

***Valeriemaya seagrieffii* sp. nov. (Delesseriaceae, Rhodophyta) from South Africa**

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A red alga that had previously been known from South Africa under the name '*ErythroGLOSSUM* sp.' is recognised to represent a new species of *Valeriemaya*: *V. seagrieffii* sp. nov. Collections of this alga occurring in the lower intertidal and subtidal habitats of rocky shores have been made from both the Eastern Cape and Western Cape Provinces. This represents the first report of the genus *Valeriemaya* from Africa. Previously, the genus, characterised by its typical apical organisation, monostromatic blades, an ill-defined midrib region,

and the absence of microscopic nerves or veins, has been known with certainty only from eastern Australia. *Valeriemaya seagrieffii* is delineated from the two previously known species of the genus by the overall size of the blades, the location of sporangial sori, the absence of gland cells, and blades which do not recurve towards the substratum to become attached and give rise to new blades. *Valeriemaya seagrieffii* has been collected from Glencairn, False Bay to Hluleka in the Eastern Cape Province.

Introduction

The first report in the literature of the alga under discussion was in Seagrief's (1984) Catalogue of South African marine algae, where he referred to '*ErythroGLOSSUM* sp. Herbarium. A record of Seagrief from East London'. Subsequently, Seagrief (1988) depicted apparently this same alga from the Eastern Cape Province, '*ErythroGLOSSUM* sp.' He showed the alga to consist of simple blades up to 6mm in length with a well developed midrib and a series of discrete tetrasporangial sori running longitudinally on either side of the blades. The blades arose from a well developed system of branching terete fleshy axes. The tips of the blades varied in outline from attenuate to broadly obtuse. In their account of marine algae from Hluleka (Transkei), Bolton and Stegenga (1987) recorded and depicted the apex of an alga cited as 'Delesseriaceae indet.', stating that their collection consisted of a few juvenile plants and one plant bearing tetrasporangia. Blades were said to be up to 15mm in length and were simple or with few marginal proliferations. Margins of the blades were smooth, with an ill-defined midrib but devoid of lateral veins. The blades were said to be three cell layers thick but thicker in the region of the midrib. These authors expressed the opinion that their alga fitted the description of *Crassilingua* (Papenfuss 1956), a genus known from Australia, but the lack of fertile female plants precluded a

more definitive determination. The apex depicted (Bolton and Stegenga 1987, Figure 3e), however, shows the distinctive organisation later recognised as the *Valeriemaya*-type apex (Millar and Wynne 1992). *ErythroGLOSSUM* sp. was also reported from the Cape Hangklip area as part of an ecological survey by Jackelman *et al.* (1991). Finally, in the recent seaweed flora of the South African west coast, Stegenga *et al.* (1997) included a record of '*ErythroGLOSSUM* sp. indet.', reportedly a South African endemic occurring from Glencairn (False Bay, Cape Peninsula) to Hluleka, Transkei. They provided both a description of this alga and four figures of its habit, thallus apex, and details of the thallus margin and cross section. Although fertile plants were not shown, tetrasporangial thalli were said to have tetrasporangia in round or elongate sori on either side of the midrib. Furthermore, a reference to Seagrief's earlier publications (1984, 1988) clearly reveals that the alga under discussion was regarded to be the same. Again, the lack of sexual plants prevented the authors from offering an identification of their material to the species level. On the other hand, the distinctive apical organisation that was depicted shows that this unknown alga is more readily assigned to *Valeriemaya* than *ErythroGLOSSUM*. Recent additional collections of this same alga from the Eastern Cape and collections housed at

the herbarium of the University of California (UC), allow us to offer a description of this alga as a new species of *Valeriemaya*.

Results

Diagnosis

Valeriemaya laminis erectis, 2–6mm latis sine rhizoidibus adventitiis, sine cellulis glandulosis, soris tetrasporangiorum situ variis. Thallus 16(–35)mm altus, frondis ovalis ad oblongis numerosis erectis e base rhizomatosa ortis. Laminae generaliter simplices vel bifurcatae, 2–4(–6)mm latae et 8–20mm longae; laminae juvenales ex stipite vel e marginis laminis e vel base rhizomatosa orientes; apices lati rotundati, typicus *Valeriemaya*; laminae monostromaticae praeter ad regionem costae; tetrasporangia in soris binis utroque costae latere disposita, 0.5–1mm lati et 1.3–2.2(–4.5)mm longi vel in soro solitario disposita, sori irregulariter positi; tetrasporangia tetrahedraliter divisa, usque ad 40–50(–65) μ m in diametro; cystocarpi per paginas laminarum fortuite distributi; spermatangia non observata.

Holotype

Bats Cave Rocks, East London, Eastern Cape Province (Papenfuss 1736, 9.vii.1937, deposited in UC as 'Delesseria?'). Figure 1. Consistent with Arts. 8.2 and 8.3 of the St. Louis Code (Greuter *et al.* 2000), the holotype comprises two different reproductive phases (cystocarpic and tetrasporangial) mounted on a single herbarium sheet, accompanied by microscope slides made from these two reproductive phases.

Isotypes

BOL, GENT, GRA, and MICH.

Description

Thallus up to 16(–35)mm high, composed of an extensive and proliferous rhizome system which gives rise to ovate to oblong blades. Blades generally simple or occasionally bifurcate, 2–4(–6)mm wide and 8–20mm long; new blades arising from the stipes or as marginal proliferations of the blades or directly from the rhizomatous basal system; apex broadly rounded, of the *Valeriemaya*-type; blades monostromatic except for the corticated midrib region; tetrasporangial sori arranged as a single pair on each side of the midrib, 0.5–1mm wide each and 1.3–2.2(–4.5)mm long or in a single, large, confluent, ovate sorus, their position on the blade varying, tetrasporangia tetrahedrally divided, up to 40–50(–65) μ m in diameter; cystocarps scattered over the blade surface. Spermatangia unknown.

Etymology

The specific epithet commemorates the late Prof. Stanley C. Seagrief, Rhodes University, Grahamstown, for his contributions towards the study of the South African algal flora.

Other known collections

Arniston (Pocock 573, 20.ii.1939, UC); Bats Cave Rocks, East London, Eastern Cape Province (Papenfuss 1735, 16.vii.1937, UC); Brandfontein, Western Cape Province (Stegenga, 11.xi.1989, BOL slide 1250, 1268); Cape Hangklip, Western Cape Province (Jackelman 1989, BOL slide 1182); Glencairn, Western Cape Province (Stegenga, 11.xi.1989, BOL Sa2573, slide 1205); Hluleka, Eastern Cape Province (Stegenga, vi. 1983, BOL slide T200, T209); Kariega Rocks, Eastern Cape Province (Walker 178, 19.xi.1943, GRA); Kei River Mouth, Eastern Cape Province (De Clerck and Stegenga, 24.x.1999, BOL KZN 1600); Morgan Bay, Eastern Cape Province (Pocock 1821c, 29.ix.1939, UC); Morgan Bay, Eastern Cape Province (Pocock 1821d, 29.ix.1939, UC Pocock); Nature's Valley, Western Cape Province (Stegenga 12.vi.1987, BOL slide EC 280); Riet River, Eastern Cape Province (Seagrief 1460, 15.ii.1961, GRA).

Distribution

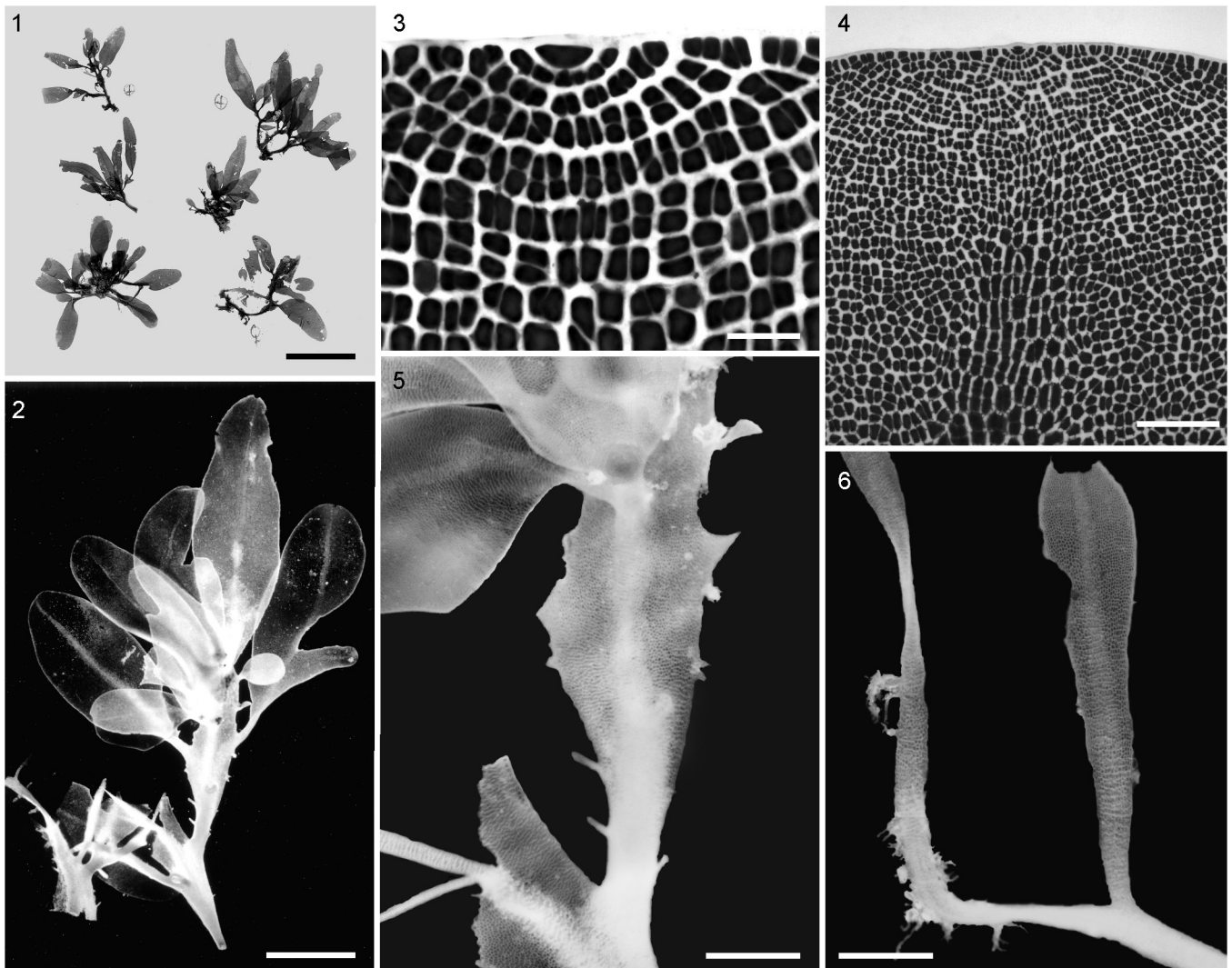
From Hluleka in the northern part of the Eastern Cape Province to Glencairn and Strandfontein in False Bay, Western Cape Province.

Ecology

Plants were collected from upper intertidal pools to the shallow subtidal, but seemed to be most common as part of turf algal communities of vertical rock ledges in the lower intertidal. Tetrasporic plants were collected in May and November; a single female gametophyte was collected in November.

Vegetative structure

The thallus consists mostly of an elaborate creeping rhizomatous base consisting of terete or slightly compressed, branched axes (500–700 μ m in diameter) attached to the substrate by means of discrete patches of rhizoids. The basal part gives rise to usually simple blades which have a short terete stipe, up to 2mm long. Often the stipe is branched and produces new blades or terete rhizoidal axes (Figures 2, 5). The blades are variable in size and morphology ranging from small, ovate, simple blades up to 4mm long and 3mm wide only, to much larger, oblong usually simple but rarely bifurcate blades attaining a length of 20mm and a width of 6mm. Branching occurs from the midrib region in the basal parts of the blades close to the terete stipe or from the margins in the lower half of the blades (Figures 5, 6, 9). Blades are entire and monostromatic except from an ill-defined midrib region (Figure 8). The cortication of the median part of the blade starts approximately 70–100 μ m below the apex and becomes more noticeable towards the basal part of the blade (Figure 4). The midrib region reaches a width of 300 μ m, comprising about 1/20 to 1/10 of the blade width near its widest part. The central region is 250–270 μ m thick and is composed of 5 layers of



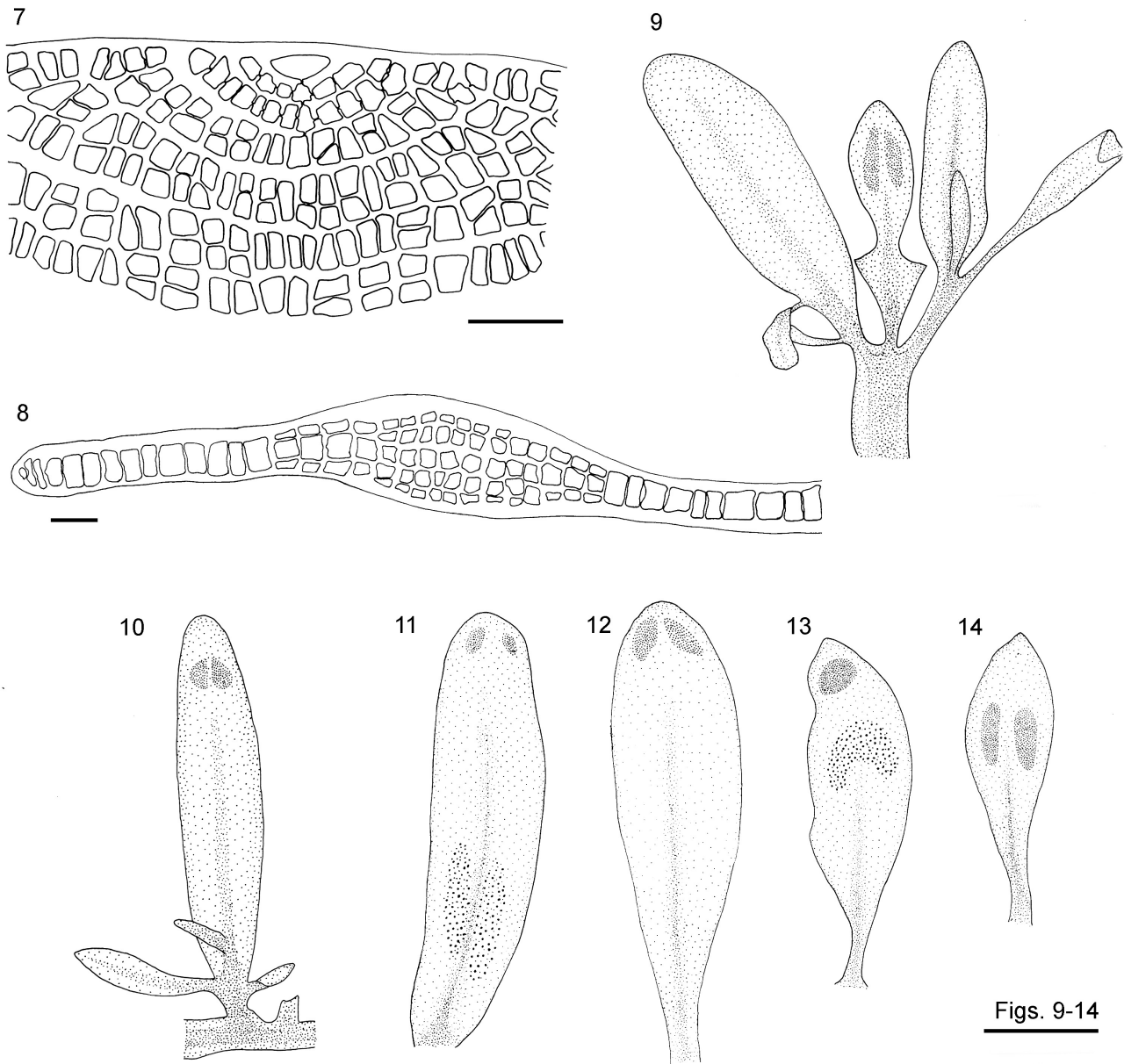
Figures 1–6: Type and habit of *Valeriemaya seagriffii*. **1** Holotype (Papenfuss 1736 in UC). Scale bar: 1.5cm. **2** Habit of a wet-preserved specimen (KZN 1600). Scale bar: 5mm. **3** Detail of the apical organisation. Scale bar: 35 μ m. **4** Blade apex showing the early development of the thickened central region. Scale bar: 200 μ m. **5** Young blades arising from the margin as well as from the midrib of an old eroded blade. Scale bar: 2.5mm. **6** Blades arising directly from a rhizoidal axes. Scale bar: 2mm

cells frequent in rows of all orders. The monostromatic wings are 70–85 μ m thick (Figure 8). Microscopic veins or nerves are absent. Growth proceeds by means of a single apical cell terminating each blade which divides transversely, cutting off cells proximally (Figures 3, 7). Cells of the primary cell row undergo intercalary divisions, and also produce second-order cell rows laterally. The latter cut off third-order cells adaxially. In the apical part of the thallus regular tiers of cell rows can be easily observed. Intercalary divisions are frequent in all order rows, eventually obscuring the regular tiered appearance corresponding to original segments. Vegetative cells measure 35–55 μ m. Gland cells are absent. Tetrasporangial sori occur mainly as two separate sori abutting the central thickened region (geminate) (Figures 9, 10, 12, 14). Sometimes a single confluent sorus is present, which most probably represents an older stage of the two geminate sori (Figures 11, 13). The position of the sori in the

blade does not seem to be fixed. Sporangial sori have been observed in the distal, median as well as basal parts of the blades. In general only a single pair of geminate sori per blade. However, some blades produced two pairs of sori: the older sorus, often confluent, situated in the median to basal part of the blade, the younger sorus situated near the apex of the blade. Mature sporangia reach a diameter of 40–50(–65) μ m and are formed in several layers. Cystocarps are scattered over the blade surface.

Discussion

The genus *Valeriemaya* was described by Millar and Wynne (1992), and two species, *V. geminata* Millar and Wynne, the type of the genus, and *V. maculata* Millar and Wynne occurring in eastern Australia, were then assigned to it. At the time the genus was described, Millar and Wynne (1992) also



Figures 7–14: Anatomy and morphology of *Valeriemaya seagriifii*. **7** Detail of the apical region. Scale bar: 50 μ m. **8** Cross-section in the median region of a blade. Scale bar: 150 μ m. **9–10** Habit of a tetrasporic portion of a thallus with new blades arising from the basal margins of older blades as well as from the thickened midrib regions. **11–14** Details of sporangiate blades showing the position and morphology of the tetrasporangial sori. Scale bar **9–14:** 5mm

established an informal group called the *Valeriemaya* group, which was said to be distinct from the *Phycodrys* group on the basis of the apical organisation. This group, which was subsequently recognised as a tribe by Wynne and Millar (Wynne 2001), was defined on the basis of its apical organisation (each apex terminated by a single transversely dividing apical cell, with intercalary divisions occurring in cells of the primary axial row, and with third-order rows cut off adaxially from second-order rows) and the procarp consisting of one 4-celled carpogonial branch, one sterile-cell group, and a cover cell(s). Also, near the apex distinct, regular tiers of cells derived from segments of the primary row are

detectable. On the other hand, in the *Phycodrys* group *sensu stricto*, the apical organisation differs in that third-order rows are cut off abaxially from second-order rows, and regular tiers of cells derived from segments of the primary row are not detectable. In addition to *Valeriemaya*, Millar and Wynne (1992) included in their new group several other genera: *Polyneurella*, *Polyneuropsis*, and *Calonitophyllum*. They also indicated that some taxa from New Zealand known as *Erythroglossum undulatissimum* (J. Agardh) Kylin and *E. laingii* Kylin should be assigned to the *Valeriemaya* group. But the lack of sexual plants in these New Zealand species made a more precise identification impossible.

Subsequently, Adams (1994) included *E. laingii* within *E. undulatissimum*, and she also expressed the opinion that the older name *Hemineura cruenta* Harvey (1855) is the same alga and has nomenclatural priority. She indicated that a new genus was to be published on this New Zealand alga according to a personal communication by MH Hommersand and GR South; but no mention was made of any relationship to *Valeriemaya*. It is worth pointing out that for both South African material and New Zealand material an assignment of these uncertain algae to *Erythrogloussum* was made.

The new species is assigned to the genus *Valeriemaya* on the basis of the typical apical structure, the presence of a midrib region, the monostromatic nature of the blades, the absence of lateral nerves and microscopic veins, and the occurrence of cystocarps scattered over the blades. In the past *V. seagriefii* was tentatively assigned to the genus *Erythrogloussum* (Seagrief 1984, 1988, Stegenga *et al.* 1997). However, the formation of third-order cell rows in an adaxial manner, the absence of veins and nerves, and the paired tetrasporangial sori abutting the midrib, prevent us from assigning the species to *Erythrogloussum*. Species belonging to the latter genus are typically characterised by the formation of third-order cell rows in an abaxial manner (*Phycodrys* group), the presence of nerves and veins, and sporangial sori which are arranged near the thallus margin (Mikami 1976, Coppejans 1983, Mikami 1987, Maggs and Hommersand 1993, Wynne 1996). The illustration of a tetrasporic plant of what is presumably *V. seagriefii* by Seagrief (1988) as *Erythrogloussum* sp. is at odds with our observations. The tetrasporangia were illustrated as discrete sori running longitudinally on either side of the blade. Despite the fact that the overall appearance of the plant depicted by Seagrief is very similar to *V. seagriefii*, such a sporangial arrangement has not been observed in any of the plants we have examined. Furthermore, the collections in GRA were all sterile. Examination of the alga reported by Bolton and Stegenga (1987) from Hluleka has shown that it is also representative of *V. seagriefii*. The mention of a thallus three layers thick seems to be erroneous. The similarity to *Crassilingua* Papenfuss can be dismissed on grounds of the apical organisation (*Phycodrys* group) and tetrasporangial organisation. It should be noted that among a set of unidentified specimens (UC) collected at various locations along the South African south coast, several specimens were encountered which are morphologically extremely similar to *V. seagriefii* but which are characterised by a clear *Delesseria*-type apex: each apex terminated by a single transversely dividing apical cell, resulting in an axial filament which becomes surrounded by two lateral and two transverse pericentral cells, with intercalary divisions occurring in second and higher order rows (Wynne 1984). Unfortunately, the lack of wet-preserved material prevents us from being more precise on the nature of these specimens at this stage.

Valeriemaya seagriefii shares its overall growth form with both *V. geminata* and *V. maculata*, being characterised by a well developed system of terete axes giving rise to erect simple or sparsely branched blades. The new species is easily differentiated from *V. maculata* by the absence of conspicuous gland cells in the wings of the blades. A further dif-

ference includes the presence of a single tetrasporangial sorus restricted to the basal parts of the blades in *V. maculata*. *Valeriemaya geminata* seems closer to *V. seagriefii*, but in the former species blades recurve towards the substratum where they become attached by means of fibrous rhizoidal holdfasts. This character has not been observed among the numerous collections of *V. seagriefii*. Furthermore, blades of *V. geminata* are narrower, attaining a width of 3mm, compared to 2–6mm in *V. seagriefii*. Also the tetrasporangial sori which are confined to the median parts of the blades differentiate *V. geminata* from *V. seagriefii* where sporangial sori are observed in the distal, median as well as basal parts of the thallus. *Erythrogloussum undulatissimum*, possibly belonging to the genus *Valeriemaya* (Millar and Wynne 1992), is a much larger species, reaching a height of 12cm, which is profusely branched from the margin (Kylin 1933, Adams 1994).

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