# Reproduction and Affinities of *Dasyptilon* (Ceramiaceae; Rhodophyceae)[1]

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THE GENUS *Dasyptilon* was set up by Feldmann-Mazoyer in 1950, for the New Zealand species long known as *Plumariopsis pellucida* (Harv.) de Toni. (Although doubts as to its identity with Harvey's type had been raised both by the New Zealanders and by G. Feldmann herself, the type of *Ptilota pellucida* Harv. seems conspecific, permitting ascription of the correct name *D. pellucidum* to (Harv.) de Toni, rather than "(Laing) de Toni.") She indicated as distinctive two important vegetative characteristics, the obliquely-dividing apical cell, and the rhizoidal cortication, and in addition the position of the tetrasporangia. However, the development of the cystocarp was quite unknown. Opportunity and incentive for its investigation was furnished by the collection of abundant female material in March, 1949, at St. Clair, Otago, South Island, New Zealand, by G. F. Papenfuss.

The vegetative structure of the purplish feathery fronds is essentially that of the Ptiloteae. The apical cell divides obliquely and alternately to left and right. Each cell of the filament which results produces two branches, the first from the longer side, one or two cells behind the apex (Fig. 2*b*); the second on the shorter side, one or two cells further back. In the vegetative shoot, the first branch becomes secondarily branched, the second remains simple, thus building up a distichous frond of alternating long and short branches.

In the fertile shoot, each short branch bears a four celled carpogonial branch upon its proximal cell. This cell is, in respect to the main axis, pericentral, as is typical of ceramiaceous procarps. Apparently the carpogonial branch is produced before the sterile cell (rudimentary vegetative short branch) (Figs. 1*a*, 2*b*), a development which may be characteristic of the Ptiloteae, as it has been noted both by Kylin (1923) in *Ptilota*[3] *plumosa* (Huds.) C. Ag. and by Suneson (1938) in *Plumaria*[3] *elegans* (Bonnem.) Schmitz, though Drew (1939) found that in the latter either might be produced first. If no carpogonium of the shoot is fertilized, the short branches resume growth to their normal character (Fig. 1*a*). In event of fertilization, further growth of the shoot above the fertile axial cell is checked by diversion of its nutriment to the gonimoblast. The primordial long branches, one to three cells in length, produce a terminal hair and cease growth (Fig. 2*a*, *d*). Apical development ceases in the short branches when they are composed of only the pericentral and (sometimes) a terminal sterile cell. The whole apex of the shoot may be deflected laterally by the growth of the cystocarp and becomes overtopped by several vigorous involucral branches arising from the axial cell below the fertile one. Occasionally

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[3] Generic names proposed for conservation.

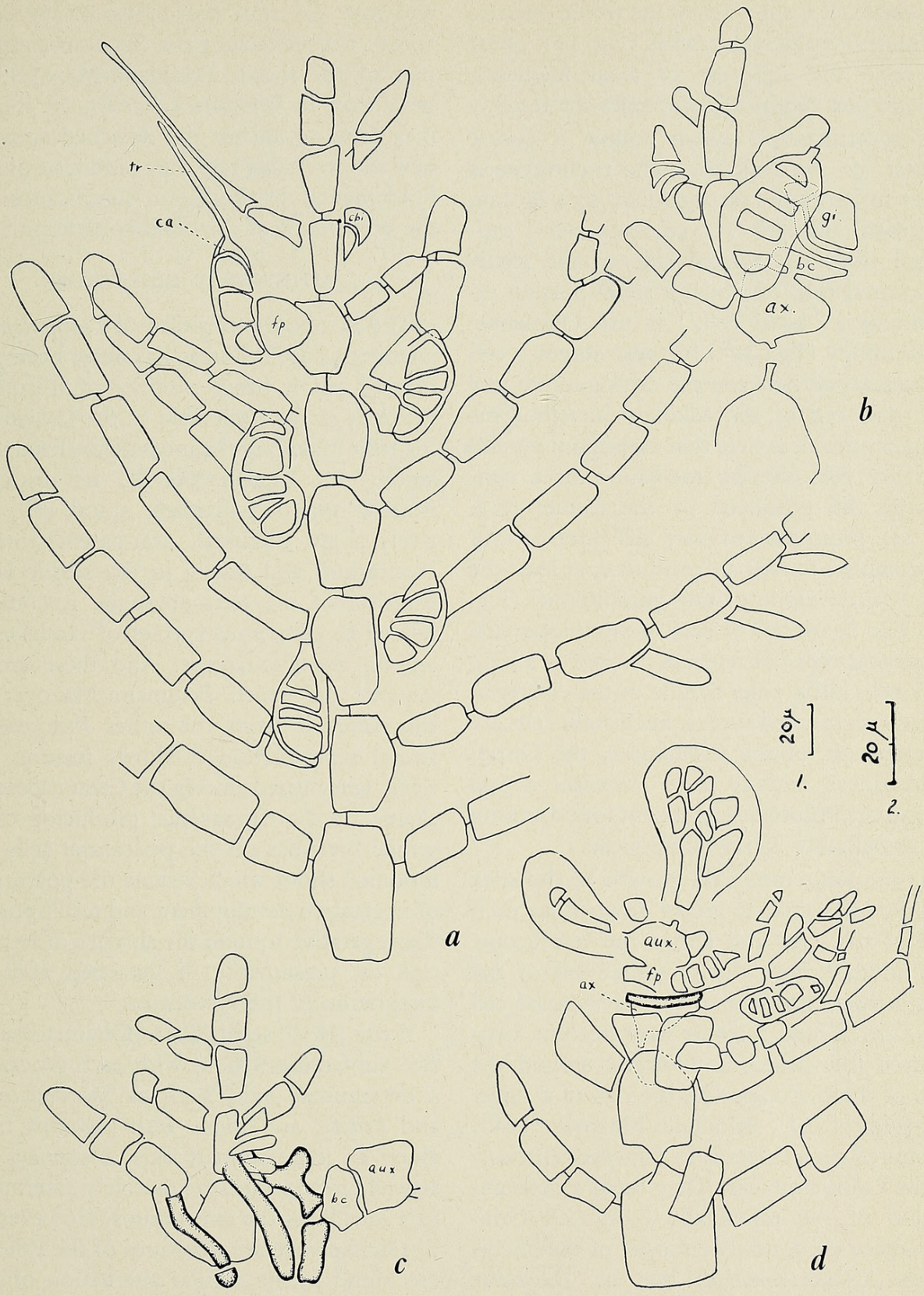


FIG. 1. *Dasyptilon pellucidum* (Harvey) Feldmann-Mazoyer. *a*, A female shoot which did not become fertilized, showing development of the short branches beyond the procarps (Scale 2); *b*, cystocarp, at first division of auxiliary cell (Scale 2); *c*, base of cystocarp, showing development of rhizoids (Scale 2); *d*, apex of fertile shoot deflected to one side by development of cystocarp (Scale 1). *ax.*, axial cell (fertile); *aux.*, auxiliary cell; *bc.*, basal cell (of Oltmanns); *ca.*, carpogonium; *cbi.*, carpogonial branch initial; *fp.*, fertile pericentral cell; *gi.*, gonimolobe initial; *tr.*, trichogyne. The rhizoids are shaded.

the axial cell second below the fertile one also produces involucral branches (Fig. 1*d*). These all have the structure of axial filaments, though one commonly surpasses the rest.

Post-fertilization stages follow a course typical for the Ptiloteae. The trichogyne is separated from the carpogonium by a septum and then collapses. The auxiliary cell is produced from the adaxial side of the fertile pericentral cell, of which a small portion remains as a "basal cell," to use Oltmanns' terminology (Fig. 1*d*). In these stages a cell is intercalated between the carpogonium and the third cell of the auxiliary branch. This suggests that it is here that carpogonium and auxiliary cell fuse by mediation of a connecting cell produced by the former (Fig. 1*d*, 2*a*). From the auxiliary cell three or four gonimoblast initials are produced, at least the first two developing into gonimolobes (Fig. 2*c*). The basal cell of each gonimolobe cuts off carpospores but remains distinct as a long stalk cell, like a paler handle to the cluster of heavily pigmented spores. Such stalk cells are characteristic of the Crouanieae, the Carpoblepharideae and at least *Plumaria elegans* among the Ptiloteae, but are not found among the presumably derived Ceramieae.

At the same time that growth of the apex is arrested, a rhizoid grows down from each side of the axial cell above the fertile one, and another from the proximal cell of the long branch attached to the fertile axial cell (Fig. 2*a*). These rhizoids may become two- or even four-celled, and extend around the base of the cystocarp like the ribs of a skeleton (Fig. 1*c*, 2*a*). Feldmann-Mazoyer (1940) illustrated such rhizoids in *Seirospora Giraudyi* of the Callithamnieae. They seem a constant feature of the rhizoidally corticated Callithamnieae (and, oddly enough, of the uncorticated *Compsothamnion*) but of *Dasyptilon* alone among the Ptiloteae, which are otherwise parenchymatously corticated. In *Dasyptilon* the fertile axial cell becomes almost continuous with the gonimoblast, by a broadening of the pit-connections of the basal cell, and may die after the release of the carpospores, thus detaching the distal, uncorticated part of the shoot. Feldmann-Mazoyer suggests that, in *Seirospora Giraudyi*, the rhizoids may serve to anchor the detached apex as a new shoot. At any rate thay cannot be of more fundamental phylogenetic significance than the occurrence of rhizoidal cortication.

## AFFINITIES OF DASYPTILON

The taxonomic position of *Dasyptilon* as a member of the Ptiloteae has never been questioned, but it has a number of features in which it is more referable to the Crouanieae, the tribe including the most generalized forms among the Ceramiaceae. In its distichous fronds, obliquely-dividing apical cell, relatively slight rhizoidal, non-parenchymatous cortication, and finally in the sessile lateral position of the tetrasporangia, it could be related to distichous species of *Antithamnion* among the Crouanieae. And these are the features on which Feldmann-Mazoyer distinguishes it from the other Ptiloteae. In sexual reproduction it shows features relatively generalized among the Ceramiaceae and shared by the Crouanieae, producing carpogonial branches on the pericentral cells of a modified shoot which retains the potentiality of vegetative development and resumption of the vegetative form in the absence of fertilization or, presumably, if detached after disintegration of the cystocarp.

Kylin (1930) separates the Ceramiaceae into two subfamilies: those with each procarp on a determinate axis, such as *Spermothamnion* and *Ptilota;* and those with procarps borne along an indeterminate axis. *Dasyptilon* with several procarps on a facultatively determinate axis thus links the two groups. However, the distinctive vegetative features of the Ptiloteae are found in the regular alternation of long and short branches on the axis, and the distinctive reproductive feature of the fertile pericentral cell producing carpogonial branch before sterile cell. Inasmuch as its features of specialization are those of the Ptiloteae, it

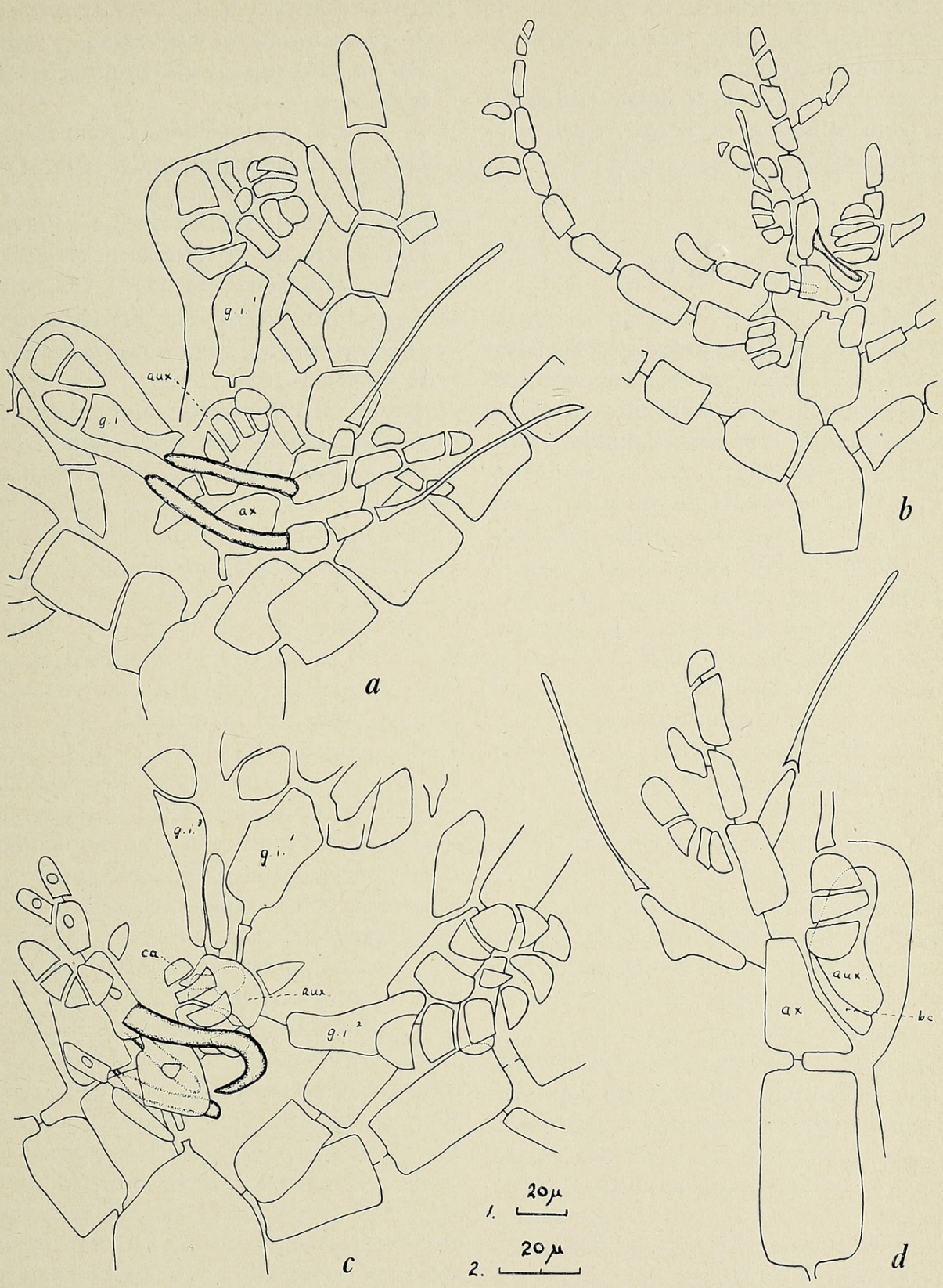


FIG. 2. *Dasyptilon pellucidum* (Harvey) Feldmann-Mazoyer. *a*, Cystocarp with girdling rhizoids; involucral branches four, one cut away to show apical part of shoot (Scale 2); *b*, fertile shoot shortly after fertilization of the middle carpogonium (Scale 1); *c*, base of a cystocarp with five gonimolobe initials (Scale 2); *d*, first post-fertilization stage: auxiliary cell just separated from pericentral cell, long shoots already tipped by hairs (Scale 2). *ax.*, axial cell (fertile); *aux.*, auxiliary cell; *bc.*, basal cell (of Oltmanns); *ca.*, carpogonium; *g.i.*, stalk cell of gonimolobe, in *c* numbered in order of development. The rhizoids are shaded.