLACEMENT/NAME. *Hydrolithon samoense* (Foslie) Keats & Y.M. Chamberlain, according to Keats & Chamberlain (754: 15).

NEW RECORDS. Canaries (702;751).

COMMENTS. Conclusion of Keats & Chamberlain (754) based on study of TRH lectotype (Woelkerling, 678: 193) from Samoa.

sauvageauii (Litholepis, Lithoporella, Melobesia)

SERIES REFERENCES. John et al., 1994: 59, 66, 72.

CURRENT PLACEMENT/NAME. *Lithoporella sauvageauii* (Foslie) W.H. Adey, according to Adey (1970: 15), but see comments.

COMMENTS. Status and disposition uncertain; conclusion of Adey (1970) requires verification via a detailed modern study of holotype from the Canaries in TRH (Woelkerling, 678: 195).

simile (Lithophyllum)

SERIES REFERENCES. Lawson & John, 350: 237; Lawson & John, 586: 208; John et al., 1994: 65.

CURRENT PLACEMENT/NAME. *Lithophyllum simile* Foslie, according to Adey (1970: 6), but see comments.

COMMENTS. Status and disposition uncertain; conclusion of Adey (1970) requires verification via a detailed modern study of holotype from São Tomé in TRH (Woelkerling, 678: 201).

solmsiana (Melobesia)

SERIES REFERENCES. Lawson & John, 350: 234; John et al., 1994: 72. Current placement/name: Not determined; see comments.

COMMENTS. Status and disposition uncertain; whereabouts of type material uncertain; additional comments provided by John et al. (1994: 72, under *Melobesia solmsiana*), Chamberlain (94: 351, under *Fosliella farinosa* f. *callithamnioides*) and Taylor (1939, under *Fosliella farinosa* var. *solmsiana*).

solmsii (Melobesia)

SERIES REFERENCES. Price et al., 1986: 92 (under *Fosliella farinosa*); John et al., 1994: 72.

CURRENT PLACEMENT/NAME. Invalid name, according to Woelkerling (678).

COMMENTS. Original presentation lacks a description or diagnosis rendering name invalid (Woelkerling, 730); name possibly a variant of *Melobesia solmsiana*, but contrary to John et al. (1994: 72, under *Melobesia solmsii*), cannot be considered a homotypic synonym.

solutum (Lithophyllum, Lithothamnion, Mesophyllum)

SERIES REFERENCE. John et al., 1994: 65, 68, 75.

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; lectotype from Adriatic Sea in TRH (Woelkerling, 678: 203, under *Lithothamnion fruticulosum* f. *soluta*) not studied in detail in a modern context; additional comments provided by John et al. (1994: 68).

sonderi (Lithothamnion)

SERIES REFERENCE. John et al., 1994: 68.

CURRENT PLACEMENT/NAME. *Lithothamnion sonderi* Hauck, according to Chamberlain (750: 191).

NEW RECORD. Canaries (750).

COMMENTS. Conclusion of Chamberlain (750) based on detailed study of lectotype in L (Woelkerling & Verheij, 1995: 77) from Helgoland, Germany.

stictaeformis (Melobesia)

SERIES REFERENCE. John et al., 1994: 73.

CURRENT PLACEMENT/NAME. Not determined; see comments.

COMMENTS. Status and disposition uncertain; protologue (Areschoug, 1852: 517) based on mediterranean material not studied in detail in a modern context; possible syntype material in TRH (Woelkerling, 678: 207); additional material presumed but not confirmed to be in LD (John et al., 1994: 73). See also discussion in Babbini & Bressan (753: 130, under *Lithophyllum frondosum*).

subtenellum (Goniolithon, Lithophyllum, Lithothamnion)

SERIES REFERENCES. Lawson & John, 350: 238; Lawson & John, 586: 208; Price et al., 1988: 231; John et al., 1994: 65, 68.

CURRENT PLACEMENT/NAME. *Lithophyllum subtenellum* (Foslie) Foslie, according to Adey (1970: 6), but see comments and also Babbini & Bressan (753: 268, under *Lithothamnion orbiculatum*).

COMMENTS. Status and disposition uncertain; conclusion of Adey (1970) requires verification via a detailed modern study of lectotype from France in TRH (Woelkerling, 678: 215).

tenuissimum (Lithothamnion, Phymatolithon)

SERIES REFERENCES. Lawson & John, 350: 242; Lawson & John, 586: 212; John et al., 1994: 68; Lawson et al., 1995: 103.

CURRENT PLACEMENT/NAME. *Phymatolithon tenuissimum* (Foslie) W.H. Adey, according to Adey (1970: 29), but see comments.

COMMENTS. Status and disposition uncertain; conclusion of Adey (1970) requires verification via a detailed modern study of holotype from São Tomé in TRH (Woelkerling, 678: 222); additional comments provided by Lawson et al. (352: 103) and Babbini & Bressan (753: 268, under *Lithothamnion tenuissimum*).

thuretii (Choreonema)

SERIES REFERENCE. Price et al., 1986: 69.

CURRENT PLACEMENT/NAME. *Choreonema thuretii* (Bornet) F. Schmitz, according to Woelkerling (1987).

COMMENTS. Conclusion of Woelkerling (1987) based on study of PC lectotype (Woelkerling, 730, under the basionym, *Melobesia thuretii* Bornet) from France.

tortuosa/tortuosum (Lithophyllum, Tenarea)

SERIES REFERENCES. Lawson & John, 350: 238; Lawson & John, 586: 210; John et al., 1994: 65; this paper.

CURRENT PLACEMENT/NAME. *Tenarea tortuosa* (Esper) Me. Lemoine, according to Woelkerling et al. (1985).

COMMENTS. Conclusion of Woelkerling et al. (1985) based on a detailed study of the FR lectotype from an unspecified locality in the Mediterranean Sea; additional comments provided under entry for *Tenarea tortuosa* in main part of this paper. Babbini & Bressan (753: 116, 192) cite *Tenarea tortuosa* (Esper) Me. Lemoine as an accepted species and as a synonym under *Lithophyllum lichenoides*.

vickersiae (Lithophyllum, Lithothamnion, Pseudolithophyllum)

SERIES REFERENCES. John et al., 1994: 65, 68; Lawson et al., 1995: 113.

CURRENT PLACEMENT/NAME. *Lithophyllum vickersiae* Me. Lemoine, but see comments.

COMMENTS. Status and disposition uncertain; placement here in *Lithophyllum* based on data on type material provided by Afonso-Carrillo (11: 139, as *Pseudolithophyllum*); protologue (Lemoine, 362: 42) based on seven collections from Canary Islands (all presumably in C) but lectotype not yet designated or studied in detail in a modern context; additional comments provided by John et al. (1994: 65).

wildpretii (Spongites)

See under *Spongites wildpretii*.

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NUMERICAL LIST OF REFERENCES

2 Acuña Gonzáles, 1970
5 Acuña Gonzáles et al., 1970
6 Adey & Lebednik, 1967
8 Afonso-Carrillo, 1980*a*
9 Afonso-Carrillo, 1980*b*
11 Afonso-Carrillo, 1984
13 Afonso-Carrillo & Gil-Rodríguez, 1980
16 Afonso-Carrillo et al., 1979
17 Afonso-Carrillo, Gil-Rodríguez & Wildpret de la Torre, 1984
18 Afonso-Carrillo, Gil-Rodríguez, Haroun Tabraue, Villena Balsa & Wildpret de la Torre, 1984
20 Agardh, 1824
21 Agardh, 1828
25 Agardh, 1852
26 Agardh, 1863
27 Agardh, 1876
30 Aleem, 1978
33 Ardré, 1970
34 Ardré, 1980
36B Wynne, 1986
37 Askenasy, 1888
38 Askenasy, 1897
38B Audiffred & Weisscher, 1984
38C Audiffred, 1985
38D Audiffred & Prud'homme van Reine, 1985
39 Baardseth, 1941
41 Barton, 1897
42 Barton, 1901
44 Benítez, 1928
48 Bodard, 1965
49 Bodard, 1966*a*
50 Bodard, 1966*b*
55 Bodard, 1971*a*
57 Bodard, 1971*b*
58 Bodard, 1971*c*
59 Bodard & Mollion, 1974
60 Børgesen, 1916
61 Børgesen, 1917
63 Børgesen, 1919
66 Børgesen, 1925
68 Børgesen, 1927
70 Børgesen, 1929
71 Børgesen, 1930
72 Børgesen, 1931
83 Børgesen, 1945
89 Bornet, 1892
90 Bory de St. Vincent, 1803
93 Carpine, 1959
94 Chamberlain, 1983
97 Chapman, 1963
99 Chevalier, 1920
100 Chevalier, 1935
105 Cinelli & Codomier, 1974
107 Colman & Stephenson, 1966
108 Cordeiro-Marino, 1978
113 Cribb, 1983
115 Cullinane & Whelan, 1982
117 Dangeard, 1948
118 Dangeard, 1949
122 Dangeard, 1952
123 Dangeard, 1958
124 Dawson, 1956
128A Delgado et al., 1986
129 De May et al., 1977
131 De Toni, 1897
133 De Toni, 1903
134 De Toni, 1905
138 De Toni, 1910
139 De Toni, 1924
140 De Toni & Forti, 1913
141A De Toni & Levi, 1888
145 Dickie, 1874
150 Dickie, 1877
153 Dickinson & Foote, 1950
154 Dickinson & Foote, 1951
167 Dinter, 1926
169 Dinter, 1927
172 Dixon & Irvine, 1977
177 Edelstein, 1964
179 Falkenberg, 1901
182 Feldmann & Bodard, 1965
183 Feldmann, 1935
184 Feldmann, 1937
186 Feldmann, 1938
187 Gabrielson, 1985
188 Feldmann, 1939

189 Feldmann, 1941
190 Feldmann, 1942
191 Feldmann, 1946
192 Feldmann, 1951
194 Feldmann & Hamel, 1934
196 Feldmann-Mazoyer, 1941
197 Foslie, 1897
198 Foslie, 1900*a*
199 Foslie, 1900*b*
205 Foslie, 1906
206 Foslie, 1907*a*
207 Foslie, 1907*b*
209 Foslie, 1908*a*
210 Foslie, 1908*b*
211 Foslie, 1909
212 Printz, 1929
214 Frémy, 1936
217 Ganesan & West, 1975
222 Gayral, 1966
225 Gil-Rodríguez, 1980
226 Gil-Rodríguez & Afonso-Carrillo, 1980
227 Gil-Rodríguez & Afonso-Carrillo, 1981
229 Gil-Rodríguez & Wildpret de la Torre, 1980*a*
230 Gil-Rodríguez & Wildpret de la Torre, 1980*b*
231 Gil-Rodríguez et al., 1978
232B Gil-Rodríguez et al., 1985
235 Gonzalez Henriquez, 1976
236 Gonzales, 1977*a*
237 Gonzales, 1977*b*
239 Goor, 1923
240 Gordon, 1972
249 Hariot, 1895
250 Hariot, 1896
251 Hariot, 1908
252 Hariot, 1911
253 Haroun Tabraue et al., 1984
254 Harvey, 1846-1851
259 Hemsley, 1885
261 Henriques, 1885
263 Henriques, 1886
264 Henriques, 1887
265 Henriques, 1917
266 Heydrich, 1894
268 Hooker & Harvey, 1847
269 Hoppe, 1969
271 Hornemann, 1819
271A Huisman, 1985
272 Huvé, 1962
273 Irvine, 1983
281 Kylin, 1956
286 John, 1972*a*
287 John, 1972*b*
288 John, 1977
290 John, 1986
292 John & Lawson, 1972*a*
293 John & Lawson, 1972*b*
294 John & Lawson, 1974
295 John & Lawson, 1977*a*
296 John & Lawson, 1977*b*
297 John & Pople, 1973
299 John et al., 1977
300 John et al., 1980
302 Johnston, 1969*a*
304 Johnston, 1969*b*
306 Johnstone & Croall, 1859
306B Jorge et al., 1986
311 Karsakoff, 1896
312A Kensley & Penrith, 1980
316 Kützing, 1843
318 Kützing, 1849
320 Kützing, 1862
323 Kützing, 1865
329 Kylin, 1932
336 Lawson, 1954
338 Lawson, 1956
339 Lawson 1957*a*
340 Lawson, 1957*b*
341 Lawson, 1960
344 Lawson, 1966
346 Lawson, 1980*a*
347A Lawson, 1985
348 Lawson et al., 1990
349 Lawson & John, 1977
350 Lawson & John, 1982
351 Lawson & Norton, 1971
352 Lawson et al., 1975
353 Lemoine, 1911
354 Lemoine, 1912
356 Lemoine, 1915
359 Lemoine, 1924
360 Lemoine, 1926
361 Lemoine, 1928
362 Lemoine, 1929*a*
363 Lemoine, 1929*b*
365 Lemoine, 1935
366 Lemoine, 1964
367 Lemoine, 1965
368 Lemoine, 1966
371 Lemoine, 1974
375 Levring, 1974
376 Lieberman et al., 1979
377 Lieberman et al., 1984
379 López Hernández & Gil-Rodríguez, 1982
380 López Hernández et al., 1986
387 May, 1912
389 Mazza, 1903
390 Mazza, 1905-1925
392 Meñez & Mathieson, 1981
397 Mildbread, 1922
399 Mollion, 1976
401 Montagne, 1839-1841
402 Montagne, 1842
407 Montagne, 1856
408 Montagne, 1860
410 Murray, 1888-1889
411 Naegelé, 1960
417A Norris & Aken, 1985
430 Papenfuss, 1944
432 Papenfuss, 1964
434 Papenfuss, 1968
439 Piccone, 1884
448 Piccone, 1889
450 Piccone, 1900
451 Piccone, 1901
453 Pilger, 1908
455 Pilger, 1919
456 Pilger, 1920
457 Pilger, 1922
474 Price & John, 1978
475 Price & John, 1980
477 Prud'homme van Reine, 1984
482 Reinbold, 1907
487 Round, 1981
489 Santos Guerra, 1972
490 Santos Guerra et al., 1970
491 Sanusi, 1980
493 Sauvageau, 1912
496 Schmidt, 1924
498 Schmidt, 1929
499 Schmidt, 1931
500 Schmidt & Gerloff, 1957
501 Schmitz & Falkenberg, 1897
502 Schmitz & Hauptfleisch, 1896-1897
512 Schneider, 1983
516 Seoane-Camba, 1960
517 Seoane-Camba, 1965
523 Simons, 1974
528 Sonder, 1852
529 Sourie, 1954
532 South & Whittick, 1976
535 Steentoft, 1967
537 Stephenson & Stephenson, 1972
538 Svedelius, 1911
542 Trochain, 1940
543 Tseng, 1944
546 Varo et al., 1979
547 Vickers, 1897
553 Weber-van Bosse, 1921
555 Weisscher, 1982
556 Weisscher, 1983
559 Wollaston, 1984
562 Wynne & Taylor, 1973
565A Yarish et al., 1985
569 Anderson & Bolton, 1985
570 Seagrief, 1984
572 Chang & Xia, 1963
576 Afonso-Carrillo, 1985
582 Afonso-Carrillo et al., 1985
583 Haroun Tabraue et al., 1985
584 Ribera Siguán et al., 1985
586 Lawson & John, 1987
589 Guiry, 1984
590 John & Lawson (unpublished)
596 Bailey & Harvey, 1862
597 Prud'homme van Reine & Lobin, 1986
598 Prud'homme van Reine (*in litt.*, 10 April 1987)
624 Marcot-Coqueugniot, 1991
625 Prud'homme van Reine & van den Hoek, 1988
633 Pinedo et al., 1992
634 Elejabeitia et al., 1992
635 Prud'homme van Reine (*in litt.*, Heincke Expedition, 1991)

639 Prud'homme van Reine & Pakker (*in litt.*, 1991)
644 Lawson et al., 1993
646 Sansón et al., 1991
648 Ballesteros et al., 1992
649 Irvine & Chamberlain, 1994
652 Otero-Schmitt & Sanjuan, 1992
654 John & Lawson, 1991
657 Afonso-Carrillo et al., 1992
662 Viera-Rodríguez et al., 1987
663 Prud'homme van Reine et al., 1994
664 Haroun et al., 1993
668 Athanasiadis, 1987
677 Romanes, 1916
678 Woelkerling, 1993
683 Otero-Schmitt, 1993
684 Kristiansen et al., 1993
685 Medina & Haroun, 1993
687 Reyes & Afonso-Carrillo, 1993
695 Hardy & Seku, 1993
698 Rojas-Gonzáles et al., 1994
699 Sansón & Reyes, 1995
701 Chamberlain & Irvine, 1994*b*
702 Chamberlain, 1994*b*
703 Evans et al., 1993
707 Stegenga et al., 1997
711 Maggs & Hommersand, 1993
712 Womersley, 1994
713 Otero-Schmitt, 1994
714 Codomier, 1973
716 Molloy, 1990
717 Febles et al., 1995
718 Ganesan, 1974
719 Maggs & Guiry, 1982*b*
720 Pakker & Breeman, 1996
721 Martin et al., 1996
722 Harper & Garbary, 1997
724 Reyes et al., 1993
726 Afonso-Carrillo et al., 1993
729 Woelkerling, 1998*a*
730 Woelkerling, 1998*b*
732 Gabrielson & Hommersand, 1982
733 Afonso-Carrillo, 1988
734 Pérez & Afonso-Carrillo, 1993
736 Chamberlain & Irvine, 1994*a*
737 Chamberlain, 1996
738 Chamberlain, 1994*a*
740 Reyes & Afonso-Carrillo, 1995
742 Chamberlain & Keats, 1995
743 Chamberlain & Keats, 1994
744 Reyes et al., 1988
745 Reyes & Sansón, 1991
746 Silva et al., 1996
747 Guadeloupe González et al., 1995
748 Soler-Onís et al., manuscript
749 Soler-Onís et al., 1995
750 Chamberlain, 1992
751 Sansón & Reyes, 1996
752 Reyes & Sansón, 1996
753 Babbini & Bressan, 1997
754 Keats & Chamberlain, 1994*a*
755 Keats & Chamberlain, 1994*b*
756 Barabara et al., 1992

REFERENCES

Acuña González, A. 1970. Algunos aspectos de la vegetación submarina de las Islas Canarias. *Vieraea*[**1**]: 2–5.

—— **Santos Guerra, A. & Wildpret de la Torre, W.** 1970. Algunos aspectos de la vegetación algal de la Playa de San Marcos, Icod, Tenerife. *Cuadernos Botanica el Museo Canaria* **9**: 30–36.

Adey, W.H. 1970. A revision of the Foslie crustose coralline herbarium. *Kongelige Norske Videnskabernes Selskabs Skrifter* **1970**(1): 1–46.

—— **& Lebednik, P.A.** 1967. *Catalog of the Foslie Herbarium.* Trondheim.

——— **Townsend, R.A. & Boykins, W.T.** 1982. The crustose coralline algae (Rhodophyta: Corallinaceae) of the Hawaiian Islands. *Smithsonian Contributions to Marine Science* **15**: i–iv, 1–74.

Afonso-Carrillo, J. 1980*a*. Algunas observaciones sobre la distribución vertical de las algas en la isla del Hierro (Canarias). *Vieraea* **10**: 3–16.

—— 1980*b*. Nota sobra algunas Corallinaceae (Rhodophyta) nuevas para la flora ficológica de las Islas Canarias. *Vieraea* **10**: 53–58.

—— 1984 ['1983']. Estudios en las algas Corallinaceae Rhodophyta) de las Islas Canarias. II. Notas taxonómicas. *Vieraea* **13**: 127–144.

—— 1985. Conexiones intercelulares entre diferentes talos de *Neogoniolithon absimile* (Foslie et Howe) Cabioch (Corallinaceae, Rhodophyta). *Vieraea* **15**: 139–142.

—— 1988. Structure and reproduction of *Spongites wildpretii* sp. nov. (Corallinaceae, Rhodophyta) from the Canary Islands, with observations and comments on *Spongites absimile* comb. nov. *British Phycological Journal* **23**: 89–102.

—— **Chacana, M. & Sanson, M.** 1993. Morphology and anatomy of *Spongites africanum* comb. nov. (Corallinaceae, Rhodophyta) from the Cape Verde Islands. *Courier Forschungsinstitut Senckenberg* **159**: 133–137.

—— **& Gil-Rodríguez, M.C.** 1980. Datos para la flora marina de la Isla de Fuerteventura. *Vieraea* **10**: 147–170.

—— —— **Haroun Tabraue, R., Villena Balsa, M. & Wildpret de la Torre, W.** 1984 ['1983']. Adiciones y correcciones al catálogo de algas marinas bentónicas para el Archipiélago Canario. *Vieraea* **13**: 27–49.

—— —— **& Wildpret de la Torre, W.** 1979 ['1978']. Estudio de la vegetación algal de la costa del futuro polígono industrial de Granadilla (Tenerife). *Vieraea* **8**: 201–242.

—— —— —— 1984 ['1983']. Estudios en las algas Corallinaceae (Rhodophyta) de las Islas Canarias. I.Aspectos metodológicos. *Vieraea* **13**: 113–125.

—— —— —— 1985 ['1984']. Algunas consideraciones floristicas, corologicas y ecologicas sobre las algas Corallinaceae (Rhodophyta) de las Islas Canarias. *Anales Biologia Universidad de Murcia* **2** (Sección especial, 2): 23–37.

—— **Pinedo, A. & Elajabeitia, Y.** 1992. Notes on the benthic algae of the Canary Islands. *Cryptogamie Algologie* **13**: 281–290.

Agardh, C.A. 1824. *Systema algarum.* Lundae.

—— 1828. *Species algarum rite cognitae . . .* **2**(1). Gryphiae.

Agardh, J.G. 1851. *Species genera et ordines algarum . . . floridearum . . .* **2**(I). Lundae. *Note*. Facsimile reprint, J. Cramer, 1977.

—— 1852. *Species genera et ordines algarum . . . floridearum . . .* **2**(2). Lundae. *Notes*. i) The Corallineae (Ordo XII. pp. 506–576) was by J.E. Areschoug. ii) Some versions of this second volume, Pars II, were issued as two separate texts – Pars II:1 being dated 1851 and Pars II:2 1852. iii) There are also internal differences of numbering of pages between copies. BM copy is numbered straight through from 337–720, including therein the Addenda [701–706] and Index [707–720]. In the copy from which the Cramer (1977) reprint was prepared, the Index [unnumbered, of 14 sides] is placed immediately after p. 700 and is followed by six sides [also unnumbered] of Addenda. Content of these unnumbered sides is exactly as the numbered BM pages. The BM copy of Vol. 2 Part 3 (1863) commences with pages headed 'Ordo XIV. Wrangelieae', and numbered 701–715; these are followed by 'Ordo XV. Chondrieae' [pp. 716–786]. All these latter pages [701–786], also so numbered, are in the Cramer (1977) version placed immediately after the unnumbered Addenda pages (see above) and before the title page to Vol. 2, Part 3, of 1863, thereby implying that the copy facsimiled was also so arranged. Pages from 787 to 1291 are in both cases in Vol. 2, Part 3, 1863. According to Stafleu & Cowan (1976. *Taxonomic literature,* 2nd ed., **1**: A–G. Utrecht), however, the pages 701–786 were already published in 1852, which means that all *Laurencia* names were published in 1852, not in 1863. Despite this, the Index in the end of the Cramer (1977) facsimile of Vol. 2, Part 3 (pp. 1279–1291) indicates the same page numbers as does the BM version. Both dated texts are indicated as the sources of data where the records occur in pp. 701– 786 [textual pages]. The implication behind all this is that there may be yet other differently paged versions elsewhere.

—— 1863. *Species genera et ordines algarum . . . floridearum . . .* **2**(3). Lundae. *Note*. See notes under J.G. Agardh (1852).

—— 1876. *Species genera et ordines algarum . . . De Florideis curae posteriores. Epicrisis systematis floridearum.* **3**(1). Lipsiae.

Aleem, A.A. 1978. A preliminary list of marine algae from Sierra Leone. *Botanica Marina* **21**: 397–399.

Anderson, R.J. & Bolton, J.J. 1985. Suitability of the agarophyte *Suhria vittata* (L.) Ag. (Rhodophyta: Gelidiaceae) for mariculture: oceanographical distribution, reproductive phenology and growth of sporelings. *South African Journal of Marine Science* **3**: 169–178.

Ardré, F. 1970 ['1969–1970']. Contribution à l'étude des algues marines du Portugal 1 – La Flore. *Portugaliae Acta biologica* B, **10**: 137–555+[56]. *Note*. The reprint is paged 1–423+[56].

—— 1980. Observations sur le cycle de développement du *Schizymenia dubyi* (Rhodophycée, Gigartinale) en culture, et remarques sur certains genres de Némastomacées. *Cryptogamie Algologie* **1**: 111–140.

Areschoug, J.E. 1852. Ordo XII. Corallinaceae. *In* J. G. Agardh, *Species, genera, et ordines algarum* **2**(2): 506–576. Lundae.

Askenasy, E. 1888 ['1889']. Algen, mit Unterstützung der Herren E. Bornet, A. Grunow, P. Hariot, M. Moebius, O. Nordstedt bearbeitet. *In* A. Engler, *Die Forschungsreise S.M.S. 'Gazelle' in den Jahren 1874 bis 1876 unter Kommando des Kapitän zur See Freiherrn von Schleinitz herausgegeben von dem Hydrographischen Amt des Reichs-Marine-Amts.* IV. Theil. *Botanik*: 1–58, tafs I–XII. Berlin. *Note*. Publication of the algal section was definitely in 1888, since it was noted in *Natura Novitates, Berlin*, No. 21, October 1888, p. 328. The overall title page for Theil IV was issued 1889 and since the whole Theil seems also to have been issued

in soft covers (also dated 1889), the algal portion was probably reissued on that date.
—— 1897. Enumération des algues des îles du Cap Vert. *Boletim da Sociedade Broteriana* **13**: 150–175.
Athanasiadis, A. 1987. *A survey of the seaweeds of the Aegean Sea with taxonomic studies on species of the Tribe Antithamnieae (Rhodophyta).* Ph.D. dissertation, University of Gothenberg, Sweden.
—— 1989. North Aegean marine algae. III. Structure and development of the encrusting coralline *Titanoderma cystoseirae* (Rhodophyta, Lithophylloideae). *Nordic Journal of Botany* **9**: 435–441.
—— 1995. Morphology, anatomy and reproduction of the eastern Mediterranean coralline *Tenarea tortuosa* and its relationship to members of the Lithophylloideae and Mastophoroideae (Rhodophyta, Corallinales). *Nordic Journal of Botany* **15**: 655–663.
Audiffred, P.A.J. 1985 ['1984']. Marine algae of El Hierro (Canary Islands). *Vieraea* **14**: 157–183.
—— **& Prud'homme van Reine, W.F.** 1985. Marine algae of Ilha do Porto Santo and Deserta Grande (Madeira Archipelago). *Boletim do Museu Municipal do Funchal* **37**: 20–51.
—— **& Weisscher, F.L.M.** 1984. Marine algae of Selvagem Grande (Salvage Islands, Macaronesia). *Boletim do Museu Municipal do Funchal* **36**: 5–37.
Baardseth, E. 1941. *The marine algae of Tristan da Cunha*. Results of the Norwegian Scientific Expedition to Tristan da Cunha 1937–1938. No. 9. Oslo.
Babbini, L. & Bressan, G. 1997. Recensement de Corallinacées de la Mer Méditerranées et considerations phytogéographiques. *Bibliotheca Phycologica* **103**: 1–421.
Bailey, J.W. & Harvey, W.H. 1862. Algae. *In* Anon., *United States Exploring Expedition. During the years 1838–1842, under the command of Charles Wilkes, U.S.N.* **17,** *Botany*. 1. *Lower Cryptogamia:* 153–192, pls I–IX. Philadelphia.
Ballesteros, E., Sansón, M., Reyes, J., Afonso-Carrillo, J. & Gil-Rodríguez, M.C. 1992. New records of benthic marine algae from the Canary Islands. *Botanica Marina* **35**: 513–522.
Barbara, I., Crenades, J. & Lopez Rodriguez, M.C. 1992. *Tiffaniella capitatum* (Ceramiaceae, Rhodophyta) en las costas atlánticae de Europa. *Cryptogamie Algologie* **13**(4): 291–299.
Barton, E.S. 1897. Welwitsch's African marine algae. *Journal of Botany, London* **35**: 369–374.
—— 1901. Marine algae. *In* Anon. [W.P. Hiern?], *Catalogue of the African plants collected by Dr. Friedrich Welwitch in 1853–61.* **2**(2). *Cryptogamia*: 324–328. London.
Basso, D., Fravega, P. & Vannucci, G. 1996. Fossil and living corallinaceans related to the Mediterranean endemic species *Lithphyllum racemus* (Lamarck) Foslie. *Facies* **35**: 275–292, pls 63–67.
Benítez, A.J. 1928(?). *Historia de las Islas Canarias (Edición ilustrada)* **[1]**. Santa Cruz de Tenerife.
Note. The work does not appear to be dated but the BM copy was received 3 July 1928 and 1928 has been impressed on the spine. The flora, entitled 'Fitografia Canaria . . . ' and appearing on pp. 137–144, appears simply to be a list of plant names taken from Montagne (401) in Barker-Webb & Berthelot (q.v.). The reference to 'vol. I' indicates simply that only the first 528 of a total of more than 1000 pages were published.
Bivona-Bernardi, A. 1822. *Scinaia*, algarum marinarum novum genus. *L'Iride, Giornale di Scienze, Letteratura ed Arti per Sicilia* **1**: 232–234.
Bodard, M. 1965. Le *Gracilaria occidentalis* (Borg.): une espèce de Rhodophycée pantropicale Atlantique. *Bulletin du Musée National d'Histoire Naturelle. Paris II,* **36**: 874–878.
—— 1966*a*. Sur le développement des tetrasporocystes d'*Anatheca montagnei* Schmitz [Solieriacées, Gigartinales]. *Bulletin de l'Institut Fondamental d'Afrique Noire* A, **28**: 867–894.
—— 1966*b*. Première liste des espèces d'algues présentes sur la Pointe de Sarène (Sénégal). *Notes Africains* **111**: 81–89.
—— 1971*a*. *Halymenia senegalensis*, nov. sp. [Algae], espèce caractéristique de l'infralittoral Sénégalais. *Bulletin de l'Institut Fondamental d'Afrique Noire* A, **33**: 1–19.
—— 1971*b*. Sur un genre nouveau de Delesseriacées: *Pseudobranchioglossum senegalense*, algue de l'infralittoral sénégalais. *Bulletin de l'Institut Fondamental de l'Afrique Noire* A, **33**: 20–31.
—— 1971*c*. Étude morphologique et cytologique d'*Helminthocladia senegalensis* (Rhodophycées, Nemalionale nouvelle à carpotétraspores et à cycle haplodiplophasique. *Phycologia* **10**: 361–374.
—— **& Mollion, J.** 1974. La végétation infralittorale de la petite côte sénégalaise. *Bulletin Société Phycologique de France* **19**: 193–221.
Børgesen, F. 1916. The marine algae of the Danish West Indies 2. Rhodophyceae [pt. 2]. *Dansk Botanisk Arkiv* **3**(1b): 81–144.
—— 1917. The marine algae of the Danish West Indies 2. Rhodophyceae [pt. 3]. *Dansk Botanisk Arkiv* **3**(1c): 145–240.
—— 1919. The marine algae of the Danish West Indies 2. Rhodophyceae [pt. 5]. *Dansk Botanisk Arkiv* **3**(1c): 305–368.
—— 1925. Marine algae from the Canary Islands, especially from Teneriffe and Gran Canaria I. Chlorophyceae. *Biologiske Meddelelser* **5**(3): 1–123.
—— 1927. Marine algae from the Canary Islands, especially from Teneriffe and Gran Canaria III. Rhodophyceae. Part 1 Bangiales and Nemalionales. *Biologiske Meddelelser* **6**(6): 1–97.
—— 1929. Marine algae from the Canary Islands, especially from Teneriffe and Gran Canaria. III. Rhodophyceae. Part II Cryptonemiales, Gigartinales and Rhodymeniales. Les Mélobésiées by Mme Paul Lemoine. *Biologiske Meddelelser* **8**(1): 1–97+[9].
—— 1930. Marine algae from the Canary Islands, especially from Teneriffe and Gran Canaria III. Rhodophyceae. Part III Ceramiales. *Biologiske Meddelelser* **9**(1): 1–159.
—— 1931. Some Indian Rhodophyceae, especially from the shores of the Presidency of Bombay. *Bulletin of Miscellaneous Information Royal Botanic Gardens, Kew* **1931**(1): 1–24.
—— 1945. Some marine algae from Mauritius. III. Rhodophyceae. Part 4 Ceramiales. *Biologiske Meddelelser* **19**(10): 1–68.
Bornet, É. 1892. Les algues de P.–K.–A. Schousboe. *Mémoirs de la Société National des Sciences Naturelles et Mathematiques de Cherbourg* **28**: 165–376.
Note. Also published in Paris as a separate, with new prefatory pages, dated 1892, and bearing two sets of pagination; the original as in the journal and a repagination from p. 1 to 216. Because of the prefatory pages, the original p. 165 becomes p. 5.
Bory de St-Vincent, J.B.G.M. 1803. *Essais sur les Isles Fortunées et l'antique Atlantide, ou précis de l'histoire générale de l'Archipel des Canaries*. Paris.
Boudouresque, C.-F., Perret-Boudouresque, M. & Knoepffler- Péguy, M. 1984. Inventaire des algues marines benthiques dans les Pyrénées-Orientales Mediterranées, France). *Vie et Milieu* **34**: 41–59.
Braga, J.C. & Aguirre, J. 1995. Taxonomy of fossil coralline algal species: Neogene Lithophylloideae (Rhodophyta, Corallinaceae) from southern Spain. *Revue Palaobotanique et Palynologique* **86**: 265–285.
Brummitt, R.K. & Powell, C.E. (Eds) 1992. *Authors of plant names*. Kew.
Cabioch, J. 1972. Étude sur les Corallinacées. II. La morphogènese, conséquences systématiques et phylogénétiques. *Cahiers de Biologie Marine* **13**: 137–288.
Campbell, S.J. & Woelkerling, W.J. 1990. Are *Titanoderma* and *Lithophyllum* (Corallinaceae, Rhodophyta) distinct genera? *Phycologia* **29**: 14–125.
Carpine, C. 1959. Aperçu sur les peuplements littoraux. *In* J. Forest, Campagne de la Calypso dans le golfe de Guinée et aux îles Príncipe, São Tomé, Annobón (1956). *Annales de l'Institut Océanographique, Monaco* **37**: 1–244.
Chamberlain, Y.M. 1983. Studies in the Corallinaceae with special reference to *Fosliella* and *Pneophyllum* in the British Isles. *Bulletin of the British Museum (Natural History)*, Botany, **11**: 291–463.
—— 1985. The typification of *Melobesia membranacea* (Esper) Lamouroux (Rhodophyta, Corallinaceae). *Taxon* **34**: 673–677.
—— 1990. The genus *Leptophytum* (Rhodophyta, Corallinaceae) in the British Isles with descriptions of *Leptophytum bornetii, L. elatum* sp. nov. and *L. laeve*. *British Phycological Journal* **25**: 179–199.
—— 1991. Historical and taxonomic studies in the genus *Titanoderma* (Rhodophyta, Corallinales) in the British Isles. *Bulletin of the British Museum (Natural History)*, Botany, **21**: 1–80.
—— 1992. Observations on two melobesioid crustose coralline red algal species from the British Isles: *Exilicrusta parva,* a new genus and species, and *Lithothamnion sonderi* Hauck. *British Phycological Journal* **27**: 185–201.
—— 1994*a*. *Pneophyllum coronatum* (Rosanoff) D. Penrose comb. nov., *P. keatsii* sp. nov., *Spongites discoideus* D. Penrose et Woelkerling and *S. impar* (Foslie) Chamberlain comb. nov. (Rhodophyta, Corallinaceae) from South Africa. *Phycologia* **33**: 141–157.
—— 1994*b*. Mastophoroideae. *In* L.M. Irvine & Y.M. Chamberlain (Eds), *Seaweeds of the British Isles*. **1**(2B): 113–158. London.
—— 1996. Lithophylloid Corallinaceae (Rhodophyta) of the genera *Lithophyllum* and *Titanoderma* from southern Africa. *Phycologia* **35**: 204–221.
—— **& Irvine, L.M.** 1994*a*. Lithophylloideae Setchell. *In* L.M. Irvine & Y.M. Chamberlain (Eds), *Seaweeds of the British Isles.* **1**(2B): 58–112. London.
—— —— 1994*b*. Melobesioideae Bizzozero. *In* L.M.Irvine & Y.M. Chamberlain (Eds), *Seaweeds of the British Isles*. **1**(2B): 159–234. London.
—— —— **& Walker, R.** 1988. A redescription of *Lithophyllum crouanii* (Rhodophyta, Corallinales) in the British Isles with an assessment of its relationships to *L. orbiculatum*. *British Phycological Journal* **23**: 177–192.
—— —— —— 1991. A redescription of *Lithophyllum orbiculatum* (Rhodophyta, Corallinales) in the British Isles and a reassessment of generic delimitation in the Lithophylloideae. *British Phycological Journal* **26**: 149–167.
—— **& Keats, D.W.** 1994. Three melobesioid crustose coralline red algae from South Africa: *Leptophytum acervatum* (Foslie) comb. nov., *L. foveatum* sp. nov. and *L. ferox* (Foslie) comb. nov. *Phycologia* **33**: 111–133.
—— —— 1995. The melobesioid alga *Mesophyllum engelhartii* (Rhodophyta, Corallinaceae) in South Africa. *South African Journal of Botany* **61**: 134–146.
—— **& Norris, R.E.** 1994. *Pneophyllum amplexifrons* (Harvey) comb. nov., a mastophoroid crustose coralline red algal epiphyte from Natal, South Africa. *Phycologia* **33**: 8–18.
Chang, C.F. & Xia, B.M. 1963. *Polycavernosa*, a new genus of the Gracilariaceae. *Studies Marine Sinica* **3**: 119–126.
Chapman, V.J. 1963. The marine algae of Jamaica Part 2. Phaeophyceae and Rhodophyceae. *Bulletin of the Institute of Jamaica, Science Series* **12**(2): 1–195.

Chevalier, A. 1920. *Exploration botanique de l'Afrique occidentale Française. Tome I. Ennumération des plantes récoltées avec une carte botanique, agricole et forestière.* Paris.

—— 1935. Les Iles du Cap Vert. Géographie, biogéographie, agriculture flore de l'archipelago. *Revue de Botanique Appliquée et d'Agriculture Tropicale* **15**: 733–1090.

Cinelli, F. & Codomier, L. 1974. Note floristique et repartition de Rhodophycées rares (Kallymeniacées et Sebdeniacées) de la Mediterranée occidentale. *Giornale Botanica Italiano* **108**: 13–18.

Codomier, L. 1973. Caractères généraux et développement des spores de *Sebdenia dichotoma* (J. Ag.) Berthold (Rhodophycées, Gigartinales). *Phycologia* **12**: 97–105.

Colman, J.S. & Stephenson, A. 1966. Aspects of the ecology of a 'tideless' shore. *In* H. Barnes, *Some contemporary studies in marine sciences*: 163–170. London.

Cordeiro-Marino, M. 1978['1977']. Rodofíceas bentônicas marinhas do Estado de Santa Catarina. *Rickia* **7**: [6]+1–243.

Cribb, A.B. 1983. *Marine algae of the Southern Great Barrier Reef Part I Rhodophyta*. Australian Coral Reef Society, Handbook No. 2. Place of publication not given [presumably Brisbane].

Cullinane, J.P. & Whelan, P.M. 1982. The ecology and distribution of *Stenogramme interrupta* (C. Agardh) Montagne ex Harvey on the coast of Ireland. *Proceedings of the Royal Irish Academy* B, **81**: 111–116.

Dangeard, P. 1948. Sur la flore des algues marines du Maroc Occidental. *Compte Rendu Hebdomedaire Séances de l'Académie des Sciences, Paris* **227**: 364–365.

—— 1949. Les algues marines de la côte occidentale du Maroc. *Botaniste* **34**: 89–198.

—— 1952. Algues de la presqu'ile du Cap Vert (Dakar) et de ses environs. *Botaniste* **36**: 193–329.

—— 1958. Notice sur les travaux scientifiques (1931–1956) de M. Pierre Dangeard . . . *Botaniste* **42**, Supplément: [2]+1–98+[4].

Dawson, E.Y. 1956. Some marine algae from the southern Marshall Islands. *Pacific Science* **10**: 25–66.

Delgado, E., Gonzales, M.N. & Jorge, D. 1986 ['1984'].Contribución al estudio de la vegetación ficológica de la zona de Arinaga (Gran Canaria). *Botanica Macaronesica* **12–13**: 97–110.

De May, D., John, D.M. & Lawson, G.W. 1977. A contribution to the littoral ecology of Liberia. *Botanica Marina* **20**: 41–46.

De Toni, G.B. 1897. *Sylloge algarun omnium hucusque cognitarum* . . . **4.** *Sylloge floridearum* . . . Sectio I – Familiae I–XI. Patavii.

—— 1903. *Sylloge algarum omnium hucusque cognitarum* . . . **4.** *Sylloge floridearum* . . . Sectio III – Familiae V– VI. Patavii.

—— 1905. *Sylloge algarum omnium hucusque cognitarum* . . . **4.** *Sylloge floridearum* . . . Sectio IV – Familiae I– II. Patavii..

—— 1910. Litteratura phycologica florae et miscellanea phycologica. *Nuova Notarisia* **21**: 40–54.

—— 1924. *Sylloge algarum omnium hucusque cognitarum* . . . **6.** *Sylloge floridearum* . . . Sectio V. *Additamenta*. Patavii.

—— **& Forti, A.** 1913. Contribution à la flore algologique de la Tripolitaine et de la Cyrénaïque. *Annales de l'Institut Océanographique, Monaco* **5**(7): 1–56.

—— **& Levi, D.** 1888. *L'algarum Zanardini*. Venezia.

Dickie, G. 1874. Enumeration of algae collected at the Cape-Verde Islands by H.N. Moseley, M.A., Naturalist to H.M.S.'Challenger'. *Journal of the Linnean Society* (Botany) **14**: 344–349.

—— 1877. Supplemental notes on algae collected by H.N. Moseley, M.A., of H.M.S. 'Challenger' from various localities. *Journal of the Linnean Society* (Botany) **15**: 486–489.

Dickinson, C.I. & Foote, V.J. 1950. Marine algae from the Gold Coast I. *Kew Bulletin* **5**: 267–272.

—— —— 1951. Marine algae from the Gold Coast: II. *Kew Bulletin* **6**: 133–138.

Dinter, K. 1926. Index, der aus Deutsch-Südwestafrika bis zum Jahre 1917 bekannt gewordenen Pflanzenarten. XIX. *Repertorium Specierum Novarum Regni Vegetabilis* **22**: 375–383.

—— 1927. Index, der aus Deutsch-Südwestafrika bis zum Jahre 1917 bekannt gewordenen Pflanzenarten. XXII. *Repertorium Specierum Novarum Regni Vegetabilis* **23**: 363–371.

Dixon, P.S. & Irvine, L.M. 1970. Miscellaneous notes on algal taxonomy and nomenclature, III. *Botaniska Notiser* **123:** 474–487.

—— —— 1977. Rhodophyta Introduction, Nemaliales, Gigartinales. In *Seaweeds of the British Isles* **1**(1): xi+1–252. London.

Düwel, L. & Wegeberg, S. 1996. The typification and status of *Leptophytum* (Corallinaceae, Rhodophyta). *Phycologia* **35**: 470–483.
Note. Effective publication date: 26 September 1996 (stated on back cover of journal issue).

Edelstein, T. 1964. On the sublittoral algae of the Haifa Bay area. *Vie et Milieu* **15**: 177–212.

Elejabeitia, Y., Reyes, J. & Afonso-Carrillo, J. 1992. Algas marinas bentónicas de Punta del Hidalgo, Tenerife (Islas Canarias). *Vieraea* **21**: 1–28.

Evans, S.M., Gill, M.E., Hardy, F.G. & Seku, F.O.K. 1993. Evidence change in rocky shore communities on the coast of Ghana. *Journal of Experimental Marine Biology and Ecology* **172**: 129–141.

Falkenberg, P. 1901. Die Rhodomelaceen des Golfes von Neapel und der angrenzenden Meeresabschnitte. *Fauna e Flora des Golfes von Neapel* **26:** 1–754.

Febles, C.I., Arias, A., Gil-Rodríguez, M.C., Hardisson, A. & Sierra López, A. 1995. Estudio in vitro de la actividad antimicrobiana de algas (Chlorophyta, Phaeophyta y Rhodophyta) recolectados en el litoral de la isla de Tenerife. *Annuario del Instituto de Estudios Canarios* **34**: 181–192.

Feldmann, G. & Bodard, M. 1965. Une nouvelle espèce de *Botryocladia* des côtes du Sénégal. *Bulletin de l' Institut Océanographique, Monaco* **65**(1342): 1–14.

Feldmann-Mazoyer, G. 1941. *Recherches sur les Ceramiacées de la Mediterranée Occidentale*. Alger.

Feldmann, J. 1935. Algues marines des Iles du Cap Vert recoltées par M. le Professeur Aug. Chevalier. *In* A. Chevalier, Les îles du Cap Vert. Géographie, Biogéographie, Agriculture flore de l'Archipel. *Revue de Botanique Appliquée et d'Agriculture Tropicale* **15**: 1069–1071.
Note. This is also published as a separate with the original page numbers retained at the top of each page and a new sequence (pp. 1–358) at the bottom of the page. See also no. 100.

—— 1937. *Recherches sur la végétation marine de la Méditerranée. La Côte des Albères*.
Note. Originally published as *Revue Algologique* **10**: 1–339. Printed 28 October 1937, but published with '1938' on title page of part. The separate form was published with '1937' on title page and attributed inside as extracted from the *Revue Algologique* Tome X, Nov. 1937. The BM copy of the journal was received 22 June 1938. No textual differences exist between the two versions.

—— 1938. Sur la répartition du *Diplanthera wrightii* Aschers. sur la côte occidentale d'Afrique. *Bulletin de la Société d'Histoire Naturelles d'Afrique du Nord* **29**: 107–112.

—— 1939. Les Algues marines de la Côte des Albères. IV – Rhodophycées. *Revue Algologique* **11**: 247–330.
Note. Includes Bangiales, Nemalionales, Gelidiales and Cryptonemiales.

—— 1941. Les Algues marines de la Côte des Albères. IV. Rhodophycées (suite). *Revue Algologique* **12**: 77–100.
Note. Covers Ceramiales. *Travaux Algologiques* **1** replaced volume **13** of the original series of *Revue Algologique*.

—— 1942. Les Algues marines de la Côte des Albères. IV. Rhodophycées (fin). *Travaux Algologiques* **1**: 29–113.
Notes. Covers Ceramiales. *Travaux Algologiques* **1** replaced volume **13** of the original series of *Revue Algologique*.

—— 1946. La flore marine des Iles Atlantides. *Mémoires de la Société de Biogéographie* **8**: 395–435.

—— 1951. La flore marine de l'Afrique du Nord. *Compte Rendu Sonmaire de Séance Société de Biogéographie* **28**: 103–108.

—— **& Hamel, G.** 1934. Observations sur quelques Gélidiacées. *Revue Génerale de Botanique* **46**: 528–549.

Foslie, M. 1897. On some lithothamnia. *Kongelige Norske Videnskabernes Selskabs Skrifter* **1897**(1): 1–20.

—— 1898. Some new or critical lithothamnia. *Kongelige Norske Videnskabernes Selskabs Skrifter* **1898**(6): 1–19.

—— 1900*a*. New or critical calcareous algae. *Kongelige Norske Videnskabernes Selskabs Skrifter* **1899**(5): 1–34.

—— 1900*b*. Five new calcareous algae. *Kongelige Norske Videnskabernes Selskabs Skrifter*. **1900**(3): 1–6.

—— 1902. New species or forms of Melobesieae. *Kongelige Norske Videnskabernes Selskabs Skrifter* **1902**(2): 1–11.

—— 1906. Den botaniske samling. *Kongelige Norske Videnskabernes Selskabs Skrifter* **1905**(10): 17–24.

—— 1907*a*. Algologiske notiser III. *Kongelige Norske Videnskabernes Selskabs Skrifter* **1906**(8): 1–34.

—— 1907*b*. Algologiske notiser IV. *Kongelige Norske Videnskabernes Selskabs Skrifter* **1907**(6): 1–30.

—— 1908*a*. Algologiske notiser V. *Kongelige Norske Videnskabernes Selskabs Skrifter* **1908**(7): 1–30.

—— 1908*b*. Die Lithothamnien der Deutschen – Sudpolar Expedition 1901–1903 [Heft II]. *In* E. von Drygalski, *Deutsche Sudpolar-Expedition 1901–1903 im Auftrage des Reichsministeriums des Innern, VIII*. Band, *Botanik:* [2]+205–219+[1]+pls 1]. Berlin.

—— 1909. Algologiske notiser VI. *Kongelige Norske Videnskabers Selskabs Skrifter* **1909**(2): 1–63.

Frémy, P. 1936. Marine algae from the Canary Islands especially from Teneriffe and Gran Canaria IV. Cyanophyceae. *Kongelige Norske Videnskabernes Selskabs Skrifter* **12**(5): 1–43.

Furnari, G., Cormaci, M. & Alongi, G. 1996. *Lithophyllum frondosum* (Dufour) comb. nov. (Corallinaceae, Rhodophyta): the species to which Mediterranean '*Pseudolithophyllum expansum*' should be referred. *European Journal of Phycology* **31**: 117–122.

Gabrielson, P.W. 1985. *Agardhiella* versus *Neoagardhiella* (Solieriaceae, Rhodophyta): another look at the lectotypification of *Gigartina tenera*. *Taxon* **34**: 275–280.

——— **& Hommersand, M.H.** 1982. The Atlantic species of *Solieria* (Gigartinales, Rhodophyta): their morphology, distribution and affinities. *Journal of Phycology* **18**: 31–45.

Ganesan, E.K. 1974. Studies on the marine algae of Venezuela V. *Pseudogloiophloea Halliae*. *Journal of Phycology* **10**: 415–418.

—— **& West, J.A.** 1975. Culture studies on the marine red alga *Rhodophysema elegans* (Cryptonemiales, Peysonneliaceae). *Phycologia* **14**: 161–166.

Gayral, P. 1966. *Les algues des côtes Françaises (Manche et Atlantique) Notions fondamentales sur l'écologie, la biologie et la systematiques des algues marines*. Paris.

Gil-Rodríguez, M.C. 1980 ['1979']. Revisión taxonómica-ecológia del género *Cystoseira* C. Ag. en el archipiélago Canario. *Vieraea* **9**: 115–148.

—— **Acebes Ginoves, J.R. & Perez de Paz, P.L.** 1978. Nueves aportaciones a la flora ficologica de las islas Salvajes. *In* Anon., *Contribución al estudio de la historia natural de las islas Salvajes*: 45–72. Resultados de la Expedición Cientifica 'Agamenon 76' (23 de febrero–3 de marzo de 1976). Santa Cruz de Tenerife.

—— **& Afonso-Carrillo, J.** 1980. Adiciones a la flora marina y catálogo ficológico para la isla de Lanzarote. *Vieraea* **10**: 59–70.

—— —— 1981['1980']. *Catalogo de las algas marinas bentonicas (Cyanophyta, Chlorophyta, Phaeophyta y Rhodophyta) para el Archipielago Canario*. Tenerife.

—— **Haroun Tabraue, R.J., Afonso-Carrillo, J. & Wildpret de la Torre, W.** 1985. Adiciones al catálogo de algas marinas bentónicas para el Archipiélago Canario. II. *Vieraea* **15**: 101–112.

—— **& Wildpret de la Torre, W.** 1980*a*. *Contribución al estudio de la vegetación ficologica marina del litoral Canario*. Tenerife [*Encyclopedia Canaria*].

—— —— 1980*b*. Contribución a la ficologia de la isla del Hierro. *Vieraea* **8**: 245–260.

Gonzalez Henriquez, M.N. 1976. Contribución al estudio del epifitismo en *Zostera marina* L. (Zosteraceae) en la playa de Las Canteras (Gran Canaria). *Botanica Macaronesica* **2**: 59–67.

Gonzalez, N. 1977*a*. Estudio de la vegetación litoral de la zona de Maspalomas. *Botanica Macaronesica* **4**: 23–30.

—— 1977*b*. Estudio de la vegetación bentonica litoral del noroeste de la Isla de Gran Canaria (Bañaderos, San Felipe, Sardina, Las Nieves). *Botanica Macaronesica* **4**: 85–104.

Goor, A.C.J. van 1923. Die Holländischen Meeresalgen (Rhodophyceae, Phaeophyceae und Chlorophyceae) insbesondere der Umgebung von Helder, des Wattenmeeres und der Zuidersee. *Verhandelingen der K. Akademie van Wetenschappen, Amsterdam*.(Tweede Sectie) **23**(2): I–IX+[1]+1–232.

Gordon, E.M. 1972. Comparative morphology and taxonomy of the Wrangelieae, Sphondylothamnieae, and Spermothamnieae (Ceramiaceae, Rhodophyta). *Australian Journal of Botany*, Suppl. **4**: [2]+1–180.

Greuter, W. 1994. *International Code of Botanical Nomenclature (Tokyo Code) adopted by the fifteenth International Botanical Congress, Yokohama, August–September 1993*. Königstein. [*Regnum Vegetabile* **131**].

Guadeloupe González, M.E. Gil-Rodríguez, M.C. & Fernández González, 1995. Flora y vegetacion marina Arrecife de Lanzarote. *Fundacion C, sar Manrique, Lanzarote*.

Guiry, M.D. 1984. Structure, life history and hybridization of Atlantic *Gigartina teedii* (Rhodophyta) in culture. *British Phycological Bulletin* **19**: 37–55.

Gümbel, C.W. 1871. Die sogenannten Nulliporen (*Lithothamnium* und *Dactylopora*) und ihre Betheiligung an der Zusammensetzung der Kalkgesteine. Erster Theil. Die Nulliporen des Pflansenreichs (*Lithothamnium*). *Abhandlungen der Ksniglich Bayerischen Akademie der Wissenschaften*, Mathematisch-Physikalischen Classe, **11**(1): 13–51, pls 1–2.

Hardy, F.G. & Seku, F.O.K. 1993. Some notes on collecting sites and field records for marine algae in Ghana. *The Phycologist* **36**: 2–7.

Hariot, P. 1895. Liste des algues recueillies au Congo par M.H. Lecomte. *Journal de Botanique, Paris* **9**: 242–244.

—— 1896 ['1895']. Contribution à la flore algologique du Gabon et du Congo français. *Compte Rendu de l'Association Française pour l'Avancement des Sciences* **24**(2): 641–643.

—— 1908. Les algues de San Thomé (Côte occidentale d'Afrique). *Journal de Botanique, Paris*, Séries 2, **1**: 161–164.

—— 1911.Algues de Mauritanie recueillies par M. Chudeau. *Bulletin Société Botanique de France* **58** [=Séries 4, **11**]: 438–445.

Haroun, R.J., Prud'homme van Reine, W.F., Müller, D.G., Serrao, E. & Herrara, R. 1993. Deep-water macroalgae from the Canary Islands: new records and biogeographical relationships. *Helgoländer Meeresuntersuchungen* **47**: 125–143.

Haroun Tabraue, R.J., Gil-Rodríquez. M.C., Afonso-Carrillo, J. & Wildpret de la Torre, W. 1984 ['1983']. Estudio del fitobentos del Roque de los Organos (Gomera). Catálogo florístico. *Vieraea* **13**: 259–276.

—— —— **& Wildpret de la Torre, W.** 1985 ['1984']. Vegetación bentónica del Roque de Los Organos (Gomera). *Anales de Biologia, Universidad de Murcia* **2** (Sección especial, 2): 107–117.

Harper, J.T. & Garbary, D.J. 1997. Marine algae of northern Senegal: The flora and its biogeography. *Botanica Marina* **40**: 129–138.

Harvey, W.H. 1846–1851. *Phycologia britannica . . .* **2, 3,** *Rhodospermeae . . .* **4.** *Chlorospermeae . . .* [Synopsis nos. 280–388]. London.

Hauck, F. 1883. *Die Meeresalgen Deutschlands und Österreichs*. Part 5: 225–272. Leipzig.
Note. The entire work (XXIV, 575 pp., 5 pls) appeared as a bound volume in 1885.

Hemsley, W.B. 1885. II. – Report on the botany of the Bermudas and various other islands of the Atlantic and Southern Oceans. [First part] *In* C.W. Thompson & J. Murray, *Report on the scientific results of the voyage of H.M.S. Challenger during the years 1873–76 under the command of Captain George S. Nares, R.N., F.R.S. and the late Captain Frank Tourle Thompson, R.N . . . , Botany* – **1:** 1–137+[27]. London.

Henriques, J.A. 1885['1884']. Contribuiçao para o plantas colhidas por estudo da flora d'algumas possessoes portuguezas I F. Newton na Africa occidental. *Boletim da Sociedade Broteriana* **3**: 129–140.

—— 1886. Algae. *In* J.A. Henriques, Contribuiçoes para o estudo da Flora d'Africa Flora de S. Thomé. *Boletim da Sociedade Broteriana* **4**: 217–221.

—— 1887. Flora de S. Thomé. *In* G.B. De Toni & D. Levi, Contributiones ad phycologiam extra-italicam. *Notarisia* **2**: 381–383.
Note. A complete extract from Henriques (1886) (263); the present text has been attributed to Henriques solely, as there appear to be no alterations in the algal text.

—— 1917. Catálogo das espécies de animais e plantas até hoje encontradas no Ilha de S. Tomé. *Boletim da Sociedade Broteriana* **27**: 138–197.

Heydrich, F. 1894. Beiträge zur Kenntniss der Algenflora von Ost-Asien besonders der Insel Formosa, Molukken – und Liu-Liu-Inseln. *Hedwigia* **33**: 267–306.

Hollenberg, G.J. 1967. New marine algae from the Central Tropical Pacific Ocean. *American Journal of Botany* **54**(10): 1198–1203.

Hooker, J.D. [& Harvey, W.H.] 1847. LV. Algae, *L. In* J.D. Hooker, *The botany of the Antarctic voyage of H.M. Discovery ships Erebus and Terror, in the years 1839–1843 . . . , I. Flora Antarctica, Botany of Fuegia, The Falklands, Kuerguelen's Land etc., Part II. Algae*: 454–502. London.

Hoppe, H.A. 1969. Marine algae as raw materials. *In* T. Levring, H.A. Hoppe & O.J. Schmid, *Marine algae a survey of research and utilization*. Botanica Marina Handbooks **1**: 126–287. Hamburg.

Hornemann, J.W. 1819. *Anniversaria in memoriam Reipublicae Sacrae et Litterariae cum Universae, tum Danicae nostrae restauratae celebranda indicit Regiae Universitatis Hauniensis Rector cum senatu academico. De Indole plantarum Guineensium [observationes]*. Hauniae.

Huisman, J.M. 1985. The *Scinaia* assemblage (Galaxauraceae, Rhodophyta): a reappraisal. *Phycologia* **24**: 403–418.

—— **& Borowitzka, M.A.** 1990. A revision of Australian species of *Galaxaura* (Rhodophyta, Galaxauraceae), with a description of *Tricleocarpa* gen. nov. *Phycologia* **29**: 150–172.

—— **& Townsend, R.A.,** 1993. An examination of Linnean and pre-Linnean taxa referable to *Galaxaura* and *Tricleocarpa* (Galaxauraceae, Rhodophyta. *Botanical Journal of the Linnean Society* **113**: 95–101.

Huvé, H. 1962. Taxonomie, écologie et distribution d'une Mélobésiée Méditerranéene: *Lithophyllum papillosum* (Zanardini) comb. nov., non *Lithophyllum* (*Dermatolithon*) *papillosum* (Zanard) Foslie. *Botanica Marina* **4**: 219–240.

Irvine, L.M. 1983. *Seaweeds of the British Isles*. **1**(2A). London.

—— **& Chamberlain, Y.** 1994. *Seaweeds of the British Isles*. **1**(2B). London.

Johansen H.W. 1981. *Coralline algae, a first synthesis*. Florida.

John, D.M. 1972*a*. A new species of *Botryocladia* (Rhodophyceae, Rhodymeniales) from the Gulf of Guinea. *Phycologia* **11**: 33–36.

—— 1972*b*. The littoral ecology of rocky parts of the north-western shore of the Guinea Coast. *Botanica Marina* **15**: 199–204.

—— 1977 ['1976']. The marine algae of Ivory Coast and Cape Palmas in Liberia (Gulf of Guinea). *Revue Algologique* N.S. **11**: 303–324.

—— 1986. Littoral and sub-littoral marine vegetation. *In* G.W. Lawson (Ed.), *Plant ecology in West Africa: systems and processes*: 215–246. New York.

—— **& Lawson, G.W.** 1972*a* ['1971']. Additions to the marine algal flora of Ghana I. *Nova Hedwigia* **21**: 817–841.

—— —— 1972*b*. The establishment of a marine algal flora in Togo and Dahomey (Gulf of Guinea). *Botanica Marina* **15**: 64–73.

—— —— 1974. Observations on the marine algal ecology of Gabon. *Botanica Marina* **17**: 249–254.

—— —— 1977*a*. The marine algal flora of the Sierra Leone Peninsula. *Botanica Marina* **20**: 127–135.

—— —— 1977*b*. The distribution and phytogeographical status of the marine algal flora of Gambia. *Feddes Reprium* **88**: 287–300.

—— —— (unpublished). Additions to the marine algal flora of Ghana II.
Note. Originally submitted to *Nova Hedwigia* and reached page proof, 21 Sept. 1972. Corrected and returned from Ghana, but no more heard of paper and never published. Revised by authors in 1973, 1974 and (finally before being abandoned) 1975. Much of the included information used subsequently elsewhere, but a few data not taken up and hence the present inclusion.

—— —— 1991. Littoral ecosystems of tropical Western Africa. *In* A.C. Mathieson & P.H. Nienhuis (Eds), *Intertidal and littoral ecosystems*. Ecosystems of the World **24:** 297–322. Amsterdam.

—— —— **Price, J.H., Prud'homme van Reine, W.F. & Woelkerling, W.J.** 1994. Seaweeds of the western coast of tropical Africa and adjacent islands: a critical assessment. IV. Rhodophyta (Florideae) 4. Genera L-O. *Bulletin of the Natural History Museum London*, Botany, **24**: 49–90.

—— **Lieberman, D. & Lieberman, M.** 1977. A quantitative study of the structure and

dynamics of benthic subtidal algal vegetation in Ghana (Tropical West Africa). *Journal of Ecology* **65**: 497–521.

—— —— —— **& Swaine, M.D.** 1980. Strategies of data collection and analysis of subtidal vegetation. *In* J.H. Price, D.E.G. Irvine & W.F. Farnham (Eds), *The shore environment*. **1.** *Methods*: 265–284. London.

—— **& Pople, W.** 1973. The fish grazing of rocky shore algae in the Gulf of Guinea. *Journal of Experimental Marine Biology and Ecology* **11**: 81–90.

—— **Price, J.H., Maggs, C. & Lawson, G.W.** 1979. Seaweeds of the western coast of tropical Africa and adjacent islands: a critical assessment. III. Rhodophyta (Bangiophyceae). *Bulletin of the British Museum (Natural History)*, Botany, **7**: 69–82.

Johnston, C.S. 1969*a*. Studies on the ecology and primary production of Canary Islands marine algae. *Proceedings of the International Seaweed Symposium* **6**: 213–222.

—— 1969*b*. The ecological distribution and primary productivity of macrophytic marine algae in the eastern Canaries. *Internationale Revue de Gesamten Hydrobiologie* **54**(4): 473-490.

Johnstone, W.G. & Croall, A. 1859. *The nature-printed British Seaweeds . . .* **2**. – *Rhodospermeae*. Fam. X–XIII. London.

Jorge, D., Gonzales, M.N. & Delgado, E. 1986['1984']. Macrofitobentos del litoral del Puerto de Las Nieves (Gran Canaria). *Botanica Macaronesica* **12–13**: 111–122.

Karsakoff, N. 1896. Sur deux Floridées nouvelles pour la flore des Canaries. *Annales des Sciences Naturelles (Botanique)* VIII, **4**: 281–291.

Keats, D.W. & Chamberlain, Y.M. 1994*a*. Three species of *Hydrolithon* (Rhodophyta, Corallinaceae): *Hydrolithon onkodes* (Heydrich) Penrose and Woelkerling, *Hydrolithon superficiale* sp. nov., and *H. samoense* (Foslie) comb. nov. from South Africa. *South African Journal of Botany* **60**: 8–21.

—— —— 1994*b*. Two melobesioid coralline algae (Rhodophyta, Corallinales), *Mesophyllum erubescens* (Foslie) Lemoine and *Mesophyllum funafutiense* (Foslie) Verheij from Sodwana Bay, South Africa. *South African Journal of Botany* **60**: 175–190.

Kensley, B. & Penrith, M.-L. 1980. The constitution of the fauna of rocky intertidal shores of South West Africa. Part III. The north coast from False Cape Frio to the Kunene River. *Cimbebasia* ser. A, **5**: 201–214.

Kristiansen, A., Nielsen, R. & Pedersen, P.M. 1993. An annotated list of marine algae collected on Lanzarote, Canary Islands, January 1986. *Courier Forschungsinstitut Senckenberg* **159**: 93–102.

Kützing F.T. 1841. Uber die "Polypieres Calciferes" des Lamouroux. *In* K.C.F.D.o.t.R. Fischer, *Zu der öffentlichen Prüfung sammtlicher Calssen der Realschule zu Nordhausen welche den 2 April 1841 veranstaltet werden soll:* 3–34. Nordhausen. *Note*. Published in the annual report of the Realschule zu Nordhausen for 1841.

—— 1843. *Phycologia generalis oder Anatomie, Physiologie und Systemkunde des Tange*. Lipsiae.

—— 1849. *Species algarum*. Lipsiae.

—— 1862. *Tabulae phycologicae oder Abbildung der Tange* **12**: [4]+30+pls 1–100. Nordhausen.

—— 1865. *Tabulae phycologicae oder Abbildungen der Tange* **15**: [1]+36+pls 1–100. Nordhausen.

Kylin, H. 1932. Die Florideenordnung Gigartinales. *Acta Universitatis Lundensis* II, **28**(8): 1–88.

—— 1956. *Die Gattungen der Rhodophyceen*. Lund.

Lawson, G.W. 1954. Seaweeds from Sierra Leone. *Journal of the West African Science Association* **1**(1): 63–67.

—— 1956. Rocky shore zonation on the Gold Coast. *Journal of Ecology* **44**: 153–170.

—— 1957*a*. Some features of intertidal ecology of Sierra Leone. *Journal of the West African Science Association* **3**: 166–174.

—— 1957*b*. Seasonal variation of intertidal zonation on the coast of Ghana in relation to tidal factors. *Journal of Ecology* **45**: 831–860.

—— 1960. The genus *Taenioma* in West Africa. *New Phytologist* **59**: 361–366.

—— 1966. The littoral ecology of West Africa. *Oceanography and Marine Biology Annual Revue* **4**: 405–448.

—— 1980*a*. Unpublished list (*in litt.*) of benthic marine algae from the intertidal and shallow subtidal of Fernando Poo (Bioko) collected during a field trip in December 1980.

—— 1980*b*. The Nigerian marine flora comes of age. *Nigerian Field Society, Ibadan Field Notes* No. 3: 1–12.

—— 1985. Algae associated with mangroves in the Niger Delta area. *In* B.H.R. Wilcox & C.B. Powell (Eds), *The mangrove ecosystem of the Niger Delta. Proceedings of a workshop:* 56–67. Port Harcourt, Nigeria.

—— **& John, D.M.** 1977. The marine flora of the Cap Blanc peninsula: its distribution and affinities. *Botanical Journal of the Linnean Society* **75**: 99–118.

—— —— 1982. *The marine algae and coastal environment of Tropical West Africa*. Beihefte Nova Hedwigia **70**. Vaduz.

—— —— 1987. *The marine algae and coastal environment of Tropical West Africa (second edition)*. Beihefte Nova Hedwigia **93**. Berlin.

—— —— **& Price, J.H.** 1975. The marine algal flora of Angola: its distribution and affinities. *Botanical Journal of the Linnean Society* **70**: 307–324.

—— —— —— 1993. The marine algal flora of St. Helena: its distribution and biogeographical affinities. *Courier Forschungsinstitut Senckenberg* **159**: 103–107.

—— **& Norton, T.A.** 1971. Some observations on littoral and sublittoral zonation at Teneriffe (Canary Isles). *Botanica Marina* **14**: 116–120.

—— **& Price, J.H.** 1969. Seaweeds of the western coast of tropical Africa and adjacent islands: a critical assessment. I. Chlorophyta and Xanthophyta. *Botanical Journal of the Linnean Society* **62**: 279–346.

—— **Simons, R.H. & Isaac, W.E.** 1990. The marine algal flora of Namibia: its distribution and affinities. *Bulletin of the British Museum (Natural History)*, Botany, **20:** 153–168.

—— **Woelkerling, W.J., Price, J.H., Prud'homme van Reine, W. & John, D.M.** 1995. Seaweeds of the western coast of tropical Africa and adjacent islands: a critical assessment. IV. Rhodophyta (Florideae) 5. Genera P. *Bulletin of the Natural History Museum*, Botany, **25**: 99–122.

Lemoine, P. 1911. Structure anatomique des Mélobésiées. Application à la classification. *Annales de l'Institut Océangraphique, Monaco* **2**(2): 1–213+[12].
Note. Also issued in thesis form with identical pagination but a different title page. A summary appears in *Bulletin de la Société Botanique de France* **58**: 394–397 (P. Hariot, 1911). Author listed as Mme P. Lemoine in the publication.

—— 1912 ['1911']. Catalogue des Mélobésiées de l'Herbier Thuret. *Bulletin de la Société Botanique de France* **58**: LI–LXV.

—— 1915. Calcareous algae. *Report on the Danish Oceanographical Expedition 1908–1910 to the Mediterranean and adjacent seas*. Biology K. 1, **2**: 1–30, pl. 1.

—— 1924. Corallinacées du Maroc [I]. *Bulletin de la Société des Sciences Naturelles du Maroc* **4**: 113–134, pls 1–2.

—— 1926. Corallinacees du Maroc (II). *Bulletin de la Société des Sciences Naturelles du Maroc* **6**: 106–108.

—— 1928. Une nouveau genre de Mélobésiées: *Mesophyllum*. *Bulletin de la Société Botanique de France* **75**: 251–254.

—— 1929*a* ['1928']. Les Algues calcaires (Mélobésiées) des Canaries – leurs affinitiés. *In* Anon., *Compte Rendu de la 52e Session, Association Francaise pour L'Avancement des Sciences . . . La Rochelle 1928*: 658–662. Paris.
Note. The date of publication must be 1929. Footnote (1), p. 659, cites full reference data to Lemoine's own 1929 paper on Melobesiées in Børgesen's 'Marine Algae from the Canary Islands . . . '. Also issued as an independently paginated reprint.

—— 1929*b*. Les algues calcaires (Mélobésiées) des Lemoine M.(Mme P.). [Subfam. 1. Melobesieae]. *In* F. Børgesen, Marine algae from the Canary Islands especially from Teneriffe and Gran Canaria III. Rhodophyceae Part II Cryptonemiales, Gigartinales and Rhodymeniales. *Det Kongelige Danske Videnskabernes Selskab Biologiske Meddelelser* **8**(1): 19–68.

—— 1935. Corallinaceae. *In* A. Chevalier, Les îles du Cap Vert. Géographie, biogéographie, agriculture flore de l'Archipel. *Revue de Botanique Appliquée et d'Agriculture Tropicale* **15**: 1071.

—— 1964. Contribution à l'étude des Mélobésiées de l'Archipel du Cap Vert. *Proceedings of the International Seaweed Symposium* **4**: 234–239.

—— 1965. Algues calcaires (Mélobésiées) recueillies par le Professeur P. Drach (croisière de la *Calypso* en mer Rouge, 1952). *Bulletin Institut Océanographique, Monaco* **64**(1331): 1–20.

—— 1966. Algues calcaires recueillies dans la Mer Rouge, en particulier dans le Golfe d'Eilat. *Bulletin of the Sea Fisheries Researtch Station, Israel (Haifa)* **42:** 1–27, 1 pl.

—— 1974. Contribution à l'étude du genre *Lithoporella* (Corallinacées). *Revue Algologique* N.S. **11**: 42–57, pls 4–6.

Levring, I. 1974. The marine algae of the archipelago of Madeira. *Boletim do Museu Municipal do Funchal* **28**(125): 1–111.

Lieberman, M., John, D.M. & Lieberman, D. 1979. Ecology of subtidal algae on seasonally devastated cobble substrates off Ghana. *Ecology* **60**: 1151–1161.

—— —— —— 1984. Factors influencing algal species assemblages on reef and cobble substrata off Ghana. *Journal of Experimental Marine Biology and Ecology* **75**: 129–143.

López Hernández, M. & Gil-Rodríguez, M.C. 1982['1981']. Estudio de la vegetación ficológica del litoral comprendido entre Cabezo del Socorro y Montaña de la Mar, Güímar, Tenerife. *Vieraea* **11**: 141–170.

—— —— **& Afonso-Carrillo, J.** 1986. Sobre la presencia de *Rhodophyllis divaricata* (Stackhouse) Papenfuss (Rhodophyllidaceae Engler, Rhodophyta) en el Archipelago Canario. *Anales Facultade Ciencias La Laguna* Vol. especial 'Homenaje T. Bravo'.

Maggs, C.A. & Guiry, M.D. 1982*a*. The taxonomy, morphology and distribution of species of *Scinaia* Biv.-Bern. (Nemaliales, Rhodophyta) in north-western Europe. *Nordic Journal of Botany* **2**: 517–523.

—— —— 1982*b*. The life history of *Haematocelis fissurata* Crouan frat. (Rhodophyta: Sphaerococcaceae). *British Phycological Journal* **17**: 235.

—— —— **& Irvine, L.M.,** 1983. The life history in culture of an isolate of *Rhododiscus pulcherrimus* Crouan frat.(Rhodophyta) from Ireland. *British Phycological Journal* **18**: 206.

—— **& Hommersand, M.H.** 1993. *Seaweeds of the British Isles*. **1**(4A). London.

Marcot-Coqueugniot, J. 1991. A preliminary list of marine algae from the Banc d'Arguin (Mauritania). *Botanica Marina* **34**: 195–199.

Martin, M.J., Sansón, M. & Reyes, J. 1996. Morphology and anatomy of *Papenfussiella kuromo* (Chordariaceae; Phaeophyta) from the Canary Islands.

Cryptogamie Algologie **17**(3): 165–173.

Masuda, M. & Ohta, M. 1981. Taxonomy and life history of *Rhodophysema odonthaliae* sp. nov. (Rhodophyta). *Japanese Journal of Phycology* **29**: 15–21.

May, D.I. & Woelkerling, W.J. 1988. Studies on the genus *Synarthrophyton* (Corallinaceae, Rhodophyta) and its type species, *S. patena* (J.D. Hooker et W.H. Harvey) Townsend. *Phycologia* **26**: 50–71.

May, W. 1912 ['1910–11']. Gomera die Waldinsel der Kanaren Reisetagebuch eines Zoologen. *Verhandlungen des Naturwissenschaftelichen Vereins in Karlsruhe* **24**: 51–272.
Note. The calcareous algae in this work are acknowledged as being determined by Heydrich; the rest are identifications by Reinbold.

Mazza, A. 1903. La *Schimmelmannia ornata* Schousb. nel Mediterraneo. *Nuova Notisaria* **14**b: 45–61.

—— 1905–1925. Saggio di algologia oceanica *Nuova Notarisia* **16**: 85–101, 129–141, 1905; **17**: 1–13, 41–56, 81–101, 129–150, 1906; **18**: 1–36, 65–98, 126–152, 177–195, 1907; **19**: 1–24, 49–66, 109–129, 153–170, 1908; **20**: 6–18, 65–86, 113–135, 1909; **21**: 1–27, 65–99, 125–152, 169–199, 1910; **22**: 7–25, 1911; **22**: 53–80, 1912; **23**: 1–24, 57–78, 109–122, 1912; **24**: 57–85, 1913; 157–174, 1914; **27**: 1–53, 104–155, 169–215, 1916;. **28**: 176–239, 1917; Aggiunte al saggio di algologica oceanica (Florideae). *Nuova Notarisia* **30**: 1–62, 1919; **31**: 93–160, 1920; **32**: 1–48, 1921; **33**: 97–125, 1922.
Note. Series continues, without relevant records, to 1925.

Medina, M. & Haroun, R. 1993. Preliminary study on the dynamics of *Cystoseira abies-marina* populations in Tencrife (Canary Islands). *Courier Forschungsinstitut Senckenberg* **159**: 109–112.

Meñez, E.G. & Mathieson, A.C. 1981. The marine algae of Tunisia. *Smithsonian Contributions to Marine Science* **10**: i–viii+1–59.

Mildbread, J. 1922. *Wissenschaftliche Ergebnisse der Zweiten Deutschen Zentral-Afrika-Expedition 1910–1911 unter Führung Adolf Friedrichs, Herzogs zu Mecklenburg 2 Botanik*. Leipzig.

Mollion, J. 1976 ['1975']. Étude quantitative d'une formation végétale marine de l'infralittoral supérieur au Sénégal. *Bulletin de l'Institut Fondamental d'Afrique Noire* A, **37**: 537–554.

Molloy, F.J. 1990. Utilized and potentially utilizable seaweeds on the Namibian coast: biogeography and accessibility. *Hydrobiologia* **204/205**: 293–299.

Montagne, J.F.C. 1839–1841 ['1835–50']. Plantes cellulaires. *In* P. Barker-Webb & S. Berthelot, *Histoire Naturelle des Iles Canaries . . .* **3**(2), *Phytographia Canariensis*, Sectio ultima: I–XV+[1]+1–208. Paris.
Note. For detailed consideration of the bibliography of this work, see W.T. Stearn in *Journal of the Society for the Bibiography of Natural History, London* **1**: 49–63 (1937). The correct date of publication is probably 1841; the introduction by Montagne is dated Paris, 1 January 1841.

—— 1842. Troisième centurie de plantes cellulaires exotiques nouvelles. *Annales des Sciences Naturelles* (Botanique) **18**: 241–282.

—— 1856. *Sylloge Generum Specierumque Cryptogamarum quas in Variis Operibus Descriptas Iconibusque Illustratas . . .* Paris.

—— 1860. Florula Gorgonea seu enumeratio plantarum cellularium quas in promontorio Viridi (*Cap Vert*) insulisque adjacentibus a diversis botanicis et imprimis Cl. Bolle. *Annales Science Naturelles* (Botanique) 4, **14**: 210–225.

Moussavian, E. & Kuss, J. 1990. Typification and status of *Lithothamnium aschersoni* Schwager, 1883 (Corallinaceae, Rhodophyta) from Paleocene limestones of Egypt. A contribution to the synonymy and priority of the genera *Archaeolithothamnium* Rothpletz and *Sporolithon* Heydrich. *Berliner Geowissenschaftliches Abhandlungen* **120**: 929–942.

Murray, G. 1888–1889. Catalogue of the marine algae of the West Indian region. *Journal of Botany, London* **26**: 193–196, 237–243, 303–307, 331–338, 358–363, 1888; **27**: 237–242, 257–262, 298–305, 1889.
Note. Re-paged reprints of the continuous text, pp. 1–46 [1888, pp. 1–28; 1889, pp. 28–46].

Naegelé, A. 1960. Note sur le peuplement algal de la presqu'ile du Cap-Vert. *Notes Africaines* **88**: 118–119.

Newton, L. 1931. *A handbook of the British seaweeds*. London.

Norris, R.E. 1991. The structure, reproduction and taxonomy of *Vidalia* and *Osmundaria* (Rhodophyta, Rhodomelaceae). *Botanical Journal of the Linnean Society* **106**: 1–40.

—— **& Aken, M.E.** 1985. Marine benthic algae new to South Africa. *South African Journal of Botany* **51**: 55–65.

Notoya, M. 1976*a*. On the influence of various culture conditions on the early development of spore germination in three species of the crustose corallines (Rhodophyta)(Preliminary Report). *The Bulletin of Japanese Society of Phycology* **24**: 137–142.

—— 1976*b*. Spore germination in several species of crustose corallines (Corallinaceae, Rhodophyta). *Bulletin of the Faculty of Fisheries Hokkaido University* **26**(4): 314–320, pls 1–3.

Oliveira, F.E.C. de, 1977. Algas marinhas bentonicas do Brasil. Unpublished Ph.D. thesis, Universidade de São Paulo, Brazil.

Otero-Schmitt, J. 1993. Some local patterns of zonation of benthic marine flora and fauna in Sal, Santiago, S. Vicente and Brava (Cape Verde Islands). *Courier Forschungsinstitut Senckenberg* **159**: 45–52.

—— 1994. Contribution to the knowledge of the Cape Verdean flora. *Nova Hedwigia* **59**: 525–536.

—— **& Sanjuan, A.** 1992. Epibiotic seaweeds of the Cape Verde Islands. *Botanica Marina* **35**: 391–398.

Pakker, H. & Breeman, A.M. 1996. Temperature responses of tropical to warm-temperate Atlantic seaweeds. II Evidence for ecotypic differentiation in amphi-Atlantic tropical-Mediterranean species. *European Journal of Phycology* **31**: 133–141.

Papenfuss, G.F., 1944. Structure and taxonomy of *Taenioma*, including a discussion on the phylogeny of the Ceramiales. *Madroño* **7**: 193–214.

—— 1964. The development of the sexual organs and the cystcarp of *Taenioma perpusillum*. *Journal of the Indian Botanical Society*. **42A**: 159–166.

—— 1968. Notes on South African marine algae. V. *Journal of South African Botany* **34**: 267–287.

Penrose, D. 1991. *Spongites fruticulosus* (Corallinaceae, Rhodophyta), the type species of *Spongites*, in southern Australia. *Phycologia* **30**: 438–488.

—— 1992. *Neogoniolithon fosliei* (Corallinaceae, Rhodophyta), the type species of *Neogoniolithon*, in southern Australia. *Phycologia* **31**: 338–350.

—— 1996*a*. Genus *Hydrolithon*. *In* H.B.S.W. Womersley, *The Marine Benthic Flora of Southern Australia D Part IIIB. Gracilariales, Rhodymeniales, Corallinales and Bonnemaisoniales*: 255–266. Canberra.

—— 1996*b*. Genus *Spongites*. *In* H.B.S.W. Womersley, *The Marine Benthic Flora of Southern Australia D Part IIIB. Gracilariales, Rhodymeniales, Corallinales and Bonnemaisoniales*: 273–280. Canberra.

—— 1996*c*. Genus *Neogoniolithon*. *In* H.B.S.W. Womersley, *The Marine Benthic Flora of Southern Australia D Part IIIB. Gracilariales, Rhodymeniales, Corallinales and Bonnemaisoniales*: 280–283. Canberra.

—— **& Chamberlain, Y.M.** 1993. *Hydrolithon farinosum* (Lamouroux) comb. nov.: implications for generic concepts in the Mastophoroideae (Corallinaceae, Rhodophyta). *Phycologia* **32**: 295–303.

—— **& Woelkerling, W.J.** 1988. A taxonomic reassessment of *Hydrolithon* Foslie, *Porolithon* Foslie and *Pseudolithophyllum* Lemoine emend. Adey (Corallinaceae, Rhodophyta) and their relationships to *Spongites* Kützing. *Phycologia* **27**: 159–176.

—— —— 1991. *Pneophyllum fragile* in southern Australia: implications for generic concepts in the Mastophoroideae (Corallinaceae, Rhodophyta). *Phycologia* **30**: 495–506.

—— —— 1992. A reappraisal of *Hydrolithon* and its relationship to *Spongites* (Corallinaceae, Rhodophyta). *Phycologia* **31**: 81–88.

Pérez, L. & Afonso-Carrillo, J. 1993. Estudios en las especies canarias de *Galaxaura* y *Tricleocarpa* (Galaxauraceae, Rhodophyta). *Vieraea* **22**: 35–36.

Piccone, A. 1884. *Crociera del Corsaro alle Isole Madera e Canarie del Capitano Enrico d'Albertis Alghe*. Genova.

—— 1889. Alghe della crociera del 'Corsaro' alle Azzorre. *Nuovo Giornale Botanico Italiana Bolletino della Società* **21**: 171–214

—— 1900. Noterelle ficologiche. XI. Pugillo di alghe dell'isola S. Thiago (Capo Verde). *Atti della Società Ligustica di Scienze Naturali e Geografiche. Genova* **11**: 238–239.

—— 1901. Noterelle ficologiche. XI. Pugillo di alghe dell'isola S. Thiago (Capo Verde). *Nuovo Notarisia* **12**: 45–47.
Note. Some data reported from Piccone (1900).

Pilger, R. 1908. Kleinere Beiträge zur Kenntnis der Meeresalgen I. *Hedwigia* **48**: 178–183.

—— 1919. Uber Corallinaceae von Annobon. *Botanische Jahrbücher für Systematik, Pflanzengeschichte und Pflanzengeographie* **55**: 401–435.

—— 1920 ['1920–21']. Algae Mildbraedianae Annobonenses. *In* A. Engler, Beiträge zur Flora von Afrika. XLVIII. *Botanika Jaabucher für Systematik, Pflanzengeschichye und Pflanzengeographie* **57**: 1–14.
Note. See also Pilger (1922).

—— 1922. Algae. Corallinaceae. *In* J. Mildbraed, *Wissenschaftliche Ergebnisse der Zweiten Deutschen Zentral-Afrika-Expedition 1910–1911 . . .* **11** *Botanik*: 157–158. Leipzig.
Note.'Algae' is a repeat of Pilger (1920) and 'Algae. Corallinaceae' of Pilger (1919).

Pinedo, S., Sansón, M. & Afonso-Carrillo, L. 1992. Algas marinas bentónicas de Puerto de la Cruz (antes Puerto Orotava), Tenerife (Islas Canarias). *Vieraea* **21**: 29–60.

Price, J.H. & John, D.M. 1978. Subtidal ecology in Antigua and Ascension: a comparison. *Progress in Underwater Science [Report Underwater Association]* N.S., **3**: 111–133.

—— —— 1980. Ascension Island, South Atlantic: a survey of inshore benthic macroorganisms, communities and interactions. *Aquatic Botany* **9**: 251–278.

—— —— **& Lawson, G.W.** 1978. Seaweeds of the western coast of tropical Africa and adjacent islands: a critical assessment II. Phaeophyta. *Bulletin of the British Museum (Natural History)*, Botany, **6**: 87–182.

—— —— —— 1986. Seaweeds of the western coast of tropical Africa and adjacent islands: a critical assessment IV. Rhodophyta (Florideae) 1. Genera A–F. *Bulletin of the British Museum (Natural History)*, Botany, **15**: 1–122.

—— —— —— 1988. Seaweeds of the western coast of tropical Africa and adjacent islands: a critical assessment. IV. Rhodophyta (Florideae) 2. Genera G. *Bulletin of*

the British Museum (Natural History), Botany, **18**: 195–273.

—— —— —— 1992. Seaweeds of the western coast of tropical Africa and adjacent islands: a critical assessment. IV. Rhodophyta (Florideae) 3. Genera H–K. *Bulletin of the British Museum (Natural History)*, Botany, **22**: 123–146.

Printz, H. (Ed.) 1929. M. Foslie – 'Contributions to a Monograph of the Lithothamnia'. *Det Kongelige Norske Videnskabers Selskab Museet.* Trondheim.

Prud'homme van Reine, W. 1984. Marine algae of the Cape Verde Islands, historical and preliminary notes. *Courier Forschungsinstitut Senckenberg* **68**: 135–137.

—— 1987. Extractions of report on red algal distribution patterns, *in litt* to J.H. Price, 10 April 1987.

—— 1991. *Heincke Expedition*, reallocation following examination of original Piccone material from the Canary Islands, *in litt.* to D.M. John, 19 November 1991.

—— **Haroun, R.J. & Audiffred, P.A.J.** 1994. A reinvestigation of Macaronesian seaweeds as studied by A. Piccone with remarks on those studied by A. Grunow. *Nova Hedwigia* **58**: 67–121.

—— **Hoek, C. van den** 1988. Biogeography of Cape Verdean seaweeds. *Courier Forschungsinstitut Senckenberg* **105**: 35–49.

—— **& Lobin, W.** 1986. Katalog der von den Kapverdischen Inseln beschriebenen Taxa von Algen (Algae: Chlorophyceae, Phaeophyceae & Rhodophyceae). *Courier Forschungsinstitut Senckenberg* **81**: 85–88.

—— **& Pakker, H.** 1991. Collections from Cape Verde Islands, *in litt.* to D.M. John, 19 November 1991.

Pueschel, C.M. 1989. An expanded survey of the ultrastructure of red algal pit plugs. *Journal of Phycology* **25**: 625–636.

Reinbold, T. 1907. Die Meeresalgen der deutschen Tiefsee – Expedition 1898–1899. *In* C. Chun, *Wissenschaftliche Ergebnisse der deutschen Tiefsee-Expedition auf dem Dampfer 'Valdivia' 1898–1899.* Bd. **II**, Teil **II**, Lieferung **IV**: 549–586+[8], pls VV–LVII. Jena.

Reyes, J. & Afonso-Carrillo, J. 1993. Morphology and anatomy of *Mesophyllum canariense* (Corallinaceae, Rhodophyta) from the Canary Islands. *Courier Forschungsinstitut Senckenberg* **159**: 27–132.

—— —— 1995. Morphology and distribution of nongeniculate coralline algae (Corallinaceae, Rhodophyta) on the leaves of the seagrass *Cymodocea nodosa* (Cymodoceaceae). *Phycologia* **34**: 179–190.

—— —— **& Wildpret de la Torre, W.** 1988. Structure of male conceptacles of *Lithophyllum lobatum* (Corallinaceae, Rhodophyta). *Actes del Simposi International de Botánico Pius i Quer, 1988* **1**(criptogámia): 137–141.

—— **& Sansón, M.** 1991. Adiciones a la flora marina de la isla de El Hierro (Islas Canarias). *Vieraea* **20**: 71–81.

—— —— 1996. Las algas epífitas en *Cymodocea nodosa* en El Médano, isla de Tenerife (Magnoliophyta, Cymodocea [*sic*!]). *Vieraea* **25**: 45–56.

—— —— **& Afonso-Carrillo, J.** 1993. Notes on some interesting marine algae new from the Canary Islands. *Cryptogamic Botany* **4**: 50–59.

Ribera Siguán, M.A., Gómez Garreta, A. & Seoane-Camba, J.A. 1985 ['1984']. Estudio biogeográfico de la flora algológica bentónica marina de las Islas Baleares. *Anales de Biologia Universidad de Murcia* **2** (Sección especial, 2): 147–159.

Rojas-Gonzáles, B., Afonso-Carrillo, J. & Ibeas, C. 1994. New records of Rhodomelaceae (Rhodophyta) from the Canary Islands. *Botanica Marina* **37**: 133–138.

Romanes, M.F. 1916. Note on an algal limestone from Angola. *Transactions of the Royal Society of Edinburgh* **51**: 581–584, 1 pl.

Rosenvinge, L.K. 1917. The marine algae of Denmark. Part II. Rhodophyceae II. (Cryptonemiales). *Det Kongelige Danske Videnskabernes Selskabs Skrifter*, 7 Raekke, Naturvidenskabelig og Matematisk Afdeling **7**: 155–283, pls 3–4.

Round, F.E. 1981. *The ecology of algae.* Cambridge.

Sansón, M. & Reyes, J. 1995. Morphological and geographical observations on four species of Ceramiaceae (Rhodophyta) new to the Canary Islands. *Botanica Marina* **34**(6): 89–95.

—— —— 1996. Sobre la morfología de *Spyridia filamentosa* y *Spyridia hypnoides* en las islas Canarias (Rhodophyta, Ceramiaceae). *Vieraea* **25**: 37–44.

—— —— **& Afonso-Carrillo, J.** 1991. Contribution to the seaweed flora of the Canary Islands: new records of Floridiophyceae. *Botanica Marina* **34**(6): 527–536.

Santos Guerra, A. 1972. Contribución al estudio de la flora marina de la isla de La Gomera. *Vieraea* **2**: 86–102.

—— **Acuña Gonzáles, A. & Wildpret de la Torre, W.** 1970. Contribución al estudio de la flora marina de la Isla de La Palma. *Cuadernos Botanica El Museo Canario* **9**: 20–29.

Sanusi, S.S. 1980. *A study on grazing as a factor influencing the distribution of benthic littoral algae.* M.Sc. Thesis, University of Ghana, Legon.

Sauvageau, C. 1912. A propos des *Cystoseira* de Banyuls et Guéthary. *Bulletin de la Station Biologique d'Arcachon* **14**: 133–556.

Schmidt, O.C. 1924. Index algarum marinarum 1920–1923. *Hedwigia* **65**: 11–27.

—— 1929. Beiträge zur Kenntnis der Meeresalgen der Azoren II. *Hedwigia* **69**: 165–172.

—— 1931. Die marine Vegetation der Azoren in ihren Grundzügen dargestellt. *Bibliotheca Botanica* **102**: 1–116.

—— **& Gerloff, J.** 1957. Die marine Vegetation Afrikas in ihren Grundzügen dargestellt. *Willdenowia* **1**: 709–756.

Schmitz, F. & Falkenberg, P. 1897. Rhodomelaceae. *In* A. Engler & K. Prantl, *Die Natürlichen Planzenfamilien . . .*, **I**. Teil. 2. Abteilung: 149–150. Leipzig.

—— **& Hauptfleisch, P.** 1896-1897. Sphaerococcaceae *In* A. Engler & K. Prantl, *Die Natürlichen pflanzenfamilien . . .*, **I.** Teil. 2. Abteilung: 382–396. Leipzig.

Schneider, C.W. 1983. The red algal genus *Audouinella* Bory Nemaliales; (Acrochaetiaceae) from North Carolina. *Smithsonian Contributions on Marine Science* **22**: iii+[1]+25.

Scott, F.J., Wetherbee, R. & Kraft, G.T. 1984. The morphology and development of some prominently stalked southern Australian Halymeniaceae (Cryptonemiales, Rhodophyta) II. The sponge-associated genera *Thamnoclonium* Kützing and *Codiophyllum* Gray. *Journal of Phycology* **20**: 286–295.

Seagrief, S.C. 1984. A catalogue of South African green, brown and red marine algae. *Memoirs of the Botanical Survey South Africa* **47**: i–vi+1–71.

Seoane-Camba, J. 1960. Nota sobre algunas especies de algas de la costa occidental africana (sur de Cabo Blanco). *Investigación Pesquera* **16**: 91–103.

—— 1965. Estudios sobre las algas bentónicas en la costa sur de la Península Iberica (litoral de Cadiz). *Investigación Pesquera* **29**: 3–216.

Silva, P.C., Basson, P.W. & Moe, R.L. 1996. Catalogue of the benthic marine algae of the Indian Ocean. *University of California Publications in Botany* **79**: 1–1259.

—— **Meñez, E.G. & Moe, R.L.** 1987. Catalog of the benthic algae of the Philippines. *Smithsonian Contributions to Marine Science* **27**: 1–179.

Simons, R.H. 1974. Algae (including diatoms and seaweeds). *In* J.H. Day, N.A.H. Millard, & M.-L. Penrith, *A guide to marine life on South African shores.* 2nd ed.: 239–261. Cape Town.

—— 1983. The genus *Trematocarpus* (Sarcodiaceae, Rhodophyta) in southern Africa and the exclusion of *Sphaerococcus* (*Chondrus scutellatus*. *Bothalia* **14**: 803–808.

Soler-Onís, E., Haroun, R.J. & Prud'homme van Reine, W.F. 1998. Mscr. *Sebdenia* in Macaronesia.

—— —— **Viera Rodríguez, A. & Prud'homme van Reine, W.F.** 1995. *Sebdenia canariensis* sp. nov. (Sebdeniaceae, Gigartinales, Rhodophyta), una nueva alga roja de profundidad delArchipiélago Canario. *Résumenes de comunicaciones. XI Simposio Nacional de Botánica Criptogámica, Santiago de Compostela, 18–21 de Septiembre de 1995:* 15–16.

Sonder, O.W. 1852. Algae. *In* J.A. Schmidt, *Beiträge zur Flora der Cap Verdischen Inseln. Mit Berücksichtigung aller bis jetzt daselbst bekannten wildwachsenden und kultivirten. Pflanzen Nach eigenen Untersuchungen und mit Benutzung der gewonnenen Resultate anderer Reisenden*: 125–127. Heidelberg.

Sourie, R. 1954. Contribution a l'étude écologique des côtes rocheuses du Sénégal. *Mémoires de l'Institut Français d'Afrique Noire* **38**: 1–342+[1].
Note. From the note on p. 117, it is clear that the algae were worked on mainly by J. Feldmann, but that Sourie took account of some of the views of Dangeard as expressed in the latter's memoir on the Cap Vert (Dakar) peninsula algae. Since the exact contribution of the various people involved is in doubt, we have left the reference in the name of Sourie, who seems to have exercised overall authorship.

South, G.R. & Tittley, I. 1986. *A checklist and distributional index of the benthic marine algae of the North Atlantic Ocean.* St. Andrews, Canada.

—— **& Whittick, A.** 1976. Aspects of the life history of *Rhodophysema elegans* (Rhodophyta, Peyssonneliaceae). *British Phycological Journal* **11**: 349–354.

Steentoft, M. 1967. A revision of the marine algae of São Tomé and Príncipe (Gulf of Guinea). *Journal of the Linnean Society* (Botany) **60**: 99–146.

Stegenga, H., Bolton, J.J. & Anderson, R.J., 1997. *Seaweeds of the South African West Coast.* Cape Town.

Stephenson, T.A. & Stephenson, A. 1972. *Life between tidemarks on rocky shores.* San Francisco.

Svedelius, N. 1911. Florideae. *In* A. Engler & K. Prantl, *Die natürlichen Pflazenfamilien . . . Nachträge zum 1.Teil, 2. Abteilung über die Jahre 1890 big 1910*: 200–276. Leipzig.

Taylor, W.R. 1939. Algae collected on the Presidential cruise of 1938. *Smithsonian Miscellaneous Collections* **98**(9): 1–18, 2 pls.

Tomita, N.Y. 1976. Contribuicão ao conhecimento do genero *Sporolithon* (Corallinaceae, Cryptonemiales) no Brasil. Unpublished Ph.D. thesis, Universidade de São Paulo, Brazil.

Townsend, R.A. 1995. *The Sporolithaceae: It's place in the Florideophyceae.* Unpublished Ph.D. thesis, University of Sydney, Australia.

Trochain, J. 1940. Contribution a l'étude de la végétation du Sénégal. *Mémoires de l'Institut Français d'Afrique Noire* **2**: [1–6]+1–433+[63].
Note. J. Feldmann clearly had a great deal to do with the main determinations on which the algal list (pp. 108–110) was based; since the extent to which the data were accepted or amended by Trochain is not clear, and since there are other parts to the text which seem definitely to have been attributable to Trochain, we have accepted the latter as overall author. For individual comments on species, the more correct authorship citation would undoubtedly be 'Feldmann, J., in Trochain, J.,' etc.

Tseng, C.K. 1944. Notes on the algal genus *Taenioma. Madroño* **7**: 215–226.

Turner, J.A. & Woelkerling, W.J. 1982*a*. Studies on the *Mastophora-Lithoporella* complex (Corallinaceae, development. *Phycologia* **21**: 201–217.

—— —— 1982*b*. Studies on the *Mastophora-Lithoporella* complex (Corallinaceae, Rhodophyta). II. Reproduction and generic concepts. *Phycologia* **21**: 218–235.

Varo, J., Ramirez, J. & Renteria, J. 1979. Estudio de la vegetación bentonica del litoral granadino. *Acta Botanica Malacitana* **5**: 79–98.

Verheij, E. 1993. The genus *Sporolithon* (Sporolithaceae fam. nov., Corallinales, Rhodophyta) from the Spermonde Archipelago, Indonesia. *Phycologia* **32**: 184–196.

—— 1994. Nongeniculate Corallinaceae (Corallinales, Rhodophyta) from the Spermonde Archipelago, SW Sulawesi, Indonesia. *Blumea* **38**: 95–137.

Vickers, A. 1897(?)[‘1896’].Contribution à la flore algologiques des Canaries. *Annales Science Naturelles* (Botanique), 8, **4**: 293–306.
Note. The date is somewhat difficult to cite as there is confusion regarding the dates of various issues. It does seem possible that pre-prints were issued in 1896 and this is the date usually cited (see Lawson & Price, 1969: 345–346).

Viera-Rodríguez, M.A., Gil-Rodríquez, M.C., Audiffred, P.A.J., Prud’homme van Reine, W.F., Haroun-Tabraue, R. & Wildpret de la Torre, W. 1987. Contribución al estudio de la flórula bentónica del islote de Montaña Clara. Canarias. *Vieraea* **17**: 271–279.

Vinassa, P.E. 1892. Coralline mediterranee raccolte dal Prof Meneghini. *Atti della Società Toscana di Scienze Naturali Residente in Pisa. Processi Verbali* **8**: 58–60.

Weber-van Bosse, A. 1921. Liste des algues du Siboga II Rhodophyceae Première partie Protoflorideae, Nemalionales, Cryptonemiales. *In* M. Weber, *Siboga-Expeditie . . . Monographie LIXb. Uikomsten op Zoologisch, Botanisch, Oceanographisch en Geologisch Gebied . . . Livr. LXXXIX*: [6]+187+392+[4].

Weisscher, F.C.M. 1982. Marine algae from Ilhéu de Fora (Salvage Islands). *Boletim do Museo Municipal do Funchal* **34**: 23–34.

—— 1983. Marine algae from Selvagem Peguena (Salvage Islands). *Boletim do Museo Municipal do Funchal* **35**: 41–80.

Wilks, K.M. & Woelkerling, W.J. 1991. Southern Australian species of *Melobesia* (Corallinaceae, Rhodophyta). *Phycologia* **30**: 507–533.

—— —— 1995. An account of southern Australian species of *Lithothamnion* (Corallinaceae, Rhodophyta). *Australian Systematic Botany* **8**: 549–583.

Woelkerling, W.J. 1983*a*. A taxonomic reassessment of *Lithothamnium* (Corallinaceae, Rhodophyta) based on studies of R.A. Philippi’s original collections. *British Phycological Journal* **18**: 165–197.

—— 1983*b*. A taxonomic reassement of *Lithophyllum* Philippi (Corallinaceae, Rhodophyta) based on studies of R.A.Philippi’s original collections. *British Phycological Journal* **18**: 299–328.

—— 1985. A taxonomic reassessment of *Spongites* (Corallinaceae, Rhodophyta) based on studies of Kützing’s original collections. *British Phycological Journal* **20**: 123–153.

—— 1987. The genus *Choreonema* in southern Australia and its subfamilial classification within the Corallinaceae (Rhodophyta). *Phycologia* **26**: 111–127.

—— 1988. *The coralline red algae: an analysis of the genera and subfamilies of Nongeniculate Corallinaceae*. London.

—— 1993. Type collections of Corallinales (Rhodophyta) in the Foslie Herbarium (TRH). *Gunneria* **67**: 1–289.

—— 1996*a*. Subfamily Lithophylloideae. *In* H.B.S. Womersley, *The marine benthic flora of Southern Australia D Part IIIB. Gracilariales, Rhodymeniales, Corallinales and Bonnemaisoniales:* 214–237. Canberra.

—— 1996*b*. Subfamily Mastophoroideae (excluding *Hydrolithon*, *Pneophyllum*, *Spongites* & *Neogoniolithon*). *In* H.B.S. Womersley, *The marine benthic flora of Southern Australia D Part IIIB. Gracilariales, Rhodymeniales, Corallinales and Bonnemaisoniales*: 237–283. Canberra.

—— 1998*a*. 3. Lamarck’s Nullipores. *In* W.J. Woelkerling & D. Lamy, *Non-geniculate coralline red algae and the Paris Museum*. Cryptogamie-ADAC and Muséum National d’Histoire Naturelle, Paris. In press.

—— 1998*b*. 4.Type collections of non-geniculate Corallinales housed at the Laboratoire de Cryptogamie (PC). *In* W.J. Woelkerling & D. Lamy, *Non-geniculate coralline red algae and the Paris Museum*. Cryptogamie-ADAC and Muséum National d’Histoire Naturelle, Paris. In press.

—— **& Campbell, S.J.** 1992.An account of southern Australian species of *Lithophyllum* (Corallinaceae, Rhodophyta). *Bulletin of the British Museum (Natural History)*, Botany, **22**: 1–107.

—— **Chamberlain, Y.M. & Silva, P.C.** 1985. A taxonomic and nomenclatural reassessment of *Tenarea*, *Titanoderma* and *Dermatolithon* (Corallinaceae, Rhodophyta) based on studies of type and other critical specimens. *Phycologia* **24**: 317–337.

—— **& Harvey, A.** 1993. An account of southern Australian species of *Mesophyllum* (Corallinaceae, Rhodophyta). *Australian Systematic Botany* **6**: 571–637.

—— **& Irvine, L.M.** 1982. The genus *Schmitziella* Bornet & Batters (Rhodophyta): Corallinaceae or Acrochaetiaceae? *British Phycological Journal* **17**: 275–295.

—— —— 1986*a*. The neotypification and status of *Phymatolithon* (Corallinaceae, Rhodophyta). *British Phycological Journal* **21**: 55–80.

—— —— 1986*b*. The neotypification and status of *Mesophyllum* (Corallinaceae, Rhodophyta). *Phycologia* **25**: 379–396.

—— **Penrose, D. & Chamberlain, Y.M.** 1993. A reassessment of type collections of non-geniculate Corallinaceae (Corallinales, Rhodophyta) described by C. Montagne and L. Dufour, and of *Melobesia brassica-florida* Harvey. *Phycologia* **32**: 323–331.

—— **& Verheij, E.** 1995. Type collections of nongeniculate Corallinales (Rhodophyta) in the Rijksherbarium, Rijksuniversiteit te Leiden (L), The Netherlands. *Blumea* **40**: 33–90.

Wollaston, E.M. 1984. Species of Ceramiaceae (Rhodophyta) recorded from the International Indian Ocean Expedition, 1962. *Phycologia* **23**: 281–299.

Womersley, H.B.S. 1994. *The marine benthic flora of Southern Australia* Part IIA. Canberra.

—— 1996. *The marine benthic flora of Southern Australia* Part IIIB *Flora of Australia* Supplementary Series **5**. Canberra.

Wulfen, F.X. 1803. Cryptogama Aquatica. *Archiv für die Botanik, Leipzig* **3**: 1–64, 1 pl.

Wynne, M.J. 1986. A checklist of benthic marine algae of the tropical and subtropical western Atlantic. *Canadian Journal of Botany* **64**: 2239–2281.

—— **& Taylor, W.R.** 1973. The status of *Agardhiella tenera* and *Agardhiella baileyi (Rhodophyta, Gigartinales)*. *Hydrobiologia* **43**: 93–107.

Yarish, C., Breeman, A.M. & Hoek, C. van den 1985? [‘1984’]. Temperature, light, and photoperiod responses of some Northeast American and West European endemic rhodophytes in relation to their geographic distribution. *Helgoländer Meeresuntersuchungen* **38**: 273–308.

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