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Four new species of Rhodophyceae from Fiji, Polynesia and Vanuatu, South Pacific

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SUMMARY

Four new species of Rhodophyceae are described from the South Pacific, with type localities in Fiji, French Polynesia and Vanuatu. *Chondria bullata* from the Tuamotus (French Polynesia), Vanuatu, Palmerston Atoll (Cook Islands) and Fiji is unique owing to its non-constricted axes with markedly protruding, bubble-like cortical cells. *Halymenia nukuhivensis*, from the Marquesas Islands in French Polynesia, is distinguished from others in the genus by its dichotomous, papery blades issued from a strap-shaped basal region, and the equal proportion of anti-clinal, periclinal and oblique filaments in its medullary layer. *Jania articulata*, so far known only from the Tuamotus in French Polynesia and Manihiki in the Northern Cook Islands, superficially resembles the genus *Amphiroa* with its articulated branches with numerous genicula between successive dichotomies, and its large axis diameter. *Meristotheca peltata* from the Fiji Islands is unique among the genus by its distinctly peltate, erect habit. The recent high number of newly described species from the South Pacific region emphasizes the need for more in-depth surveys, particularly in deeper outer reef slope habitats, which remain for the most part unexplored and could yield particularly interesting new taxa or distributional records.

Key words: *Chondria bullata*, *Halymenia nukuhivensis*, *Jania articulata*, *Meristotheca peltata*, new species, Rhodophyceae, South Pacific, taxonomy.

INTRODUCTION

The South Pacific region (Fig. 1) encompasses a vast geographic area, between the Australian and South American continents into which there are widely scattered numerous archipelagoes with a wide range of habitats, from high volcanic islands to low-lying coral atolls. The phycological collecting effort in this region has been relatively sporadic and limited, with historical peaks in the later half of the nineteenth century (e.g. Harvey 1857; Grunow 1874; Weber-van Bosse 1898) and early and mid twentieth century (e.g. Børgesen 1924; Setchell 1924, 1926; Taylor 1950; Dawson 1956, 1957). In more recent times, with the widespread use of scuba diving and the advent of systematic regional biodiversity surveys, more data on algal diversity and distribution have been obtained for South Pacific localities (e.g. N'Yeurt 1996, 2001; Abbott 1999a,b; Payri *et al*. 2000, 2004; Littler & Littler 2003; South & Skelton 2003; N'Yeurt & Payri 2004; 2006, 2007; Millar & Payri 2006; Payri 2006; N'Yeurt *et al*. 2007; Skelton & South 2007). Despite this apparent surge in phycological effort, considering the vastness of the geographic area in question and the diversity of biotopes available, most localities still remain largely unexplored, especially for deeper water flora. In the context of ongoing surveys of regional floras from the South Pacific, four new species of marine Rhodophyceae are reported in the present study.

MATERIALS AND METHODS

Plants were collected by scuba diving or reef-walking, and stored in 5% buffered formalin. Sections were made using a freezing microtome, and stained using either cotton blue/lactophenol or 1% aniline blue in 60% clear corn syrup. Prepared slides were examined using a camera-lucida mounted on an Olympus BH-2 microscope (Olympus Optical Co. Ltd, Tokyo, Japan). Macrophotographs were taken with an Olympus SZ-40 stereomicroscope fitted with an Olympus PM-10 ADS camera unit and Olympus PM-CBSP exposure unit, printed on Kodak Plus-X pan 125 film, developed and printed in the laboratory. Microphotographs were taken with an Olympus C-5050 digital camera and the resulting files processed into figures using computer software. Voucher specimens have been deposited in the

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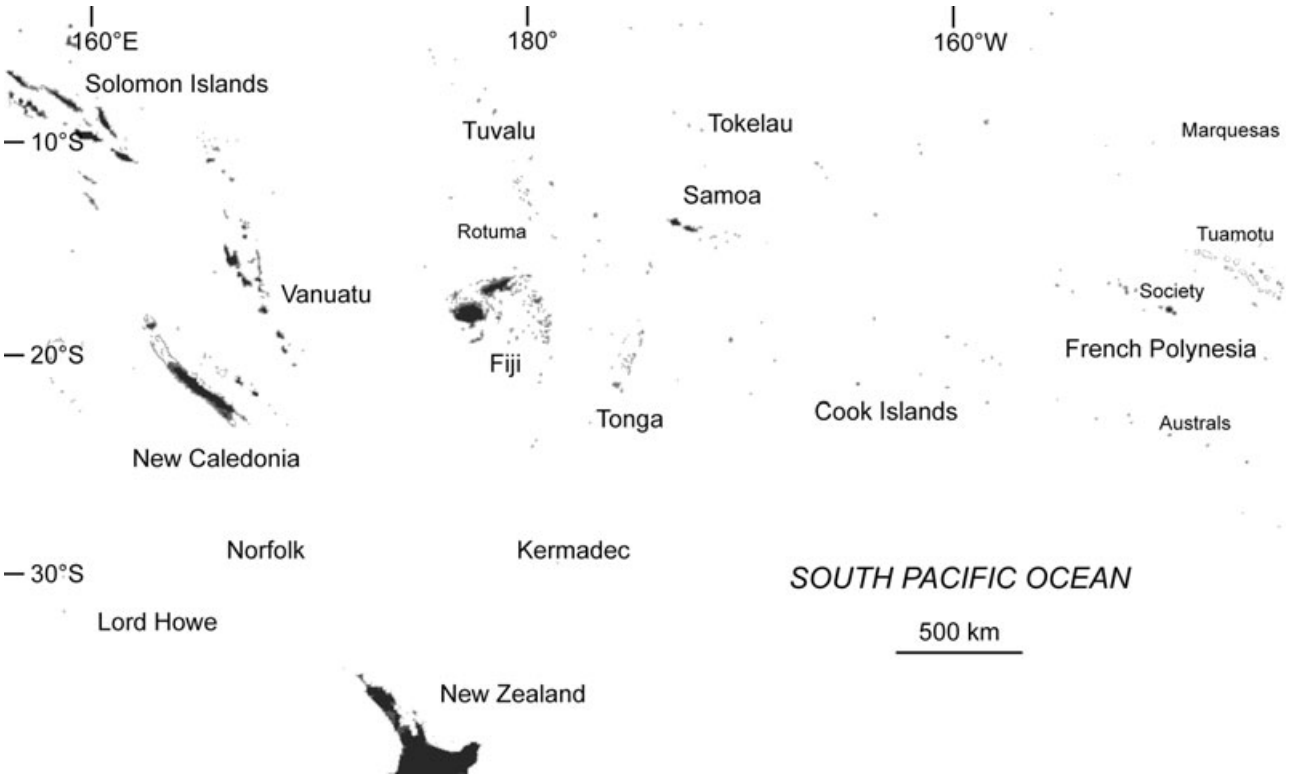


Fig. 1. Map of the South Pacific, including collecting localities.

herbaria of the Université de la Polynésie Française in Tahiti (UPF), Institut de Recherche Pour le Développement (IRD) (Nouméa, New Caledonia), Suva, Fiji (SUVA-A). Accession numbers followed by the letter 'L' indicate liquid-preserved material, while those preceded by the letter 'S' refer to microscope slide collections. Herbarium acronyms follow Holmgren *et al*. (1990).

RESULTS AND DISCUSSION

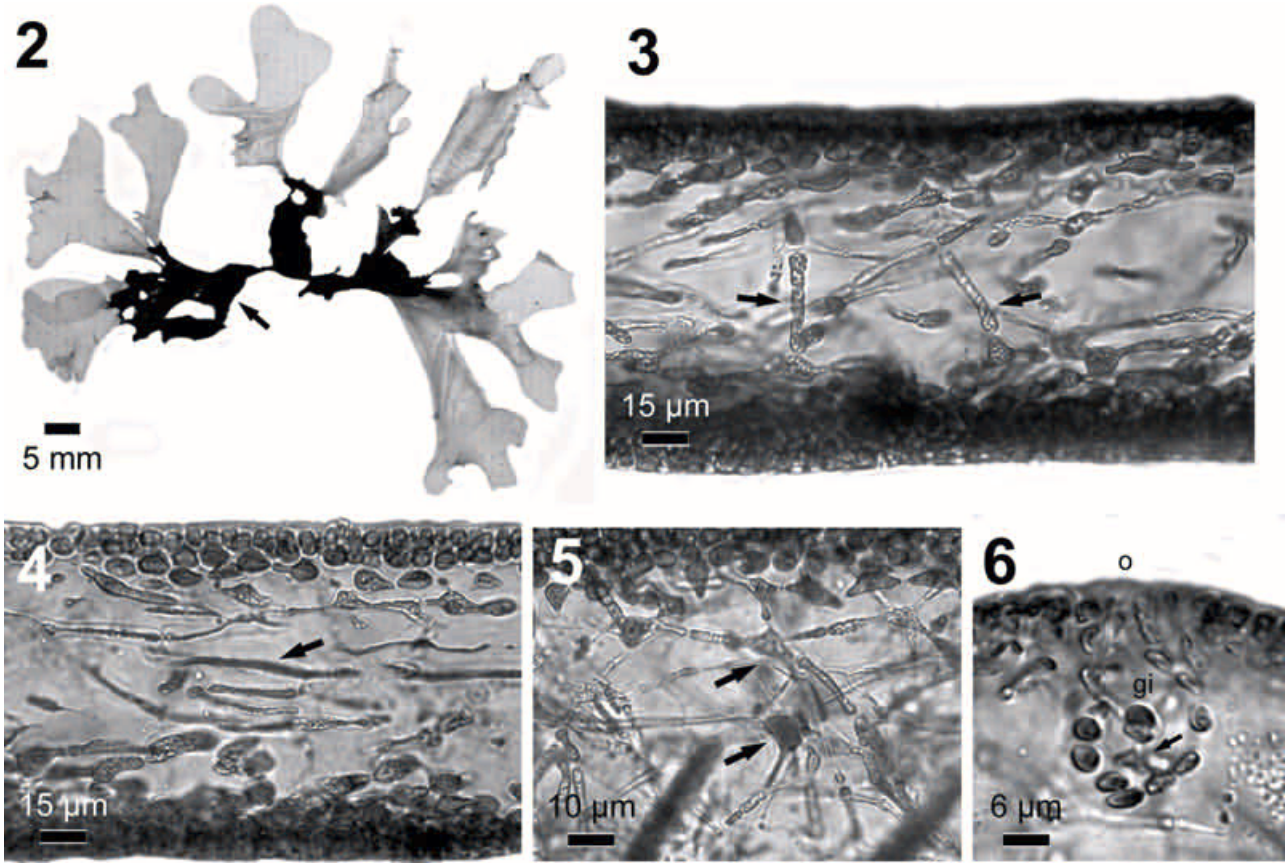
Halymeniales G.W. Saunders et Kraft
Halymeniaceae Kützing
Halymenia C. Agardh, *nomen conservandum*
**Halymenia nukuhivensis* N'Yeurt et Payri, sp. nov. (Figs 2–6)

Description. Thallus 50–60 mm altus. Portio thalli irregulariter ligulata, 3–5 mm lata, e qua fasiculi 8–10 laminarum tenuissimarum velut charta atque cuneatarum usque ad spathulatarum emanantes. Laminae 5–15 mm latae et 120–130 μm crassae, ramosae lateraliter atque late dichotomeque. Cortex stratus 2–3-plo. Cellulae extimae corticales cuboideae usque ad leniter elongatae, 2.5–6.0 μm diametro et 2.0–6.0 μm longae, binatae portata in cellulis rotundis 4–5 μm diametro. Cellulae intimae corticales ovoideae usque ad stellatae, 10–20 μm diametro atque plerumque bracchiis gracilibus filamenta medullosa 5–7 μm diametro et 15–40 μm longa subtentes. Medulla e filamentis anti-clinalibus, periclinalibus et obliquis, in proportionibus aequalibus, constans.

Thallus 50–60 mm high, composed of an irregular, strap-shaped portion of thallus 3–5 mm wide, from which are issued clusters of 8–10 papery-thin cuneate to spathulate blades 5–15 mm broad and 120–130 μm thick, irregularly and broadly dichotomously branched. Attachment to the substratum is via a small stipe about 2 mm long and 0.5–1.0 mm in diameter (Fig. 2), slightly thicker but of similar internal anatomy to the rest of the thallus. Color in living state is unknown; formalin-preserved material is yellow-cream becoming brownish-black in basal portions.

Cortex 2–3 layered; outermost cortical cells cuboid to slightly elongate, 2.5–6.0 μm in diameter and 2.0–6.0 μm long, borne in pairs on rounded cells 4–5 μm in diameter (Fig. 4). Innermost cortical cells ovoid, refractive, ganglionic to stellate, 10–20 μm in diameter, usually with three to six slender arms subtending medullary filaments 5–7 μm in diameter and 15–40 μm long (Fig. 5). Medulla composed in almost equal proportions of periclinal, anti-clinal and oblique filaments (Figs 3,4).

Carpogonial branches were not seen. Auxiliary cells are formed in open ampullar baskets, with branched filaments lining a narrow neck (Fig. 6). Gonimoblasts



Figs 2–6. *Halymenia nukuhivensis* sp. nov. vegetative and reproductive morphology of Holotype (UPF 575). 2. Habit of pressed plant, showing strap-shaped basal region (arrow). 3. Cross section showing dense cortex and presence of periclinal filaments (arrows) mixed with anti-clinal and oblique filaments. 4. Another section of the thallus, showing equally abundant presence of anti-clinal filaments (arrow) and cuboid cortical cells. 5. Region of inner cortex showing refractive ganglionic stellate cells (arrows). 6. Ampullar basket of female plant showing narrow ostiole (o) and gonimoblast initials issued from the auxiliary cell (arrow).

develop on the auxiliary cell, after contact with a connecting filament, consisting of several successively maturing gonimolobes 10–15 µm in diameter surrounded by a lax involucre of sterile filaments, located in the outer medulla below a carpostome flanked by elongate sterile cells. Plants do not adhere well to paper when dry.

Holotype. Nuku Hiva (08°52′57″S, 140°06′05″W), Marquesas *c*. 1997, *leg. J. Orempuller*, UPF 575.

Paratype. Nuku Hiva, Marquesas, *c*. 1997, *leg. J. Orempuller*, UPF 574.

Etymology. the specific epithet is derived from the island of Nuku-Hiva, where the alga was first collected.

Habitat. Growing subtidally, at about 20 m depth on rocky slopes.

Distribution. Nuku-Hiva, Marquesas, French Polynesia.

Remarks. The genus *Halymenia* currently consists of 66 species (Guiry & Guiry 2008). Abbott (1999a) recently surveyed known southwestern Pacific species of the genus *Halymenia*, but no mention was made of any taxon approaching the unusual habit of *H. nukuhivensis*. Among related foliose Pacific and tropical *Halymenia* species (Table 1), *H. nukuhivensis* sets itself apart by its strap-shaped basal portion from which are issued cuneate or irregularly subdichotomous blades, in contrast to the mostly simple, lobed habits of other species. It is also characterized by its dense, palisade-like outer cortex and the mostly equal proportion of anti-clinal, periclinal and oblique medullary filaments, which is unusual among the genus *Halymenia* where anti-clinal filaments are usually dominant. Its female reproductive features, such as open ampullary basket and slight involucre around the developing carposporophyte, fall well within the genus. Superficially, the cuneate, often irregularly subdichotomous habit could be mistaken for a species of *Rhodymenia* Greville, but its internal anatomy agrees well with the

Table 1. Comparison of selected characters between *Halymenia nukuhivensis* and other related species

Species	Habit and texture	Cortical cells	Medullary filaments
H. nukuhivensis†	Spathulate to cuneate or subdichotomous, issued from a strap-shaped base, papery; absence of a terete stipe	Cuboid to slightly elongate, in a palisade layer	Equally periclinal, anti-clinal and oblique, 5–7 μm in diameter
H. actinophysa M. Howe (type locality: La Paz, Gulf of California)‡	Lobed clustered blades; gelatinous	Ovoid, irregularly disposed	Mostly anti-clinal, to 5 μm in diameter
H. dilatata Zanardini (type locality: Red Sea)§	Foliose blade with a reniform or subpeltate base; stipe absent to short and thick	Rounded to elongate 'rabbit eared'	Both periclinal and anti-clinal, 6–7 μm in diameter
H. hollenbergii I.A. Abbott (type locality: San Diego, California, USA)¶	Broadly lanceolate to subcordate, lobed, crisp to undulate; stipe small.	Ovoid, irregularly disposed	Mostly anti-clinal, 4–10 μm in diameter
H. maculata J. Agardh (type locality: Mauritius)††	Foliose, irregularly palmate to cuneate, or subdichotomously branched; fleshy and slippery; stipe solid, long and cylindrical, to 13 mm long	Conspicuously elongate, 'rabbit-eared'	Oblique or periclinal, occasionally anti-clinal, 4–5 μm in diameter
H. porphyraeformis Parkinson (type locality: Okha, Gujarat, India)‡‡	Gelatinous, circular to elliptical, extremely thin and smooth, inconspicuous stalk	Ovoid, mostly irregularly disposed	Mostly anti-clinal, pillar-like and thick, to 10 μm in diameter
H. stipitata I.A. Abbott (type locality: O'ahu, Hawaiian Islands)§§	Foliose, conspicuously stipitate blade; stalk cartilaginous, thick	Conspicuously elongate, 'rabbit-eared'	Mostly periclinal, 5 μm in diameter

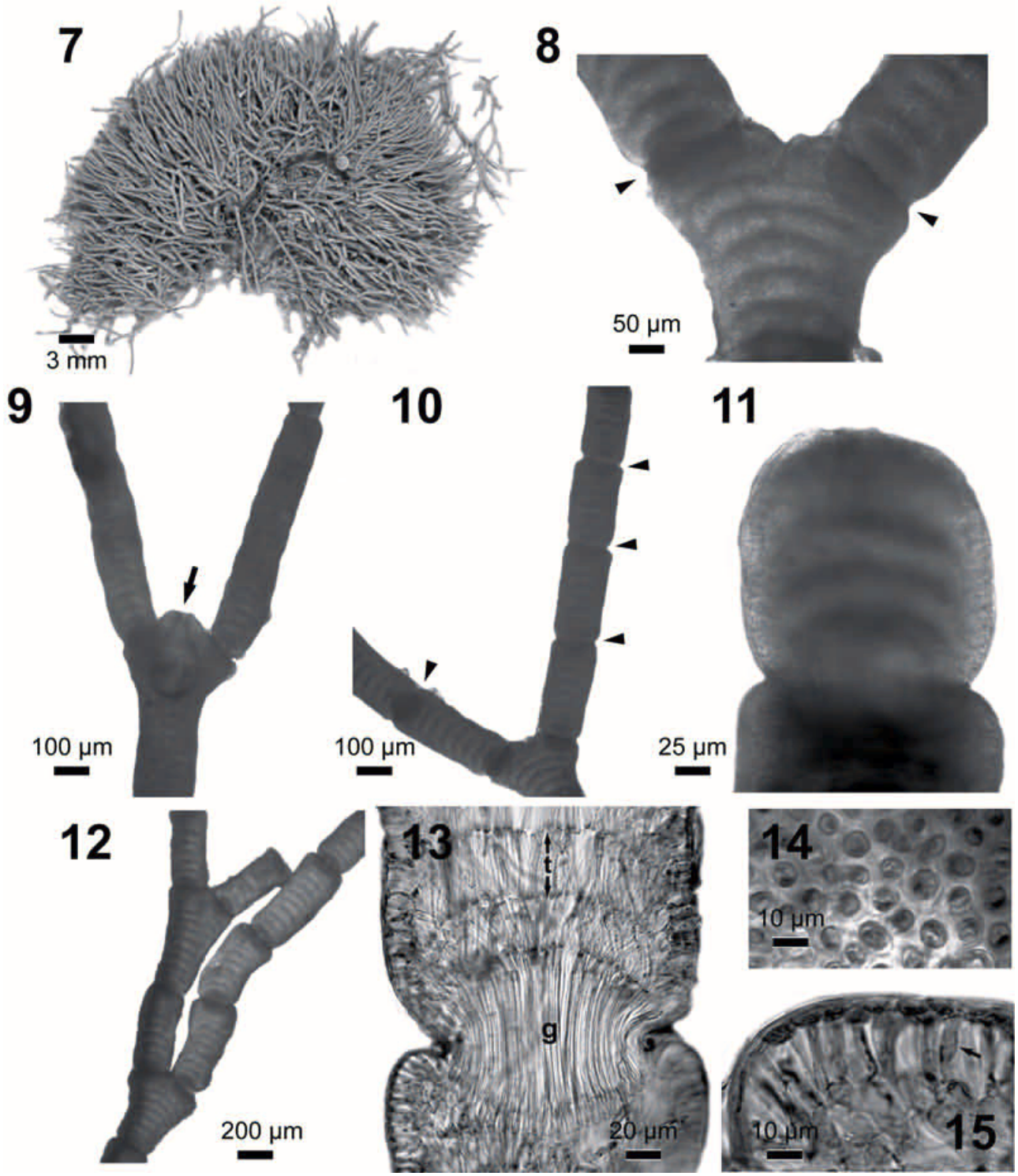
Source: †This study; ‡Howe (1911); §Kawaguchi and Lewmanomont (1999); ¶Abbott (1967); ††Kawaguchi *et al*. (2002); ‡‡Parkinson (1980); §§Abbott (1998).

genus *Halymenia*, notably the characteristic presence of anti-clinal filaments joining the upper and lower cortex, a character typical of the genus *Halymenia* (Abbott 1999b). So far in French Polynesia, *H. nukuhivensis* is only reported from the rocky slopes of the northern Marquesas group, an archipelago characterized by its submerged ancient reefs and lack of any typical barrier reefs (Cabioch *et al*. 2003; Montaggioni 2005).

Corallinales P.C. Silva *et* H.W. Johansen
Corallinaceae J.V. Lamouroux
Jania J.V. Lamouroux
**Jania articulata* N'Yeurt et Payri, sp. nov. (Figs 7–15)

Description. Thallus armeniacus usque ad eburinum, mollis et flexibilis, fasiculos usque ad 15 mm altos et 20–30 mm latos formans, e multis ramis articulatis constans. Rami articulati e segmentis calcifactis aut intergeniculis constantes. Calcificatio distincte annulata. Intergenicula nodis-non-calcifactis aut geniculis separata. Rami medulla filamentorum medullosorum quorum cellulae in stratis 40–50 μm distantibus ordinatae, cortice cellularum parvarum rotundatarum circumcinctae. Axes (200) 300–400 (600) μm diametro, geniculis frequentissimis et-non-calcifactis. Ramificatio dichotoma, aliquando trichotoma in partibus basalibus thallli. Intergenicula 400–1000 μm distantia. Genicula non ramosa 4–11 (22) inter dichotomis successivis. Apices ramorum rotundati,-non-inflati. Angulus ramificationis 45–60. Conceptacula tetrasporangiorum uni-locellata et tumida, in apicibus intergeniculorum terminalia, usque ad 500 μm lata et 400 μm alta, ramulis 2 superpositis. Tetrasporangia zonatim divisa, usque ad 200 μm longa et 80 μm diametro.

Thallus reddish-orange to cream-colored, soft and pliable, forming clumps to 15 mm high and 20–30 mm wide (Fig. 7), consisting of numerous jointed branches composed of calcified segments or intergenicula; calcification distinctly annulate. Holdfast small and inconspicuous, embedded in coralline algae substratum. Intergenicula separated by uncalcified nodes or genicula (Figs 8–12); branches with a core of medullary filaments with cells organized in tiers 40–50 μm apart, surrounded by a cortex of small rounded cells. Axes (200) 300–400 (600) μm in diameter, with very fre-



Figs 7–15. *Jania articulata* sp. nov. vegetative and reproductive morphology of Holotype (UPF 2710). 7. Habit of pressed plant, showing distinct annulate nature of branches. 8. Detail of decalcified branch node, showing slightly offset dichotomies and genicula (arrowheads). 9. View of decalcified fertile branch node, showing swollen, terminal tetrasporangial conceptacle with a narrow ostiole (arrow). 10. View of decalcified terminal axis, showing large number of unbranched genicula (arrowheads) between dichotomies. 11. Detail of rounded branch apex. 12. Detail of lower portion of axis, showing dichotomous branching. 13. Longitudinal section of decalcified genicula, showing densely packed elongate cells (g) and an intergenicular tier of cells (t, between arrows). 14. View of decalcified thallus surface, showing rounded cortical cells. 15. Transverse section of cortex, showing columnar subcortical cell (arrow).

Table 2. Comparison of selected characters between *Jania articulata* and other related species

Species	Branching	Mid axis diameter (μm)	Calcification	Angle of branching (°)	Intergenicular distance (μm)	Intergenicular length: width ratio	No. unbranched genicula between successive dichotomies
J. articulata†	Dichotomous, at times trichotomous	300–400	Annulate	45–60	400–1000	1.3–2.5	(4) 11 (22)
J. adhaerens J.V. Lamouroux‡	Dichotomous	70–140	Continuous	40–50	900–1200	8.5–12.9	2
J. pumila J.V. Lamouroux‡	Dichotomous	70–80	Continuous	30–40	500–800	7.1–10.0	3–4
J. rubens (Linnaeus) J.V. Lamouroux§	Dichotomous	80–90	Continuous	80–90	400–600	5.0–6.7	5–10
J. verrucosa ‡	Dichotomous	150–250	Continuous	<30	1500–3500	10.0–14.0	1–5

Source: †This study; ‡Abbott (1999b), §N'Yeurt (1996).

quent uncalcified genicula (Fig. 10). Branching dichotomous, sometimes trichotomous in basal portions of thallus; dichotomies slightly offset. Intergenicular distance 400–1000 μm; genicula numerous; between 4 and 11 (22) unbranched genicula between successive dichotomies. Intergenicular length: width ratio small, between 1.3 and 2.5. Intergenicula with (4) 6–11 (13) tiers of clear cylindrical cells 150–160 μm long and 5–6 μm in diameter; genicula composed of a single tier of densely packed elongate cylindrical cells 400–420 μm long and 5–6 μm in diameter (Fig. 13). Cortical cells (6)8–10(12) μm in diameter (Fig. 14), supported by elongate, cylindrical subcortical cells 25–30 μm long (Fig. 15). Branch apices rounded, not inflated, 150–200 μm in diameter (Fig. 11). Angle of branching 45–60°. Tetrasporangial conceptacles single-chambered and swollen, terminal on intergenicular apices, to 500 μm wide and 400 μm high, with two surmounting branchlets (Fig. 9). Tetrasporangia zonately divided, to 200 μm long and 80 μm in diameter.

Holotype. Fangatau Atoll (15°49′50″S, 140°54′00″W), Tuamotu, 17 May 2003, *leg. C. E. Payri*, UPF 2710.

Other material examined. Motu Tauhunu, Manihiki, Northern Cook Islands, 15 July 1974, *leg. G. N. MacRaild*, WELT CI25.

Etymology. The specific epithet is derived from the L. *articulatus*, meaning jointed, referring to the numerous, distinctive flexible genicula of the new species.

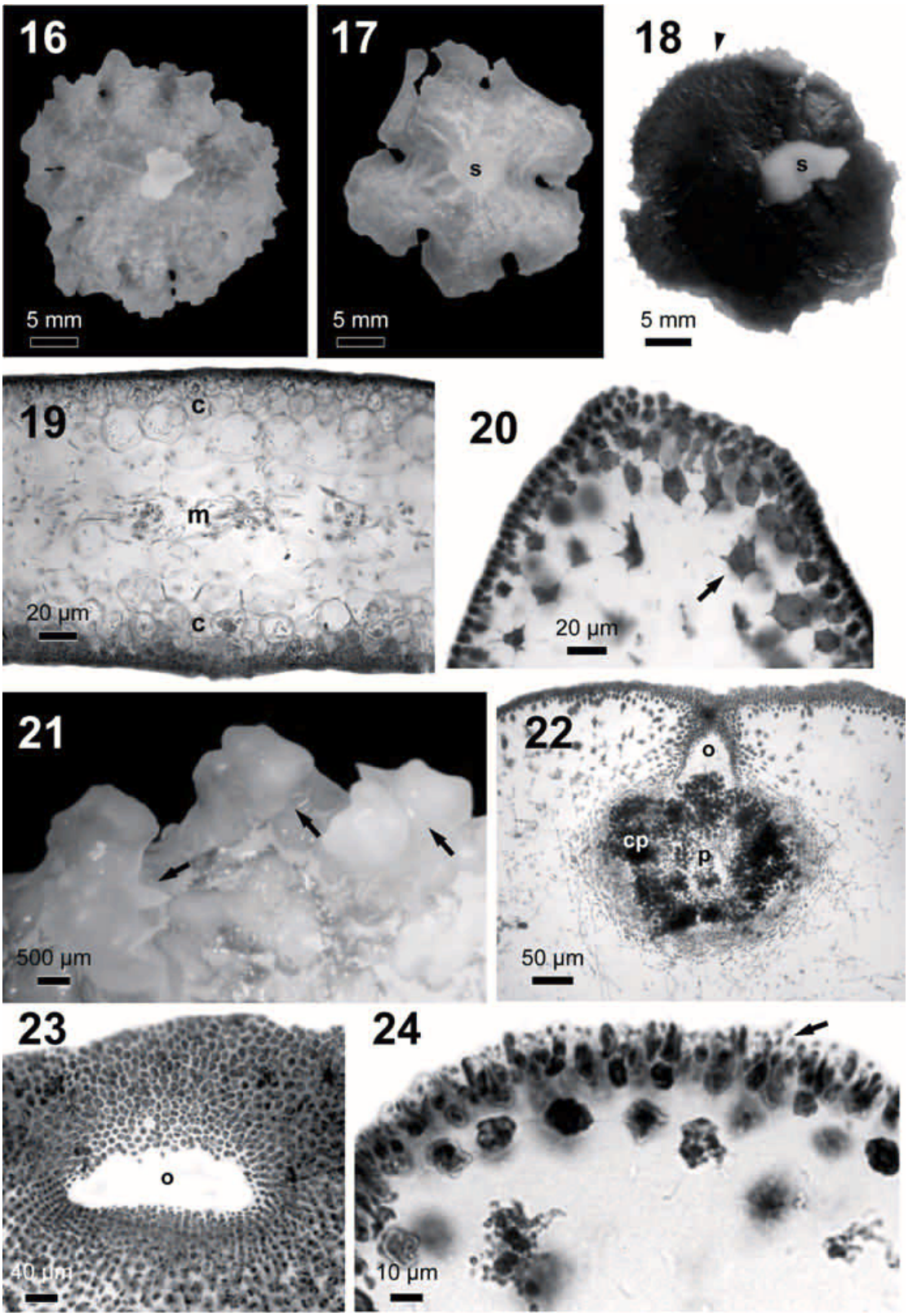
Habitat. Growing on the outer reef flat, epiphytic on coralline algae.

Distribution. Tuamotu archipelago, French Polynesia and Manihiki, Northern Cook Islands.

Remarks. The genus *Jania* consists of 35 current species worldwide (Guiry & Guiry 2008) and is characterized by its dichotomous branching and axial conceptacles (Womersley 1996). The large branch diameter and numerous interdichotomal genicula are distinctive characters of *J. articulata* within the genus *Jania*. From Table 2 showing some common tropical Pacific species of *Jania*, *J. articulata* has a much larger mid-axis diameter than other related species in the genus; also it sets itself apart by the very large number of unbranched genicula (up to 22) between successive intergenicular dichotomies, imparting the distinctive soft, pliable texture. The intergenicular length: width ratio of *J. articulata* is also by far the smallest among the reported species. A further difference is its sometime trichotomous branching, not reported in other *Jania* species. *Jania articulata* may superficially resemble some species of *Amphiroa*, but in the latter genus branching is irregularly dichotomous, axes are more than 1000 μm wide, and the reproductive structures are invariably borne on the intergenicular surfaces, whereas in *Jania* they occur in single, swollen chambers terminal on intergenicular apices (Norris & Johansen 1981).

Gigartinales Schmitz
Solieriaceae J. Agardh
Meristotheca J. Agardh
Meristotheca peltata N'Yeurt et Payri, sp. nov.
As *Meristotheca* sp. in N'Yeurt 2001: 795, figs 212–216. (Figs 16–24)

Description. Thallus peltatus, 20–30 mm diametro et 870–900 μm crassus, marginibus undulatis et vadose vel profunde dentatis, in substrato per stipitem prominentem centralem 5–7 mm longem et 3–4 mm diametro affixus; rubro-viridis, supra interdum maculata. Medulla ex filamentis rhizoideis 2–5 μm diametro foveas conjungentes secondarias numerosas habenti-



bus pro parte maxima constans. Cellulae corticales extimae ellipticae, 6–7 µm diametro; cellulae proxime subcorticales sphaericae vel ovoideae, 14–16 µm diametro, refractivae contento copioso amyli; cellulae intimae magnae, stellatae, multinucleatae, 42–60 µm diametro, foveis conjungentibus secondariis abundis instructae, rhizoidea transverse perducentia efferentes. Ramus carpogonialis-non-observatus; cystocarpia

Figs 16–24. *Meristotheca peltata* sp. nov. vegetative and reproductive morphology. 16. Habit of liquid-preserved Holotype (SUVA-A 5407La), showing distinctive peltate habit, undulate cystocarpic margin and central peg-like holdfast. 17. Habit of Paratype (SUVA-A 5407Lb) showing deeply cleft margin and central holdfast (s). 18. Habit of spermatangial thallus (SUVA-A 5482L), showing peltate habit, central holdfast (s) and dentate margin (arrowhead). 19. Transverse section of thallus (SUVA-A 5407La) showing inner filamentous medulla (m) and outer pseudoparenchymatous cortical layers (c). 20. Transverse section of thallus near margin (SUVA-A 5407Lb) showing stellate inner cortical cell (arrow). 21. Detail of female thallus (SUVA-A 5407La) with spinose marginal cystocarps (arrows). 22. Transverse section of carposporophyte (SUVA-A 5407L), showing central placenta of fused gametophytic and gonimoblast cells (p), carposporangial mass (cp) and ostiole (o). 23. Surface view of thallus (SUVA-A 5407La) showing ovoid ostiole (o). 24. Detail of cortex of male plant (SUVA-A 5482L) showing terminal spermatangia (arrow).

matura 1–1.5 mm diametro, pericarpio denso ostiolato interdum spinifero, superficialia ad marginem, protrudentia. Carposporophytum 545–800 μm diametro, placenta centralis ex cellulis connatis gametophyticis gonimoblastisque constans strato superficie carposporangiorum ovoideorum 7–11 μm diametro obtecta. Spermatangia terminalia in cellulis corticalibus extimis, superficialia in nematheciis elevatis. Tetrasporangia-non-observata.

Thallus peltate, 20–30 mm in diameter and 870–900 μm thick, with edges ruffled and shallowly or deeply dentate, attached to the substratum from its lower surface via a prominent peg-like central holdfast 5–7 mm long and 3–4 mm in diameter; reddish green, sometimes blotchy on upper surface (Figs 16–18). Medulla consisting mostly of rhizoidal filaments 2–5 μm in diameter with numerous secondary pit connections (Fig. 19). Outer cortical cells elliptical, 6–7 μm in diameter; cells immediately below spherical to ovoid, 14–16 μm in diameter, refractive with much starch content; inner cortical cells large, stellate, multinucleate, 42–60 μm in diameter, with abundant secondary pit connections and issuing transversely traversing rhizoids (Fig. 20). Carpogonial branch not seen. Cystocarps 1.0–1.5 mm in diameter, often spinose (Fig. 21), with a dense ostiolate pericarp, protruding from the upper surface on special papillae issued from the thallus margins (Figs 22,23). Carposporophyte 545–800 μm in diameter, consisting of a central placenta of fused gametophytic and gonimoblast cells covered by a surface layer of outwardly directed ovoid carposporangia 7–11 μm in diameter (Fig. 22). Spermatangia terminal on outer cortical cells, superficial in raised nemathecia (Fig. 24). Tetrasporangia not seen.

Holotype. Belcher Rocks, Suva Lagoon, Fiji (18°10′15″S, 178°31′10″E), 7 November 1994, *leg. D. W. Keats*, –20 m, SUVA-A 5407La (cystocarpic).

Paratypes. Belcher Rocks, Suva Lagoon, Fiji, 7 November 1994, *leg. D. W. Keats*, –20 m, SUVA-A 5407Lb (cystocarpic); 5407Lc.; Belcher Rocks, Suva Lagoon, Fiji, 13 November 1999, *leg. D. W. Keats & A. D. R. N'Yeurt*, –25 m, SUVA-A 5482L (spermatangial).

Etymology. The specific epithet is derived from the L. *peltatus*, meaning shield-like and attached by its lower surface, referring to the circular blade with a central stalk, so far unique among the genus.

Habitat. Growing at a depth of 25–30 m, on coral debris in a biotope characterized by relatively cool waters, high turbidity and strong wave action, where a high diversity of unusual taxa was found including the red alga *Pinnatiphycus menouana* (N'Yeurt *et al*. 2006) and some yet undescribed *Gracilaria* species.

The adequate collection of specimens was hindered by the notoriously rough conditions of the site (Belcher Rocks), which only allows safe boat access a few days each year, and only three fertile specimens were collected and examined over a span of 5 years.

Distribution. So far only known from the island of Viti Levu, Fiji.

Remarks. The family Solieriaceae belongs to the red algal order Gigartinales, and consists of genera that are multiaxial, with secondary pit connections between adjacent cells, and ostiolate cystocarps with a central fusion cell of sterile tissue surrounded by a surface layer of carposporangia. Inner cortical cells are usually stellate (Gabrielson & Kraft 1984). Characteristics of genera within the family were further delineated by Guimarães and Oliveira (1996) to include the presence or absence of interconnecting medullary filaments and nemathecial reproduction, and auxiliary cell complexes recognizable prior to, or after, diploidization. Womersley (1994) had proposed the merger of the Solieriaceae within the Areschougiaceae based on the priority of the latter name, but Fredericq *et al*. (1999) and Saunders *et al*. (2004) provided new molecular evidence for the reinstatement of the family Solieriaceae. Within the Solieriaceae, the only two flattened, blade-like members are the genera *Euryomma* Schmitz and *Meristotheca*. *Euryomma platycarpa*, the only species in the genus, has been reported from Sri Lanka (Kylin 1932), and mainly differs from *Meristotheca* by having embedded, non-papillate cystocarps with much denser enveloping

Figs 25–32. *Chondria bullata* sp. nov. vegetative and reproductive morphology. 25. General habit (IRD 3792). 26. Apical region of branch (VU 731), showing terminal trichoblasts (arrowhead). 27. Side view of main axis in mid-portion (UPF 423), showing distinctly bullate cortical cells (arrow). 28. Apical region of thallus (UPF 423) showing bullate cortical cells (arrowheads) and apical pit with rudimentary trichoblast. 29. Transverse section of mid-thallus (IRD 3792) showing small central axial cell (a) surrounded by five larger pericentral cells (1–5). Pericentral cell 4 has detached itself slightly from the axial cell during the preparation. 30. Surface view of thallus (UPF 423) showing isodiametric to lenticular cortical cells. 31. Apical region of fertile branchlet (IRD 3792) showing immersed tetrasporangia (t). 32. Detail of tetrasporangia (t), showing lateral attachment point (arrow).

Table 3. A comparison of selected characters between *Meristotheca peltata* and related *Meristotheca* species

Species	Type locality	Habit	Holdfast(s)	Margins	Cystocarps
M. peltata†	Belcher Rocks, Suva, Fiji	Peltate, erect	Single, central, prominent	Dentate, curled	Marginal
M. coacta Okamura‡	Kyushu, Japan; Taiwan	Prostrate, imbricating blades	Multiple, marginal	Dentate or fimbriate	Unknown
M. papulosa (Montagne) J. Agardh§	Hodeida, Yemen, Red Sea	Erect, blade-like	Single basal disc	Smooth or curled	Marginal
M. procumbens Gabrielson *et* Kraft¶	Lord Howe Is, Australia	Prostrate, blade-like	Multiple, marginal	Smooth or curled	Marginal

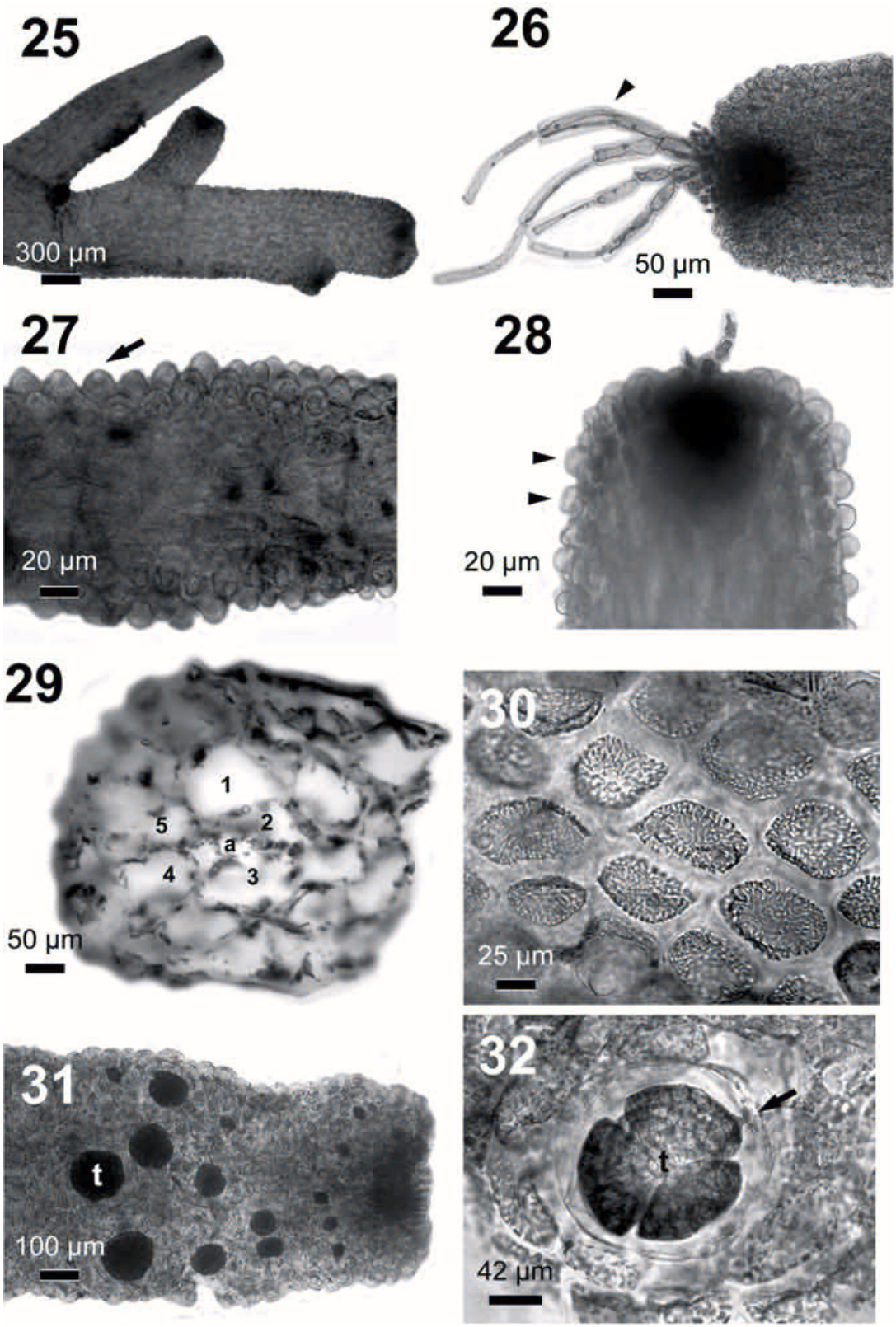
Sources: †This study; ‡Okamura (1930), Faye *et al*. (2007); §Agardh (1872); ¶Gabrielson and Kraft (1984).

tissue. The genus *Meristotheca* currently consists of 11 species (Faye *et al*. 2008), all irregularly flabellate or dichotomously branched. *Meristotheca* is characterized by the absence of interconnecting cells amongst medullary filaments, the occurrence of reproductive structures in nemathecia and cystocarps on papillae or marginal proliferations, and the absence of an auxiliary cell complex distinguishable prior to diploidization (Guimarães & Oliveira 1996). In the Asia-Pacific region, the genus is represented by *M. coacta* Okamura, *M. imbricata* Faye et Masuda and *M. papulosa* (Montagne) J. Agardh from Japan (Yoshida *et al*. 1995; Faye *et al*. 2007), and *M. procumbens* Gabrielson et Kraft from the South Pacific (Gabrielson & Kraft 1984; Payri *et al*. 2000; N'Yeurt 2001; Littler & Littler 2003); the latter species being part of the traditional diet of some Pacific Islanders (N'Yeurt 1995).

The Fijian plant is placed within the genus *Meristotheca* based on the pseudoparenchymatous nature of the cortex, multi-axial structure of the thallus with stellate cells, medullary filaments lacking interconnecting cells, and carposporophytes with a central placenta of fused cells. From Table 3 showing flabellate Pacific species of the genus, *M. peltata* is unique in having a consistently peltate habit and a peg-like central holdfast, in all three specimens examined collected 5 years apart. It is closest to *M. gigartinoides* Joly et Ugadim (Joly *et al*. 1965) which also has a single holdfast and dentate margins, but the latter species is much larger, blade-like and has cystocarps scattered over the surface, with the holdfast in a lateral, inferior position. Older specimens of *M. peltata* have been observed to have deeply cleft margins, with some anastomoses among the overlapping tiers reminiscent of *M. procumbens*, but the latter species has multiple discrete holdfasts and a decumbent habit unlike *M. peltata*. Although this is a relatively uncommon plant with only a few specimens collected, the peltate habit of the species was found to be consistent, in young plants as well as in older, fertile thalli, and also between collections spanning some five years (1994–1999). The eventual discovery of tetrasporangial thalli with presumably zonate tetrasporangia would be decisive in the firm placement of the species within the Solieriaceae. Unfortunately, no material suitable for molecular analyses is available, and recent algal surveys from Fiji and elsewhere in the region have not turned up any new collections of this distinctive species.

Ceramiales Oltmans
Rhodomelaceae Areschoug *nomen conservandum*
Chondria C. Agardh
**Chondria bullata* N'Yeurt et Payri, sp. nov. (Figs 25–32)

Description. Thallus usque ad 30 mm longus, repens, teres et irregulariter ramosus. Axes primarii (400) 545–600 (720) μm diametro. Axes secondarii (280) 320–360 (384) μm diametro, basi-non-constricti, claviformes, apicibus truncatis. Trichoblasti apicales, aggregati 3–8, dichotome ramosi, 160–400 μm alti, e cellulis cylindricis 50–60 μm longis et 25–40 μm diametro constantes. Cellulae superficiares (28) 32–48 (56) μm diametro, isodiametrae usque ad lenticulares, valde protrudentes 5–16 μm per thallum,



praesertim in partibus apicalibus iunioribus. Cellula axialis teres, 30–40 µm diametro, cellulis 5 pericentralibus elongatis usque ad ovoideis 70–80 µm diametro circumventa. Tetrasporangia in partibus subapicalibus ramulorum fecundorum immersa, 50–120 µm diametro, tetraedice divisa atque lateraliter affixa ad cellulam parentis. Materia gametangialis ignota.

Thallus to 30 mm long, creeping, terete and irregularly branched. Primary axes (400) 545–600 (720) μm in diameter; secondary axes (280) 320–360 (384) μm in diameter, unconstricted at the base, clavate shaped, with truncate apices (Fig. 25). Trichoblasts scarce, but when present terminal in groups of three to eight and dichotomously branched, 160–400 μm high, composed of cylindrical cells 50–60 μm long and 25–40 μm in diameter (Fig. 26). Axial cell terete, 30–40 μm in diameter, surrounded by five elongate to ovoid pericentral cells 70–80 μm in diameter (Fig. 29). Surface cells (28) 32–48 (56) μm in diameter, isodiametric to lenticular in shape (Fig. 30), markedly protruding by 5–16 μm throughout the thallus, especially in younger apical portions (Figs 27,28). Tetrasporangia immersed in subapical portions of fertile branchlets, 50–120 μm in diameter, tetrahedrally divided and laterally attached to parent cell (Figs 31,32). Gametangial material unknown.

Holotype. Nihiru Atoll (16°41′60″S, 142°49′60″W), Tuamotu, French Polynesia, 01 October 1995, *leg. J. Orempuller*, UPF 423 S37, UPF 424 S38.

Paratypes. Abokisa Island, Santo, Vanuatu, 22 August 2006, –35 m, *leg. C. E. Payri, Geoffray and J. L. Menou*, VU 731; Malo Island, Santo, Vanuatu, 31 August 2006, –18 m, *leg. C. E. Payri, Geoffray and J. L. Menou*, IRD 3791; Nagelelevu Island, Fiji, 20 May 2007, *leg. C. E. Payri*, –20 m, IRD 2347, IRD 2348.

Other material examined. Palmerston Atoll, Cook Islands, 25 May 1974, *leg. G.N. MacRaild*, WELT CI439a.

Etymology. The specific epithet is derived from the L. '*ebullio*', meaning to bubble-up, in reference to the characteristic exerted shape of the cortical cells, which look like bubbles in surface view.

Habitat. Growing on coral debris, on reef slope.

Distribution. Fiji, French Polynesia, Cook Islands, Vanuatu.

Remarks. A genus of some 74 current species worldwide (Guiry & Guiry 2008), *Chondria* in the tropical Pacific is represented by relatively few species, mostly diminutive and creeping or epiphytic (except for *C. armata* (Kützing) Okamura and *C. ryukyuensis* Yamada). Among related tropical species (Table 4), *Chondria bullata* is so far unusual in its markedly protruding cortical cells throughout its thallus and unconstricted secondary axes. Superficially similar to *Chondria simpliciuscula*, *C. bullata* is distinguished by its markedly projecting surface cells, which are not

Table 4. Comparison of selected characters between *Chondria bullata* and other related species

Species	Habit	Branching	Main axis diameter (μm)	Base of branches	Cortical cells
C. bullata†	Terete, creeping	Irregular	(400) 545–600 (720)	Unconstricted	Protruding, isodiametric to lenticular, 30–40 μm in diameter
C. dangeardii E.Y. Dawson‡	Flattened, decumbent	Subdistichous	1000–2500	Slightly constricted	Flush, elongate-cylindrical, 15–25 μm in diameter
C. minutula Weber-van Bosse‡	Terete, creeping	Irregular	125–200 (500)	Markedly constricted, spindle-shaped axes	Flush, elongate to ellipsoidal, 12–25 μm in diameter
C. repens Børgesen§	Terete, creeping	Irregular	200–300	Constricted	Flush, ovoid to elongate, 20–70 μm in diameter
C. simpliciuscula Weber-van Bosse‡	Terete, creeping	Secund to alternate	(170) 300–410 (900)	Slightly constricted	Flush, polygonal to elliptical, 15–65 μm in diameter

Source: †This study; ‡Abbott (1999b), N'Yeurt (1996, 2001), Price and Scott (1992); §Børgesen (1924).

elongated but isodiametric to lenticular in shape. *Chondria simpliciuscula* from the Great Barrier Reef (Price & Scott 1992) and Hawai'i (Abbott 1999b) differ slightly in their descriptions, but the Hawaiian material is deemed more typical, and certainly differs from *C. bullata* in a number of characters (Table 4). *Chondria bullata* differs from *Chondria repens* by its protruding, smaller diameter cortical cells and lack of constrictions at the base of branchlets. It is interesting to have recently identified *C. bullata* from hitherto unexamined collections in WELT from Palmerston Atoll in the central Cook Islands, thus bridging its distributional range from eastern Polynesia to western Melanesia.

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