Re-interpretation of *Cocconia palmae*, with description of the genus *Dianesea* (Ascomycota: Dothideomycetidae)

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The original circumscription of *Cocconia palmae* F. Stevens was found to consist of elements of two unrelated species, belonging to *Hysterostomella* Speg. (Parmulariaceae) and an undescribed genus of Dothideomycetidae (Kirk et al., 2001) probably referable to the Coccoideaceae respectively. The name *Cocconia palmae* is typified to represent the latter fungus, for which the new genus *Dianesea* is introduced.

Key words: palm fungi, Ascomycota, Coccoideaceae, Dothideomycetidae, morphology.

Introduction

The circumscription and content of the ascomycete family Parmulariaceae are currently confused. A project to monograph the family with special reference to generic limits has led to examination of type material of a wide range of species which have not been subject to modern interpretation and description. One of these is *Cocconia palmae* F. Stevens (Stevens, 1927). Sectioning fruit-bodies of type specimens revealed two different fungi, and it is clear that the original description is a composite of both species. One of these fungi is clearly identifiable as a member of the Parmulariaceae and can be referred to *Hysterostomina palmae* Stev. (Stevens, 1923). The other is considered to belong to a new genus of the Dothideomycetidae (Kirk et al., 2001) with an uncertain familial placement. *Cocconia palmae* is lectotypified to represent the latter species, which is described as the only member of the new genus *Dianesea*, *D. palmae* (Stev.) Ináció & P.F. Cannon.

Materials and Methods

Type material of *Cocconia palmae* was obtained from K and IMI. Dried material was observed directly and after rehydration, using a dissecting microscope. Samples were examined with a compound microscope after sectioning using a cryomicrotome, or fruit bodies were dissected out using a needle, and transferred to slides as squash mounts. Stains and mounting media employed were lactofuchsin, erythrosin in ammonia, lactic acid/cotton-blue, KOH-glycerol/phloxine and Meltzer’s reagent.
Results


**Stromata** crustose, black, often aggregated, containing single or multiple ascomata. **Ascomatal locules** 55-130 × 22-60 μm, often difficult to distinguish from the outside, opening with an irregular split. **Upper wall** dark, 17-24 μm thick, appearing in horizontal view as brown to dark brown with prismatic cells 7-12 × 3-5 μm. **Asci** 60-90 × 17-27 μm, saccate to broadly clavate, containing up to 8 ascospores. **Ascospores** 19-36 × 7-10 μm, ellipsoidal to ellipsoidal-clavate, brown, 1-3-septate, constricted at the middle septum, apparently smooth.

**Dianesa** Inácio & P.F. Cannon, **gen. nov.**

**Etymology:** named in honour of José Carmine Dianese, Universidade de Brasília, a prolific and well-respected modern contributor to knowledge of Latin American fungal diversity.

**Macula** in foliis vivis, ad 4.5 × 2 mm in dimensio. **Stromata** 65-113 × 138-288 μm, atra, irregular crustosa, erumpentes. **Conidomata** loculata. **Cellulae conidiogenae** 6-12 × 2-4 μm, ampulliformae vel ampulliformae-cylindricae, percurrentes. Conidia 11-17 × 2-4 μm, variabilis, aseptatae, laeves, hyalinae. **Ascomata** perithecioidea, 83-238 × 100-218 μm, ± globosa, ostiolo periphysatis. **Hamathecium** pseudoparaphysibus cellulares composito. **Asci** 54-72 × 12-16 μm, cylindraceo-clavati vel clavati, crassitunicati, non caerulescentes in iodo, 6- ad 8-sporis, rostratis. **Ascospores** 12-20 × 3-5 μm, pallide brunneae, gelatinosae, verrucosae, unisepia, constrictae, cylindrico-ellipsoideae.

**Dianesa palmae** (F. Stevens) Inácio & P.F. Cannon, **comb. nov.** (Figs. 1-13)


**Typification:** COSTA RICA, Peralta, on unidentified palm, 13 July 1923, F.L. Stevens 432 (K, *isotype, here designated lectotype of Cocconia palmae*; IMI 164045! *isotype*).

**Symptoms:** present as small leaf spots to 4.5 mm long × 2 mm wide, scattered, rarely confluent, amphigenous, different in appearance between leaf upper and lower surfaces; on the lower leaf surface as small ± flat black stromatic structures, variable in shape, mostly elliptical, but sometimes circular or irregular, within dark-brown to greyish leaf spots. On the upper leaf surface stromata prominent, black, crustose, within reddish-brown spots, intimately associated with flat black stromata belonging to *Hysterostomina palmae*.

**Stroma:** apparently mostly superficial (the relative location of the leaf cuticle is hard to determine), 65-113 × 138-288 μm, brown to black, composed of *textura angularis* with cells 3-10 μm diam which gradually become paler and eventually colourless in the lower part of the epidermis and the upper part of the mesophyll.
Teleomorph: Habit appearing at the same time as, or possibly after the conidiomata, often occupying the same stromatic crusts. External appearance brown to dark-brown, perithecial, immersed in the stromatic crust, forming irregular warts. In horizontal section with an upper wall composed of textura angularis with cells 3-7 µm diam with dark brown walls. In vertical section 213-325 µm deep, composed of a brown to dark-brown outer wall enclosing a central fertile locule, usually with a small portion of displaced cuticle and epidermis above the stroma, and with a basal stromatic layer mixed with plant cells. Stromatal wall dense, thick, making observation of individual layers difficult, composed of brown-walled cells 3-8 µm diam, ± globose around the edge and angular and somewhat larger in the central part. Ascomatal wall composed of several layers of compressed cells, sometimes intergrading with but easily distinguishable from the stroma due to their darker colour. Locule 83-238 x 100-218 µm, composed of a thin basal subhymenial cushion 18-30 µm deep, with asci and paraphyses above. Interascal tissue composed of cellular pseudoparaphyses, mostly colourless, septate, thin-walled, filiform but rounded and slightly swollen at the tips, 1-2 µm thick, sometimes dichotomously branched, the branches arising at an acute angle from the middle or near the top of individual cells. Asci maturing sequentially, with young and old asci in the same locule. Young asci variable in shape before spores can be distinguished, normally cylindric or cylindric-clavate to clavate, at first thin-walled, becoming thick-walled particularly in the upper part, with a subapical chamber formed before spores are visible. Full-sized asci containing spores, 54-72 x 12-16 µm, cylindric-clavate to clavate, thick-walled particularly in the upper part, not changing colour in iodine, with 6 or 8 spores arranged in one, two rows or in a cluster. Asci after spore release collapsed, with a large apical crack in the outer wall, and with the inner wall extending like a tongue through the crack. Ascospores 12-20 x 3-5 µm, initially colourless, guttulate, becoming light brown to brown, covered by a gelatinous layer, verrucose, 1-septate, slightly narrowed at the septum, cylindric-ellipsoidal, the lower cell slightly attenuated and rounded towards the base, the upper cell with a rounded apex.

Anamorph: coelomycetous. Habit intimately mixed with ascomata, often occupying the same stromatic crusts. External appearance difficult to distinguish from the teleomorph, brown to black, shiny, crustose, embedded within a common stroma. Conidiomatal locule 118-238 x 80-188 µm, containing conidia and with conidiogenous cells lining all of the internal wall surface. Conidiogenous cells 6-12 x 2-4 µm, ampulliform to ampulliform-cylindrical, colourless, smooth. Conidia: 11-17 x 2-4 µm, colourless, aseptate, smooth, variable in shape, cylindric-ellipsoidal, ovoid or cylindric-clavate,
guttulate. Conidial development by a replacement wall-building apex system with enteroblastic percurrent non-progressive proliferation (replacement wall-building apex phialides).

Discussion

Hysterostomina palmae

The discoid fruit bodies in the specimen originally described as Cocconia palmae are poorly preserved, but appear very similar to the fungus described as Hysterostomina palmae (Stevens, 1923). Hysterostomina was originally described as a counterpart of Hysterostomella which lacked interascal tissue, but is now regarded as a synonym of that genus. Hysterostomella itself is poorly defined and possibly polymorphic, and will be the subject of further monographic treatment. At least two other species of Hysterostomella are known from palms, H. sparsa (Peck & Clinton) Barr (syn. H. sabalicola Tracy & Earle; Barr et al., 1986) and H. elaeicola Maubl. Both are quite distinct in ascospore measurements.

Dianesea palmae

Stevens (1927) in his description of Cocconia palmae mentioned: “The loculiferous stroma occurs either as the superficial stroma or on the erumpent stroma. The circular arrangement of the perithecia is so irregular that the suggestion of this as character is questionable. This fungus is of special interest as a form showing the characters of the Microthyriaceae in the radiation of the superficial stroma, and of the Dothideales in possessing globose locules in a stroma”. The difficulty Stevens had in assessing the relationships of his species can clearly be attributed to his failing to appreciate that two fungi were present and that his description was therefore a composite. The International Code of Botanical Nomenclature allows the name to be typified subsequently by one of the original elements. We have therefore chosen the perithecial fungus to represent the name Cocconia palmae as it is the most prominent of the two. Stevens also described and illustrated the asci and ascospores of this species rather than those of the Hysterostomina (Stevens, 1927).

Cocconia palmae as newly circumscribed is now well characterised, but its relationships remain unclear. It clearly cannot be maintained as a species of Cocconia, a member of the Parmulariaceae (Dothideomyetidae) with ascomata which release their spores through irregular splits rather than the distinct ostioles found in C. palmae. An alternative placement is problematic, and an appropriate, previously existing genus could not be found. The familial affinities of the new genus are also not clear, but it seems most closely allied to
Table 1. Morphological characters of Coccoidea, Coccoidella and Dianesea.

<table>
<thead>
<tr>
<th></th>
<th>Coccoidea</th>
<th>Coccoidella</th>
<th>Dianesea</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stromata</strong></td>
<td>Black, peltate to pulvinate</td>
<td>Black, peltate to botryose</td>
<td>Black, botryose</td>
</tr>
<tr>
<td><strong>Anamorph</strong></td>
<td>Unknown</td>
<td>Acervular</td>
<td>Locular, irregular in form</td>
</tr>
<tr>
<td><strong>Ascomata</strong></td>
<td>Locular, lacking a distinct wall</td>
<td>Locular, lacking a distinct wall</td>
<td>Perithecial, with a well-defined wall</td>
</tr>
<tr>
<td><strong>Ostiole</strong></td>
<td>Lacking periphyses</td>
<td>Lacking periphyses</td>
<td>Periphyses present</td>
</tr>
<tr>
<td><strong>Interascal tissue</strong></td>
<td>Cellular</td>
<td>Cellular</td>
<td>Cellular</td>
</tr>
<tr>
<td><strong>Asci</strong></td>
<td>Clavate, fissitunicate</td>
<td>Cylindric-clavate, fissitunicate</td>
<td>Cylindric-clavate, fissitunicate</td>
</tr>
<tr>
<td><strong>Ascospores</strong></td>
<td>Brown, ellipsoidal, septate near the base, smooth</td>
<td>Hyaline to pale brown, cylindric-ellipsoidal, septate near the middle, smooth</td>
<td>Hyaline to pale brown, cylindric-ellipsoidal, septate near the middle, verrucose</td>
</tr>
</tbody>
</table>

The Coccoideaceae. An appropriate genus could not be found in the extensive list of ascomycetes known from palms (Hyde et al., 2000).

The Coccoideaceae contains a single biotrophic genus Coccoidea Henn. with a possible further member Coccoidella Höhn. (Kirk et al., 2001). The circumscription of the family is largely similar to that of Dianesea, but ascomata are formed as multiple distinct locules in peltate stromata, and the anamorph is acervular rather than locular (stromatic). Coccoidea also has ascospores which are septate close to the ends in contrast to those of Dianesea where they have a ± median septum (Eriksson, 1981; Barr, 1987; Sivanesan, 1987; Kirk et al., 2001). Coccoidella forms irregular or botryose stromata (Sivanesan, 1987); it is currently considered to be of uncertain familial placement, but shares many characters with the Coccoideaceae (Kirk et al., 2001). The three genera are compared in Table 1. Potentially the most fundamental distinction between Dianesea and the genera of the Coccoideaceae is the apparently ascohymenial type of ascomata with distinct walls, rather than the ascolocular type which is typical of the Dothideomycetidae. This might invite placement of Dianesea in the Sordariomycetidae, but fissitunicate asci with rostrate dehiscence are unknown in that group.

No other potential family placement within the Dothideomycetidae appears appropriate. The Venturiaceae are mostly necrotrophs, but a small proportion exhibit biotrophic nutrition. The family is currently poorly defined, but most genera have small setose ascomata and hyphomycetous anamorphs, in contrast to Dianesea (von Arx and Müller, 1975; Sivanesan, 1984; Barr, 1987;
Kirk et al., 2001). The genus Rosenscheldiella has some resemblance to Dianesea with its external stromatal shape, but these contain multiple ascomatal locules producing colourless ascospores but without a distinct periphysate ostiole (Barr, 1987). The Botryosphaeriaceae contain a few biotrophic species, but typically lack interascal tissue and have aseptate ascospores. The Mycosphaerellaceae are primarily necrotrophs and saprobes and rarely have any significant level of stromatic development, but some species of Microcyclus are biotrophic and appear superficially similar to Dianesea. However, they lack interascal tissue (Cannon et al., 1995). The Dacampiaceae show some similarities with Dianesea, but stromatic tissue is poorly developed, ascomatal walls are much thicker and multilayered, and many are lichenicolous or lichenised (Barr, 1987). The Parodiellaceae contains biotrophic fungi, but have well-developed verrucose unilocular ascostromata. The Phaeosphaeriaceae have thin-walled ascomata which are occasionally aggregated into multilocular stromata, but are saprobes or necrotrophs and have quite distinct anamorphs.

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