New records and notes on marine benthic algae of American Samoa-Chlorophyta & Phaeophyta

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Abstract — A total of 43 species are added to the previously known flora of the benthic marine algae of American Samoa (8 Phaeophyta, 35 Chlorophyta), raising the known flora to 230 species. More new additions to the flora can be anticipated when Rhodophyta and Cyanophyta collected during recent surveys, and older unworked collections, are examined. Most of the additions reported here have a widespread Indo-Pacific distribution. Spono-
cladopsis erythraea Naar (Chlorophyceae, Chaetophorales) was found epiphytic on the base of Sargassum anapense Seltchel et Gardner, the first record outside its type locality (Red Sea).

American Samoa / benthic marine algae / Chlorophyta / new records / Phaeophyta / Spono-cladopsis erythraea

Résumé — Nouvelles signalisations et notes sur des algues marines benthiques des îles Samoa américaines – Chlorophyta & Phaeophyta. 43 espèces au total sont ajoutées à la flore précédemment connue des algues marines des îles Samoa américaines (8 Phaeophyta, 35 Chlorophyta), augmentant le nombre d'espèces connues jusqu'à 230. Beaucoup de ces nouvelles additions à la flore pourraient être prévisibles à l'examen des Rhodophyta et Cyanophyta récoltées récemment et des anciennes collections non exploitées. La plupart de ces nouvelles espèces signalées ici ont une large répartition indo-pacifique. Spono-
cladopsis erythraea Naar (Chlorophyceae, Chaetophorales) a été trouvée en épiphyte sur la base de Sargassum anapensor Seltchel et Gardner, et pour la première fois en dehors de sa localité type (Mer Rouge), (Traduit par la Rédaction).

Algues marines benthiques / Samoa américaines / Chlorophyta / nouvelles signalisations / Phaeophyta / Spono-cladopsis erythraea

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Communicating editor: John Huisman

1. We are pleased to dedicate this paper in honour of Inez Abbert’s 85th birthday. For both of us Inez has been a great friend, mentor and role model in our studies of tropical Pacific benthic marine algae. We know of nobody else who has the enthusiasm and such an in-depth knowledge of these challenging algae; and we look forward to working with her over the coming years as we continue to learn about these fascinating algae.
INTRODUCTION

Much of our knowledge on the marine algal flora of American Samoa (14°S, 168°17′W) is credited to William Albert Setchell, who published a fairly comprehensive flora of the islands in 1924. Setchell employed the assistance of many able collectors from abroad and locally, and the collections were mostly from the intertidal to the shallow subtidal zone, with deeper collections possible through dredging. Setchell compiled 100 species, including 13 Cyanophyta, 47 Rhodophyta, 11 Phaeophyta and 29 Chlorophyta, from about 15 sites, primarily on Tutuila and Aunu'u islands. The inner Pago Pago Harbour received much of Setchell’s attention and over 60 species were found, with four new to science (Setchell, 1924; summarised in Skelton, 2003a).

Known collectors since Setchell are listed in Table 1. Specimens collected by them are scattered in many herbaria but the majority are housed at BISH and UC. A compilation of all known algae from the Samoa Archipelago (including American Samoa) was made by the authors (Skelton & South, 1999), and remains a foundation for modern treatment of algae from Samoa. Littler & Littler (2003) published an illustrated guide to common sea-weeds of the South Pacific in which 33 species were attributed to American Samoa, the majority of which are new records, including 3 Phaeophyta and 6 Chlorophyta.

In 2002, the authors participated in invasive species surveys carried out by the Pacific Biological Survey of the Bishop Museum (Coles et al., 2003). This was followed by an invitation by the Department of Marine & Wildlife Resources (DMWR), Government of American Samoa to do further algal surveys of the Manu’a Group and other sites that were not surveyed during the invasive species initiative (Coles et al., 2003 and Skelton, 2003b). Some of the findings include new additions to Setchell’s list, of which the Chlorophyta and Phaeophyta are reported herein.

Table 1. Chronology of known algal collectors of American Samoa.

<table>
<thead>
<tr>
<th>Collector</th>
<th>Date</th>
<th>Herbarium</th>
</tr>
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<tbody>
<tr>
<td>W.A. Setchell</td>
<td>1900</td>
<td>UC, BISH</td>
</tr>
<tr>
<td>A.L. Treadwell</td>
<td>1900</td>
<td>UC, BISH</td>
</tr>
<tr>
<td>F.A. Potts</td>
<td>1920</td>
<td>UC, BISH</td>
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<tr>
<td>ITASCA Expedition</td>
<td>1935</td>
<td>UC</td>
</tr>
<tr>
<td>H. Way</td>
<td>1938</td>
<td>BISH</td>
</tr>
<tr>
<td>L.B. Lorin</td>
<td>1958</td>
<td>BISH</td>
</tr>
<tr>
<td>R. Tinta</td>
<td>1963</td>
<td>BISH</td>
</tr>
<tr>
<td>R. Bagwell</td>
<td>1964</td>
<td>BISH</td>
</tr>
<tr>
<td>Ab Sze</td>
<td>1964</td>
<td>BISH</td>
</tr>
<tr>
<td>C.H. Lamontozzi</td>
<td>1965</td>
<td>BISH</td>
</tr>
<tr>
<td>J. Randell</td>
<td>1971, 1974</td>
<td>BISH</td>
</tr>
<tr>
<td>M.G. Ditty</td>
<td>1975</td>
<td>BISH</td>
</tr>
<tr>
<td>M.D. Hoyle</td>
<td>1975</td>
<td>BISH</td>
</tr>
<tr>
<td>D. Littler &amp; M. Littler</td>
<td>1990</td>
<td>US</td>
</tr>
<tr>
<td>P. Guernock</td>
<td>1998</td>
<td>Personal</td>
</tr>
<tr>
<td>P. Vroom</td>
<td>2000</td>
<td>BISH</td>
</tr>
<tr>
<td>P.A. Skelton</td>
<td>2002, 2003</td>
<td>SURA, BISH*</td>
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*Specimens to be deposited pending completion of analysis.
Fig. 1. Map of Tutuila Island (above); Ofo and Ofosega (below) showing the collecting sites. (Maps courtesy of the Department of Marine and Wildlife Resources, Government of American Samoa).

MATERIALS AND METHODS

26 sites were surveyed (see Fig. 1, Table 2). Collections were made by snorkeling, wading, intertidal sampling, and scuba-diving. All specimens were preserved in 4% formalin/seawater solution for 2 days, and were shipped to Australia for further analysis. The collecting sites and details are given in Table 2. Specimens were pressed on herbarium sheets or mounted on slides. Slide specimens were stained with aniline blue and mounted in a 30% karo solution.
Table 2. Collecting sites (see fig. 1). TI – Tutuila Island; OF – Ofu Island; OL – Olosega Island; AU – Aumua’s Island.

<table>
<thead>
<tr>
<th>Station No</th>
<th>Date Collected</th>
<th>Locality</th>
<th>Lat. GPS</th>
<th>Long. GPS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>16-Oct-02</td>
<td>Amahus (TI)</td>
<td>14°15.58’</td>
<td>170°59.32’</td>
</tr>
<tr>
<td>2</td>
<td>16-Oct-02</td>
<td>Vaiia (TI)</td>
<td>14°14.79’</td>
<td>170°40.15’</td>
</tr>
<tr>
<td>3</td>
<td>13-Oct-02</td>
<td>Uluk (TI)</td>
<td>14°17.02’</td>
<td>170°44.67’</td>
</tr>
<tr>
<td>4</td>
<td>15-Oct-02</td>
<td>Dock (TI)</td>
<td>14°16.59’</td>
<td>170°44.24’</td>
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<tr>
<td>5</td>
<td>15-Oct-02</td>
<td>Omalae (TI)</td>
<td>14°17.58’</td>
<td>170°50.62’</td>
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<tr>
<td>6</td>
<td>14-Oct-02</td>
<td>Fagaipoa Bay (TI)</td>
<td>14°21.96’</td>
<td>170°50.85’</td>
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<tr>
<td>7</td>
<td>16-Oct-02</td>
<td>Fagaipoa (TI)</td>
<td>14°17.05’</td>
<td>170°50.36’</td>
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<tr>
<td>8</td>
<td>16-Oct-02</td>
<td>Leone (TI)</td>
<td>14°16.23’</td>
<td>170°50.66’</td>
</tr>
<tr>
<td>9</td>
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<td>Lofalofa (TI)</td>
<td>14°16.79’</td>
<td>170°54.10’</td>
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<tr>
<td>10</td>
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<td>Asa (TI)</td>
<td>14°14.04’</td>
<td>170°58.58’</td>
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<tr>
<td>11</td>
<td>24-Sep-03</td>
<td>Maitiha (OF)</td>
<td>14°10.03’</td>
<td>170°37.53’</td>
</tr>
<tr>
<td>12</td>
<td>22-Sep-03</td>
<td>Mili (OL)</td>
<td>14°10.03’</td>
<td>170°37.53’</td>
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<td>13</td>
<td>30-Sep-03</td>
<td>Pogatepo (TI)</td>
<td>14°17.65’</td>
<td>170°40.56’</td>
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<tr>
<td>14</td>
<td>15-Sep-03</td>
<td>Fatuafne (TI)</td>
<td>14°17.65’</td>
<td>170°40.56’</td>
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<tr>
<td>15</td>
<td>12-Sep-03</td>
<td>A'al (TI)</td>
<td>14°19.25’</td>
<td>170°59.32’</td>
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<tr>
<td>16</td>
<td>17-Sep-03</td>
<td>Amua’s Is (AU)</td>
<td>14°18.94’</td>
<td>170°59.36’</td>
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<tr>
<td>17</td>
<td>10-Sep-03</td>
<td>Petau (TI)</td>
<td>14°17.20’</td>
<td>170°40.56’</td>
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<td>Monu (TI)</td>
<td>14°19.54’</td>
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<td>19</td>
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<td>Amua(au) (TI)</td>
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<td>20</td>
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<td>N'auoe (OF)</td>
<td>14°17.93’</td>
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<td>21</td>
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<td>Olosega (OL)</td>
<td>14°10.20’</td>
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<td>22</td>
<td>20-Sep-03</td>
<td>Hurricane Hole (OF)</td>
<td>14°12.66’</td>
<td>170°59.25’</td>
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<td>23</td>
<td>16-Sep-03</td>
<td>N'amue (OF)</td>
<td>14°10.16’</td>
<td>170°59.15’</td>
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<tr>
<td>24</td>
<td>16-Sep-03</td>
<td>Olosega (OF)</td>
<td>14°10.16’</td>
<td>170°59.15’</td>
</tr>
</tbody>
</table>

Slide preparations were examined using a Nikon® SMZ645 dissecting microscope and an Olympus® CX31 compound microscope. Images were taken using a Nikon Coolpix® 990 digital camera and arranged in plates using Adobe Photoshop® 6.0 software.

The specimens are assigned the author’s field numbers (AS) pending their deposit in the Physiological Herbarium of the South Pacific Regional Herbarium (SUVA-A). Duplicates will be deposited at BISH and at the Department of Marine and Wildlife Resources, Government of American Samoa.

RESULTS

The classification follows Silva et al. (1996). Our surveys yielded 35 Chlorophyta and 8 Phaeophyta species as new additions to Setchell’s list and are reported below (see Table 3).
Phaeophyta

**Dictyotales: Dictyotaceae**

*Dictyopteris repens* (Okamura) Borgesen 1924: 265, fig. 13. Basionym: *Hediteris repens* Okamura 1916: 8, fig. 3, pl. 1: figs 7-10 (type locality: Chuuk Islands, Caroline Islands). (Figs 2, 3).

This common alga is often found epiphytic on larger algae. *Dictyopteris deliciata* Lamouroux, another common epiphytic alga, is morphologically similar to *D. repens*. The two can be differentiated by a submarginal rib in *D. deliciata* whereas the margins of *D. repens* remain atraumatic. Furthermore, the distribution of *D. deliciata* appears to be in Fiji with no reports of its presence in Samoa.


**Other records**: Fagatele Bay, Birkeland et al. 1987 (BISH).

*Dictyota bartrayei*ana Lamouroux 1899a: 43 (type locality: probably Ha'ati fide De Clerck, 1959).

This conspicuous brown alga is frequently seen in the intertidal or shallow subtidal zones. Due to the exposed nature of the fringing reefs of American Samoa *D. bartrayei*ana does not reach the great sizes (i.e. 10-20 cm wide) as seen in neighboring Samoans (Skelton pers. obs.). The majority of specimens collected are of small stature (ca thallus 2 mm wide, 2 cm tall).


*Dictyota friabilis* Setchell 1926: 91-92, pl. 13: figs 4-7; pl. 20: fig. 1 (type locality: Tafa' a Point, Tahiti).

This appears to be the only truly epiphytic *Dictyota* species in American Samoa. It tends to grow in the same plane as the host, but occasional crept unattached fronds have also been collected. The specimens at hand agree with the concept of this species as prescribed by Setchell (1926) for French Polynesian plants.


*Dictyota hamifera* Setchell 1926: 92 (type locality: French Polynesia). (Fig. 4)

This very distinctive *Dictyota* species has tendrils that function as hooking devices for attachment purposes. A single collection was made from Nu'utele Islet near the exposed channel.

Figs. 2-9. Figs. 2-3. *Dictyophora repens* (fig. 2) thallus showing the faint mid rib (fig. 3) the growing cells (arrows) and the beginning of the sub-ossiparate Stinking. Fig. 4. *Dictyonema buniflexa* pressed specimen showing the tetrads (arrows). Fig. 5. *Sporochnoides repens* pressed specimen. Figs. 6-8. *Sporochnoides erinaceus* (fig. 6) habit (figs. 7 & 8) showing the prostrate system and the basal part of erect thallus. Fig. 9. *Dobsonia marina* habit of the sporophyte stage.
Dictyota sp.

This epilithic Dictyota is characterised by its iridescent greenish-blue colour, growing subtidally in fairly strong current. It forms a turf community with other algae, but stands out by the iridescent blades. Only fertile material was collected and appears to be quite distinct from the other epiphytic Dictyota species (D. friabili). Determination would be possible following the collection of reproductive specimens.


This very common and widespread alga grows close to the substratum often forming fan-shaped blades that may overlap. There does not seem to be a preferred substratum for this alga, as specimens have been collected from base of *Xenoglossum*, rock, rubble, bases of living corals, concrete blocks, buoys and other discarded objects.


Padina boryana Thivy in W.R. Taylor ’966: 355-356, fig. 2 (type locality: Tonga).

This alga is closely related to *P. australis* Haeck, both having mostly dichotomous blades. The arrangement of the sporangia and hair bands is currently perceived as an important distinguishing feature. Furthermore, the *Vaughanella* (mat-like filamentous phase) is known in *P. boryana* but not yet recorded for *P. australis*. American Samoan specimens were mostly depauperate and growing in tide-pools in the intertidal zone.


Fucales: Sargassaceae

*Sargassum cf. cristafolium* C. Agardh 1820: 13 (type locality: unknown).

(Fig. 5) This entity should probably be attributed to the widely distributed *Sargassum cristafolium* C. Agardh. Littler & Littler (2003) illustrated *Sargassum tenerum* J. Agardh from American Samoa (Table 3), which appears to be different from our plants by their straight, lance-shaped blades, compared to slightly curled blades.

Chlorophyta
Chlorophorales: Chlorophleidaceae
Sporocladopsis erythrospora Naas 1944:33 (type locality: Red Sea) (Figs 6-8).
This algae was collected only from Amalau, epiphytic on the base of Sargassum anaperne Satchell. Currently only two species are known for the genus, with the second species - Sporocladopsis novae-zelandiae Chapman recorded from New Zealand and New South Wales, Australia (Millar & Kraft, 1994).


Chlorophorales: Chlorophoraceae
Rhizoclonium africanum Kützing 1853: 21, pl. 67 (2) (type locality: Senegambia [Senegal or Gambia], Africa). Taxonomic synonym: Rhizoclonium samouese Satchell 1924: 177, fig. 42.
This common alga was found mainly in the high intertidal zone. We examined Satchell's material (R. samouese UC 233513)) and agree with Womersley & Bailey (1970) who merged R. samouese with R. africanum.


Siphonocladaceae
This clavate shaped green alga is found in the shallow intertidal, usually in coarse sand. In exposed sites, the plants are usually depauperate and barely visible. Some of the materials collected were fertile.


A common component of the intertidal flora, forming dense spongy cushions, often of a light green colour when exposed. Filaments anastomosing frequently resulting in a three-dimensional network; anastomosing by small septate cells issued from the apex of primary branch with crenulated ends in contact with secondary branch. The placement of this entity under Boodlesia rather than Microdictyon follows the treatments of Egerod in Papenfuss & Egerod (1957) and Abbott & Huisman (2004).

Voucher specimens: Tutulua Island: Utulei Point, P.A. Skelton 13.x.2002 (AS 42); As 102); Fa’agalele Bay, P.A. Skelton 14.x.2002 (AS 149); Fagafa‘u, P.A. Skelton 10.x.2003 (AS 460).

This alga represented by a few specimens is found mainly in the high intertidal. It forms dark fleshy mats on rocks or other substrata.


Specimens were collected from the intertidal and are tentatively placed in this species because of its larger filament diameter (> 200 μm) compared to C. carolinensis (< 200 μm diam.).

**Voucher specimens:** Tutuala Island: Laloaloa, P.A. Skelton 17.x.2002 (AS 81).


This rarely collected intertidal alga is less abundant than Dicyosphaeria versicolor Weber-van Bosse, and is distinguished by its hollow thallus.


This fairly common but delicate alga is found in most habitats except exposed places. It has a cylindrical siphonous stalk bearing a leaf-shaped meshwork in the upper fronds with plants reaching a few centimetres in height. The placement of Phyllodictyon under the family Siphonocladaeae follows the results of Lelaitet al. (2003).


Valoniaceae

Valonia agarigopila C. Agardh 1823 [1822-1823]: 429-430 (type locality: Nenezia, Italy).

The recognition of this Mediterranean species from the tropics needs further study. The material recognised here as belonging to this species is clumpy in appearance with cells or vesicles arising in a disorderly direction, compared to arising sub-terminally as in V. tutigiru. This disorderly and decastrate presentation may be attributed to the habitat, being exposed and with a strong current flow.


Valonia macrophysa Kützing 1843: 307 (type locality: Lessina, Croatia).

Only a few delicate specimens were collected from the subtidal. The cells are slightly bigger than V. agarigopila (5-7 mm compared to 2.5 mm).

**Voucher specimens:** Ofu Island: Malata, P.A. Skelton 24.x.2003 (AS 326).
Bryopsidales Caulerpaceae

Caulerpa capricorni (Vahl) C. Agardh 1817; XXIII. Basionym: Fucus capricorni Vahl 1802; 38 (type locality: St Croix, Virgin Islands). (Fig. 10)

This species was common on Oufi and Islands, but absent from Tutuila and Anua’u Islands. Populations occur on coarse sand, rock and rubble substrata in the high intertidal zone and tide pools, with moderate to fast water flow. The plants have a spreading stolon and erect thallus to 5 cm tall, attached by fine root-like rhizoids. The erect thallus forms small bushy and sometimes twisted branches bearing dentate ramuli. The ramuli are arranged either distichously or trigonously. Three growth forms (C. disticha Weber-van Bosse; C. plumaroides Bægensen; C. fruticulosum Weber-van Bosse) were observed from the American Samoa popula-
tions, appearing to be environmentally induced.


Caulerpa racemosa var. pelusa (Lamouroux) Ehrb in Stephenson 1944: 349.

This variety is recognized as having both compressed and sub-globose racemes on an individual plant.


Caulerpa serrulata (Forskål) J. Agardh 1837: 174. Basionym: Fucus serrulatus Forskål 1775: 199 (type locality: Mokha, Yemen). Taxonomic synonymy: Caulerpa feynigii C. Agardh 1823 [822-1823]: 446. Common in the intertidal or in tide pools, less common subtidally. Occurs on most substrata (sand, rubble, rock, and discarded materials) in moderate to fast current flow. The abundance of this alga, especially near the harbour where plant sizes are relatively tall (5 cm), may indicate that it has recently been introduced, as suggested by Skelton (2003a). However, a sizeable population of diminutive plants (2 mm) was found on Otu-Olosega islands, suggesting that it is native but has been overlooked.


**Other records:** Swains Atoll, Anon. ND (BISH 542705).

*Caulerpa taxifolia* (Vahl) C. Agardh 1817; XXII. Basionym: *Fucus taxifolius* Vahl 1802: 36 (type locality: St Croix, Virgin Islands).

The rarely encountered alga in Samoa is represented by a few specimens, quite a contrast to a genetically varied and morphologically alike form that has an invasive status in the Mediterranean and parts of Australia. It grows in close association with other *Caulerpa* species in shallow intertidal places, usually on coarse sandy substratum.


*Caulerpa verticillata* J. Agardh 1847: 6 (type locality: probably West Indies). (Fig. 11)

The species has only been found from one site (Paha Lagoon) near the largest remaining mangroves. It was found epiphytic on *Halimeda opuntia* (Linnaceae) Lamouroux, as well as growing on rock and decaying logs in the shallow intertidal.

**Voucher specimens:** Tutuila Island: Pala Lagoon, Nu'uuli, P.A. Skelton 11.ix.2003 (AS 425).

*Caulerpa webbiana* Montagne 1837: 354 (type locality: Arrecife, Isla Lanzarote, Islas Canarias). (Fig. 12)

The specimens are all small (to 1 cm tall), and heavily epiphytised by foraminifera. Found in the shallow intertidal, in tide pools and on large carbonate structures. Plants form a green fuzz in the coarse sand, barely visible during collection. The ramuli are arranged either dichotomously (*i.e.* *distichous* Weber-van Bosse – fig. 12) or whorled (*i.e.* *pinnatifid* (Harvey et Bailey) Eames). The ramuli are forked with two distinctive mucronate tips at the apex. The form *pinnatifid* is still recognized as a distinct species by some (Littré & Littré, 2003), whereas we follow Kráš (2000) and South & Skelton (2003a; 2003b) in treating it as a form of *C. webbiana*.

**Voucher specimens:** Ofo Island: Amanava, P.A. Skelton 13.ix.2003 (AS 525).


A common constituent of turf algal communities in the shallow subtidal reefs, growing on rocks and large carbonate structures. Plants are small, to 5 mm tall and have a weakly defined stolon. Attachment is by short branched thalloids with the erect fronds branching dichotomously to trichotomously. The ramuli are distichous, occasionally whorled, and lacking constrictions at the base, with rounded apices. The ramuli pattern is variable, commonly in a series of longest pairs at the bottom giving rise to a few short pairs, then reverting back to long pairs and so forth, and frequently some sections are devoid of ramuli.

Codiaceae
A single specimen was collected from Utulei Point, near the mouth of Pago Pago Harbour. The spherical shape is reminiscent of *C. manilllossum*, which has been recorded from Fiji (South & Skelton 2003a) and other nearby Pacific Island countries. The specimen is small (1 cm diam.), and is tentatively placed under this species.


Derbesiaceae
This fairly common alga is found from intertidal to subtidal sites. Two very contrasting morphological stages are reported, the spherical *Halicyctis* or the gametophytic stage and the filamentous *Derbesia* sporophytic stage. The latter stage was the only stage found at American Samoa. The cylindrical filaments (40-42.5 μm diam.) are irregularly and sparsely branched, with a double septum at the base of some branches, and are found entangled with other algae.


Halimedaceae
*Halimeda gracilis* Harvey ex J.Agardh 1887: 62 (type locality: Sri Lanka). Common in the upper subtidal (ca 5 m depth) in moderate water flow. The segments are reminiscent of *Halimeda opuntia* (Linnæus) Lamouroux but are larger and less profusely branching in more than one plane.


Figs 10-19. Fig. 10. *Caulerpa cupressoides* habit of a pressed specimen. Fig. 11. *Caulerpa verticil- ians* habit of a wet specimen. Fig. 12. *Caulerpa wehnniana* Lévi nua habit of a slide-preserved speci- men. Fig. 13. *Caulerpa ambiguca* habit. Fig. 14. *Tetramaria expeditionis* habit of pressed specimen. Figs 15 & 16. *Porvocaulis clavate* (fig. 15) habit showing 5 rays; (fig. 16) close up of two rays showing the spherical to sub-spherical gametangia. Figs 17 & 18. *Porvocaulis ericius* (fig. 17) part of the habit showing fused rays confined to the base; (fig. 18) close up of a ray with young gametangia and a slightly protruding apex. Fig. 19. *Porvocaulis parvula* part of the habit showing fused rays bearing spherical gametangia.

*Other records:* Vaitia Bay, Randall & Devaney 1974 (BISH).

**Halimeda macroloba** Decaisne 1841: 118 (type locality: Red Sea).

Another common mid-to-high intertidal alga, characterised by its large, round to reniform segments.


**Halimeda cf. macrophysa** Askenasy 1888: 14, pl. IV: figs 1-4 (type locality: Matuku Island, Fiji).


**Udoteaceae**


**Tydemania expeditionis** Weber-van Bosse 1901: 139-140 (synotype localities various in Indonesia). Taxonomic synonmys: *Tydemania gardineri* A. Gepp et E. Gepp 1911: 67-68, 141, pl. XVIII: fig. 155. *Tydemania mahabhitae* Nasr 1944: 49-41. (Fig. 14) One of the few algae that is common in some sites, especially on Otu and Oloega islands but rare in others (e.g. Tutuila and Aumui’s islands). It is found from the subtidal to the lower intertidal, usually on the side of large boulders. Of the two forms known – flabellate *versus* verticilate, only the flabellate form has been collected.


**Dasyycladaceae**

*Neomeris van-bosseae* Howe 1909: 80-82, pl. 1: figs 4, 6; pl. 5: figs 17-19 (van bossea).

This common intertidal and tide-pool alga is distinguished from *N. annulata* by the lack of annular rings around the lower thallus.


Skelton P.A. & South G. R.
Polyphysaceae


Parvacaulis clavata is similar to P. exigua (Solms-Laubach) Berger et al. (2003) but can be separated by the rounded ray tips (versus mammillate tips in P. exigua). Moreover, the rays are arranged in a single plane (Abbott & Huisman 2004).


Parvacaulis exigua is common in the shallow intertidal and in tide-pools, but is rarely collected due to its small size. It grows on rubble and other carbonate structures usually in fairly calm to moderate water flow. It is often found growing with Parvacaulis parvula and P. clavata – two similar looking species. It can be separated from the other two species by the unattached oblong rays with mammillate tips. Abbott & Huisman (2004) observed the rays to be arranged in more than one plane, as opposed to the single plane in P. clavata.


Parvacaulis parvula (Solms-Laubach) Berger et al. 2003: 559, figs 11, 25, Basionym: Acerabularia parvula Solms-Laubach 1895: 29, pl. 2: figs 3, 5 (sensu type localities: ‘Tropical India’; Celebes, Indonesia). Nomenclatural synonym: Polyphysa parvula (Solms-Laubach) Schettler et Buia Meyer 1982: 42. (Fig. 19)

Closely associated with P. exigua and P. clavata, this alga can be separated by its fused obvoid rays and the non-mammillate tips.


DISCUSSION

With the additions reported here, the latest compilation of marine benthic algal species reported from American Samoa is 230, comprising 133 Rhodophyta, 23 Phaeophyta and 74 Chlorophyta. The examination of Rhodophyta and Cyanophyta collections made during our surveys, as well as those made by previous collectors (scattered in various herbaria), will result in a further increase in algal diversity for the American Samoa flora.
<table>
<thead>
<tr>
<th>Phycothecogena</th>
<th>Reference</th>
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<tbody>
<tr>
<td>Axenoma brevii-rolandii (J. Agardh) Oránskys et Botzum</td>
<td>Setchell 1924, Skelton 2003a</td>
</tr>
<tr>
<td>Cladophora minima (K. Hering) Papenfus</td>
<td>Setchell 1924, Lüttich &amp; Lüttich 2005; Skelton 2006a (as C. impexa)</td>
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<tr>
<td>Discopythum repens (Okamura) Bargese</td>
<td>Birkeland et al. 1985; Skelton 2003a</td>
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<tr>
<td><em>Discopythum schizo</em> (Zanardini)</td>
<td>Lüttich &amp; Lüttich 2005</td>
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<tr>
<td>Discopythum baciferum Lamouroux</td>
<td>Skelton 2003a</td>
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<tr>
<td>Discelya flabellis Setchell</td>
<td>Setchell 1924</td>
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<tr>
<td>Discelya hirtifera Setchell</td>
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<td>Discelya sp. Lamouroux</td>
<td>Setchell 1924</td>
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<tr>
<td>Ectocarpus van buuren Setchell et Gardner</td>
<td>Setchell 1924, Skelton 2003a</td>
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<td>Fldiomma indica (Synder) Womersley et Bailey</td>
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<tr>
<td>Hapalosiphon pageniense (Setchell) FC. Silva</td>
<td>Setchell 1924</td>
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<tr>
<td>Lobophora variegata (Lamouroux) Womersley et Olivier</td>
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<td>Palimar berrana Thry</td>
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<tr>
<td>Polysiphonia (J. Agardh)</td>
<td>Lüttich &amp; Lüttich 2005</td>
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<td>Setiophis anapone Setchell et Gardner</td>
<td>Setchell 1924, Skelton 2013a</td>
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<td>Sargassum farnesii Setchell et Gardner</td>
<td>Setchell 1924</td>
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<tr>
<td>Sargassum sp.</td>
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<td><em>Sargassum microcarpum</em> J. Agardh</td>
<td>Lüttich &amp; Lüttich 2005</td>
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<td>Sargassaria cavitata Sauvageau</td>
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<tr>
<td>Sargassaria sp.</td>
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<td>Sargassaria utricularis Meneghini</td>
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<tr>
<td><em>Sargassaria pumila</em> (Huds.) J. Agardh</td>
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<thead>
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<tr>
<td>Anadyomene sp.</td>
<td>Lüttich &amp; Lüttich 2005</td>
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<tr>
<td>Bryopsis forbesii (Harvey) J. F. Ellis</td>
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<td>Buddleia montaguei (Harvey ex J. Gray) Egerad</td>
<td>Skelton 2003a</td>
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<tr>
<td><em>Bryopsis plumosa</em> (Huds.) C. Agardh</td>
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<td>Bryopsis penna IV. Lamouroux</td>
<td>Lüttich &amp; Lüttich 2005; Skelton 2003a</td>
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<td>Bryopsis penna var. secunda (Harvey) Collins et Harvey</td>
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<td><em>Caulerpa cupressoides</em> (Vaill. C. Agardh)</td>
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<td>Caulerpa cupressoides L. dichotoma Wee-van Bosse</td>
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<td>Caulerpa cupressoides L. plumieriades Bogens</td>
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<td>Caulerpa cupressoides L. sp. unclassified Wee-van Bosse</td>
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<td>Caulerpa pelusa Lamouroux</td>
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<td>Caulerpa racemosa (Forsskal) J. Agardh</td>
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<td>Caulerpa racemosa var. pelusa (Lamouroux) Eubank</td>
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<td>Caulerpa taxiformis (Yald. C. Agardh)</td>
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<td>Caulerpa verticillata L. Agardh</td>
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<tr>
<td>Caulerpa webbiana Montagne</td>
<td>Skelton 2003a</td>
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<td>Caulerpa weebiana L. dichotoma Wee-van Bosse</td>
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<tr>
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<tr>
<td>Caulerpa weebiana L. verticillata</td>
<td>Skelton 2003a</td>
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<tr>
<td>Caulerpa weebiana L. verticillata</td>
<td>Skelton 2003a</td>
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</table>
Eight Phaeophyta are reported here as new records from our surveys, with an additional three species: Diocysta adnata Zanardini, Sargassum tenuirinum J. Agardh and Ralfsia expansa (J. Agardh) J. Agardh, illustrated by Littler & Littler (2003). Sechell (1924) listed 11 Phaeophyta with four new species. One of Sechell’s new species, Ectocarpus san-bossaui Sechell et Gardner, appears to conform to the generic description of Haeckelia. 25 new records of Chlorophyta were found from our surveys, complemented with four illustrated by Littler & Littler (2003).

The majority of the new records of Chlorophyta and Phaeophyta have an Indo-Pacific distribution, with the exception of Sporodendron erinaceus previously only recorded from its type locality, the Red Sea (Nast, 1944). Its presence as an epiphyte on the endemic Sargassum anapense suggests that it is part of the native flora and not introduced. This list also includes about seven species that need to be examined to confirm their presence (see Table 3).

In comparison to other Pacific Island floras – especially French Polynesia (Payri & N’Ymert, 1997), Fiji (South & Skelton, 2003a) and Hawaii (Abbott & Huisman, 2004), the flora is comparable relative to the small landmass of the islands and limited habitats (Table 4). Increasing interest in collecting efforts in American Samoa will yield more species, although the total diversity will not be as high as that seen in the Hawaiian flora. The Fijian flora also has a high diversity of Chlorophyta and Phaeophyta but much of its marine environment remains unexplored and thus the total algal diversity will be much higher. The French Polynesian flora has a very high diversity and this may be attributed to the high collecting intensity in some localities, and the varied habitats of the islands.

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