

**CHECKLIST AND BIBLIOGRAPHY
OF THE MARINE BENTHIC ALGAE
FROM ISLANDS AND ATOLLS
WITHIN YAP STATE,
FEDERATED STATES OF MICRONESIA**

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Checklist and Bibliography

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Federated States of Micronesia

By

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<p>DISCUSSION</p> <p>Literature</p> <p>REFERENCES CITED</p> <p>Other alga in <i>Caulerpa</i> 1968b), <i>Ulva</i> 1978), <i>Avicula</i> and <i>Trichosolen</i> present within the Harbor, Yap</p> <p>Twenty technical reports applicable to Yap 1970), dock site Yap, and Groszund and Tsu 2002). Although reported in the end of the stud included 34 spec Herbaria Inventor economic algal s</p> <p>The seagr (Wolkens, 1901; com McMillan, 1983, 19 found in Yap are & Homprich ex aroides (Lamour (Zollinger) den H.</p>	<p>17</p> <p>18</p>

INTRODUCTION

The checklist of marine benthic algae from Yap and the atolls of Ulithi, Ifalik and Sorol within Yap State (Figure 1) is based on the compilation from past references (Tsuda and Wray, 1977; Tsuda, 1978, 1981) and subsequent phycological studies conducted within Yap State, Federated States of Micronesia. Floristic studies on the marine benthic algae within Yap State were initiated by Reinbold (1901), Okamura (1904, 1916) and Tokida (1939). Schmidt (1928) included species from Yap in his compilation of 484 species of marine benthic algae from the tropical western Pacific Ocean. Abbott (1961) recorded 85 species of marine benthic algae from Ifalik (Ifaluk) Atoll. Trono (1968, 1969, 1971) published his Ph.D. dissertation studies on the marine benthic algae of the Caroline Islands which included algae from Yap, Ifalik Atoll and Sorol Atoll. Tsuda and Belk (1972) recorded 23 species of marine benthic algae from Yap not previously reported in the literature.

Other studies targeted selected genera which included species from Yap and adjacent atolls, i.e., *Caulerpa* (Taylor, 1975, 1977), *Polysiphonia* (Hollenberg, 1968a), *Herposiphonia* (Hollenberg, 1968b), *Ulva* (Tsuda, 1982), *Sargassum* (DeWreede, 1973; Tsuda, 1976, 1988), *Rhipilia* (Gilbert, 1978), *Avrainvillea* (Olsen-Stojkovich, 1985), *Gracilaria* (Tsuda, 1985; Meneses and Abbott, 1987) and *Trichosolen* [= *Pseudobryopsis*] (Enomoto et al., 1987). Lassuy (1980) reported the algae present within the territorial habitat of the damselfish, *Hemiglyphidodon plagiometopon*, at Tamil Harbor, Yap.

Twenty new species records of marine benthic algae for Yap State are included in five technical reports by faculty, staff and graduate students of the University of Guam Marine Laboratory applicable to Yap and Ulithi Atoll, i.e., sewer outfall site at Donitsch Island, Yap (Amesbury et al., 1976), dock site at Colonia, Yap (Amesbury et al., 1977), potential sewer outfall sites at Balabat and Pelak in Yap, and at Falalop Islet in Ulithi Atoll (Tsuda et al., 1978), Yap reef flat and lagoonal holes (Hedlund and Tsuda, 1978; Tsuda, 1978) and dredging site at Yyin in Yap (Amesbury and Tsuda, 2002). Although few algal voucher specimens are available from these studies, the algal studies reported in the technical reports provide quantitative information on the marine benthic algae within each of the study sites. The "Yap Island Coastal Resource Inventory" by Orcutt et al. (1989) included 34 species of marine benthic algae observed and identified at 24 of the Yap Coastal Resource Inventory stations by a University of Guam Marine Laboratory algal team during an economic algal survey of Yap lagoon (Tsuda et al., 1987).

The seagrasses constitute a significant component of the marine flora within Yap lagoon (Volkens, 1901; den Hartog, 1970; Tsuda et al., 1977; Kock and Tsuda, 1978; McMillan et al., 1982; McMillan, 1983; Bridges and McMillan, 1986; and Tsuda and Kamura, 1990). The seven species found in Yap are *Syringodium isoetifolium* (Ascherson) Dandy, *Cymodocea rotundata* Ehrenberg & Hemprich ex Ascherson, *Cymodocea serrulata* (R. Brown) Ascherson and Magnus, *Enhalus acoroides* (Linnaeus f.) Royle, *Thalassia hemprichii* (Ehrenberg) Ascherson, *Halophila minor* (Zollinger) den Hartog and *Halophila ovalis* (R. Brown) Hooker f.

FEDERATED STATES OF MICRONESIA

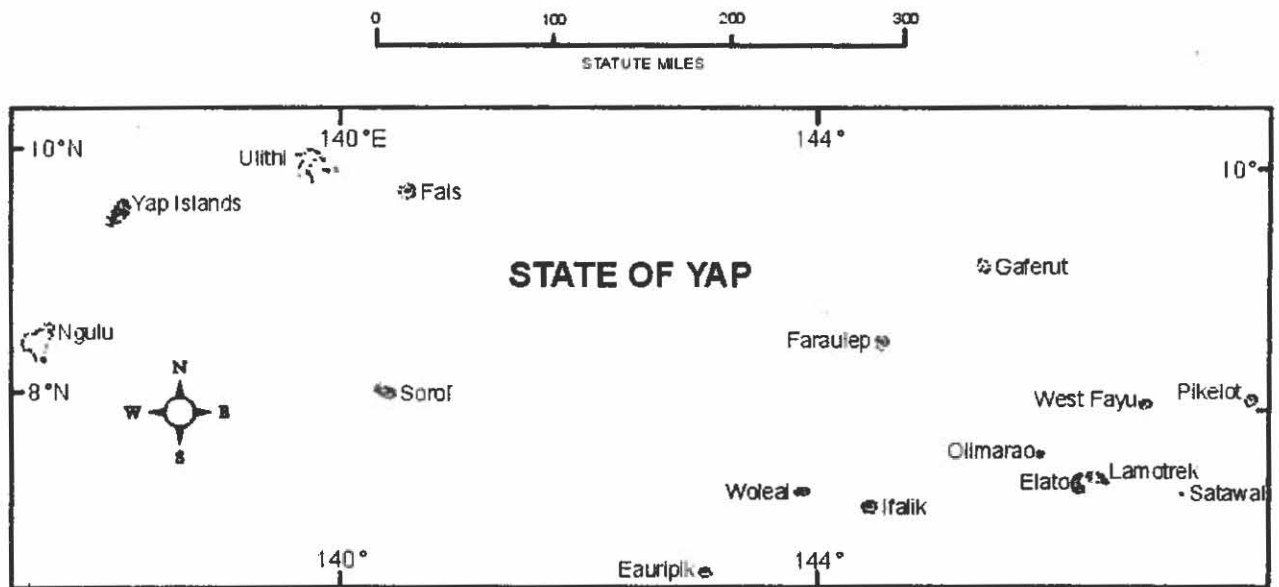


Figure 1. Map of Yap State, Federated States of Micronesia (Adapted from Motteler, 1986).

The classification system follows Silva et al. (1996), and synonymies are according to Silva et al. (1987) and Silva et al. (1996). The two species described as new based on the type specimens from Yap and Ifalik Atoll, respectively, are designated in boldface. Species reported by Abbott (1961), Trono (1968, 1969, 1971), Hollenberg (1968a, 1968b), Taylor (1977), Tsuda et al. (1978) and Olsen-Stojkovich (1985) from the outer islands (atolls) of Yap State, i.e., Ifalik Atoll, Sorol Atoll and Ulithi Atoll, are listed with their respective atolls. All other collections were made from Yap.

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SPECIES AND REFERENCES

Division CYANOPHYTA (Blue-Green Algae/Cyanobacteria)

Class Cyanophyceae

Order Oscillatoriales

Family Oscillatoriaceae

Lyngbya majuscula (Dillwyn) Harvey. YAP: Reinbold (1901), Okamura (1904), Tokida (1939), Trono (1968); Amesbury et al. (1976, 1977), Hedlund and Tsuda (1978), Tsuda et al. (1978), Lassuy (1980) and Orcutt et al. (1989) as *Microcoleus lyngbyaceus* (Kützing) P. Crouan & H. Crouan. ULITHI: Tsuda et al. (1978) as *Microcoleus lyngbyaceus*.

Family Phormidiaceae

Spirulina subsalsa Oersted. YAP: Tsuda and Belk (1972).

Family Schizothrichaceae

Schizothrix calcicola (C. Agardh) Gomont. YAP: Trono (1968), Amesbury et al. (1976, 1977), Hedlund and Tsuda (1978), Tsuda et al. (1978), Orcutt et al. (1989). IFALIK: Trono (1968). ULITHI: Tsuda et al. (1978).

Schizothrix mexicana Gomont. YAP: Tsuda and Belk (1972), Hedlund and Tsuda (1978), Tsuda et al. (1978). ULITHI: Tsuda et al. (1978).

Order Nostocales

Family Nostocaceae

Hormothamnium enteromorphoides Grunow. YAP: Tsuda et al. (1978) and Orcutt et al. (1989) as *Hormothamnium enteromorphoides* Grunow.

Hormothamnium solutum Bornet & Flahault. YAP: Tsuda and Belk (1972) as *Hormothamnium solutum* Bornet & Flahault.

Family Rivulariaceae

Calothrix confervicola (Dillwyn) C. Agardh. YAP: Tsuda and Belk (1972).

Calothrix crustacea Thuret. YAP: Amesbury et al. (1976, 1977), Lassuy (1980).

Calothrix pilosa Harvey. YAP: Tsuda and Belk (1972).

Dichothrix penicillata Zanardini. YAP: Okamura (1904), Tokida (1939).

Order Stigonematales

Family Mastigocladaceae

Brachytrichia quoyi (C. Agardh) Bornet & Flahault. YAP: Amesbury et al. (1978).

Division CHLOROPHYTA (Green Algae)

Class Chlorophyceae

Order Ctenocladales

Family Ulvellaceae

Ulvella lens P. Crouan and H. Crouan. IFALIK: Abbott (1961).

Order Ulvales

Family Ulvaceae

Enteromorpha clathrata (Roth) Greville. YAP: Tsuda (1978), Lassuy (1980). ULITHI: Tsuda et al. (1978).

Enteromorpha kylinii Bliding. YAP: Tsuda and Belk (1972).

Enteromorpha lingulata J. Agardh. IFALIK: Abbott (1961).

Enteromorpha torta (Mertens) Reinbold. IFALIK: Abbott (1961).

Ulva lactuca Linnaeus. YAP: Tsuda (1978), Tsuda et al. (1978), Tsuda (1982).

Order Cladophorales

Family Anadyomenaceae

Anadyomene wrightii Harvey ex Gray. YAP: Okamura (1916), Schmidt (1928), Tokida (1939), Amesbury et al. (1976, 1977). IFALIK: Abbott (1961).

Microdictyon okamurai Setchell. IFALIK: Abbott (1961), Trono (1968).

Microdictyon pseudohapteron A. Gepp & E. Gepp. YAP: Okamura (1916), Schmidt (1928), Tokida (1939).

Family Cladophoraceae

Chaetomorpha antennina (Bory de Saint-Vincent) Kützing. IFALIK: Abbott (1961).

Chaetomorpha crassa (C. Agardh) Kützing. YAP: Tsuda and Belk (1972).

Chaetomorpha linum (O.F. Müller) Kützing. YAP: Reinbold (1901).

Cladophora catenata (Linnaeus) Kützing [= *Cladophora fuliginosa* Kützing]. IFALIK: Abbott (1961) as *C. fuliginosa*.
Rhizoclonium samoense Setchell. IFALIK: Abbott (1961).

Family Siphonocladaceae

Boergesenia forbesii (Harvey) Feldmann. YAP: Tsuda (1978), Tsuda et al. (1978).
ULITHI: Tsuda et al. (1978).
Boodlea coacta (Dickie) Murray & DeToni. YAP: Okamura (1904, 1916), Schmidt (1928), Tokida (1939).
Boodlea composita (Harvey) Brand [= *Boodlea siamensis* Reinbold]. YAP: Tokida (1939) as *B. siamensis*, Amesbury et al. (1976, 1977), Tsuda et al. (1978). IFALIK: Abbott (1961). ULITHI: Tsuda et al. (1978).
Boodlea vanbosseae Reinbold. YAP: Okamura (1916), Tokida (1939).
Cladophoropsis sp. ULITHI: Tsuda et al. (1978).
Dictyosphaeria cavernosa (Forsskål) Børgesen [= *Dictyosphaeria favulosa* (C. Agardh) Decaisne ex Endlicher]. YAP: Okamura (1904, 1916) and Schmidt (1928) as *D. favulosa*, Amesbury et al. (1976, 1977), Hedlund and Tsuda (1978), Tsuda et al. (1978). IFALIK: Abbott (1961), Trono (1968). ULITHI: Tsuda et al. (1978).
Dictyosphaeria versluysii Weber-van Bosse. YAP: Tokida (1939), Tsuda and Belk (1972), Orcutt et al. (1989). IFALIK: Abbott (1961).
Siphonocladus sp. YAP: Okamura (1904), Tokida (1939).
Struvea anastomosans (Harvey) Piccone & Grunow ex Piccone [= *Struvea delicatula* Kützing]. YAP: Okamura (1904) and Tokida (1939) as *S. delicatula*.
Struvea tenuis Zanardini. YAP: Okamura (1904), Schmidt (1928), Tokida (1939).
Ventricaria ventricosa (J. Agardh) Olsen & West [= *Valonia ventricosa* J. Agardh]. YAP: Trono (1968), Amesbury et al. (1976) and Hedlund and Tsuda (1978), Tsuda et al. (1978), Orcutt et al. (1989). IFALIK: Abbott (1961). ULITHI: Tsuda et al. (1978).
All as *Valonia ventricosa*.

Family Valoniaceae

Valonia aegagropila C. Agardh. YAP: Tsuda (1977). IFALIK: Abbott (1961).
Valonia fastigiata Harvey ex J. Agardh. YAP: Hedlund and Tsuda (1978), Tsuda (1978), Tsuda et al. (1978), Orcutt et al. (1989). ULITHI: Tsuda et al. (1978).
Valonia utricularis (Roth) C. Agardh. IFALIK: Abbott (1961).

Order Bryopsidales

Family Bryopsidaceae

Bryopsis pennata Lamouroux. YAP: Tsuda and Belk (1972), Tsuda et al. (1978), Lassuy (1980).

Pseudodichotomosiphon constricta Yamada. IFALIK: Abbott (1961).
Trichosolen sp. [= *Pseudobryopsis* sp.]. YAP: Enomoto et al. (1987) as *Pseudobryopsis* sp.

Family Caulerpaceae

- Caulerpa antoensis* Yamada. YAP: Amesbury et al. (1977). IFALIK: Abbott (1961), Trono (1968), Taylor (1977).
Caulerpa bikinensis Taylor. IFALIK: Abbott (1961).
Caulerpa brachypus Harvey. YAP: Trono (1968), Taylor (1977), Amesbury et al. (1977).
Caulerpa cupressoides (Vahl) C. Agardh. YAP: Trono (1968), Taylor (1977), Tsuda et al. (1978), Orcutt et al. (1989). IFALIK: Trono (1968), Taylor (1977). SOROL: Trono (1968), Taylor (1977).
Caulerpa elongata Weber-van Bosse. YAP: Tsuda and Belk (1972), Taylor (1977).
Caulerpa filicoides Yamada. YAP: Amesbury et al. (1976).
Caulerpa lentillifera J. Agardh. YAP: Okamura (1904), Tokida (1939).
Caulerpa lessonii Bory de Saint-Vincent. YAP: Taylor (1977).
Caulerpa mexicana Sonder ex Kützing. YAP: Taylor (1975).
Caulerpa peltata Lamouroux. YAP: Reinbold (1901), Schmidt (1928), Tokida (1939).
Caulerpa racemosa (Forsskål) J. Agardh. YAP: Reinbold (1901), Okamura (1904, 1916), Schmidt (1928), Tokida (1939), Trono (1968), Amesbury et al. (1976, 1977), Taylor (1977), Hedlund and Tsuda (1978), Tsuda et al. (1978), Lassuy (1980), Orcutt et al. (1989), Amesbury and Tsuda (2002).
Caulerpa serrulata (Forsskål) J. Agardh [= *Caulerpa boryana* J. Agardh and *Caulerpa freycinetii* C. Agardh]. YAP: Okamura (1904) and Schmidt (1928) as *C. freycinetii*, Trono (1968), Taylor (1977), Tsuda et al. (1978), Orcutt et al. (1989). IFALIK: Abbott (1961), Trono (1968). SOROL: Trono (1968).
Caulerpa sertularioides (Gmelin) Howe. YAP: Trono (1968), Amesbury et al. (1976, 1977), Tsuda et al. (1978).
Caulerpa taxifolia (Vahl) C. Agardh. YAP: Trono (1968), Amesbury et al. (1977), Hedlund and Tsuda (1978), Tsuda et al. (1978), Orcutt et al. (1989).
Caulerpa urvilleana Montagne. YAP: Trono (1968), Taylor (1977), Hedlund and Tsuda (1978), Tsuda et al. (1978). IFALIK: Abbott (1961), Trono (1968), Taylor (1977). SOROL: Trono (1968). ULITHI: Tsuda et al. (1978).
Caulerpa verticillata J. Agardh. YAP: Amesbury et al. (1977).
Caulerpa webbiana Montagne [= *Caulerpa pickeringii* Harvey & Bailey]. YAP: Trono (1968) as *C. pickeringii*, Amesbury et al. (1976), Hedlund and Tsuda (1978).
Caulerpella ambigua (Okamura) Prud'homme van Reine & Lokhorst [= *Caulerpa ambigua* Okamura and *Caulerpa vickersiae* Børgesen]. IFALIK: Abbott (1961) as *Caulerpa ambigua*.

Family Codiaceae

Codium arabicum Kützing. SOROL: Trono (1968).

Codium edule P. Silva. SOROL: Trono (1968).

Codium geppiorum O. Schmidt [= *Codium geppii* O. Schmidt]. YAP: Amesbury et al. (1977) as *C. geppii*.

Family Dichotomosiphonaceae

Dichotomosiphon sp. IFALIK: Abbott (1961).

Family Halimedaceae

Halimeda copiosa Goreau & Graham [= *Halimeda hederacea* (Barton) Colinvaux and *Halimeda opuntia* (Linnaeus) Lamouroux form *hederacea* Barton]. IFALIK: Abbott (1961) as *H. opuntia* f. *hederacea*.

Halimeda cuneata Hering. YAP: Okamura (1916), Schmidt (1928), Tokida (1939).

Halimeda discoidea Decaisne. YAP: Trono (1968), Amesbury et al. (1976, 1977), Tsuda et al. (1978), Orcutt et al. (1989). IFALIK: Trono (1968). ULITHI: Tsuda et al. (1978).

Halimeda fragilis W.R. Taylor. IFALIK: Abbott (1961), Trono (1968).

Halimeda gigas W.R. Taylor. YAP: Tsuda and Belk (1972), Hedlund and Tsuda (1978), Orcutt et al. (1989).

Halimeda gracilis Harvey ex J. Agardh. IFALIK: Abbott (1961).

Halimeda incrassata (Ellis) Lamouroux [= *Halimeda tridens* (Ellis & Solander) Lamouroux]. YAP: Trono (1968), Amesbury et al. (1976, 1977), Tsuda et al. (1978), Orcutt et al. (1989). IFALIK: Abbott (1961) as *H. tridens*, Trono (1968).

Halimeda lacunalis W.R. Taylor. IFALIK: Abbott (1961).

Halimeda macroloba Decaisne. YAP: Reinbold (1901), Okamura (1904), Schmidt (1928), Tokida (1939), Trono (1968), Amesbury et al. (1976, 1977), Tsuda et al. (1978), Orcutt et al. (1989), Amesbury and Tsuda (2002).

Halimeda macrophysa Askenasy. YAP: Amesbury et al. (1976, 1977), Orcutt et al. (1989).

Halimeda micronesica Yamada. IFALIK: Abbott (1961), Trono (1968).

Halimeda opuntia (Linnaeus) Lamouroux [= *Halimeda cordata* J. Agardh]. YAP: Reinbold (1901) and Okamura (1904) as *H. cordata*; Schmidt (1928), Tokida (1939), Trono (1968), Amesbury et al. (1976, 1977), Hedlund and Tsuda (1978), Tsuda et al. (1978), Orcutt et al. (1989), Amesbury and Tsuda (2002). IFALIK: Abbott (1961), Trono (1968). SOROL: Trono (1968). ULITHI: Tsuda et al. (1978).

Halimeda simulans Howe. YAP: Tsuda and Belk (1972), Amesbury and Tsuda (2002).

Halimeda stuposus W.R. Taylor. IFALIK: Abbott (1961), Trono (1968).

Halimeda taenicola W.R. Taylor. YAP: Tsuda et al. (1978). IFALIK: Abbott (1961), Trono (1968).

Halimeda tuna (Ellis & Solander) Lamouroux. YAP: Tokida (1939), Trono (1968).

Family Udoteaceae

- Avrainvillea erecta* (Berkeley) A. Gepp & E. Gepp [*Avrainvillea papuana* (Zanardini) G. Murray & Boodle]. YAP: Reinbold (1901) as *A. papuana*.
- Avrainvillea hollenbergii* Trono (1971) from Ifalik. IFALIK: Trono (1968) as *Avrainvillea* sp.
- Avrainvillea lacerata* Harvey ex J. Agardh. YAP: Tsuda and Belk (1972), Amesbury et al. (1977), Olsen-Stojkovich (1985).
- Avrainvillea nigricans* Decaisne. IFALIK: Trono (1968), Olsen-Stojkovich (1985).
- Avrainvillea obscura* (C. Agardh) J. Agardh. YAP: Amesbury et al. (1976, 1977), Tsuda et al. (1978), Olsen-Stojkovich (1985), Orcutt et al. (1989).
- Chlorodesmis fastigiata* (C. Agardh) Ducker [= *Chlorodesmis comosa* Harvey & Bailey]. YAP: Hedlund and Tsuda (1978), Tsuda (1978), Orcutt et al. (1989). ULITHI: Tsuda et al. (1978).
- Chlorodesmis hildebrandtii* A. Gepp & E. Gepp. YAP: Trono (1968).
- Rhipilia diaphana* Taylor. IFALIK: Abbott (1961).
- Rhipilia geppii* Taylor. IFALIK: Abbott (1961).
- Rhipilia orientalis* A. Gepp & E. Gepp. YAP: Amesbury et al. (1976). IFALIK: Abbott (1961).
- Rhipilia sinuosa* Gilbert. YAP: Gilbert (1978).
- Tydemania expeditionis* Weber-van Bosse. YAP: Schmidt (1928), Tokida (1939), Trono (1968), Amesbury et al. (1976, 1977), Hedlund and Tsuda (1978), Tsuda et al. (1978), Orcutt et al. (1989).
- Udotea argentea* Zanardini. IFALIK: Abbott (1961).
- Udotea indica* A. Gepp & E. Gepp. IFALIK: Abbott (1961).
- Udotea orientalis* A. Gepp & E. Gepp. IFALIK: Abbott (1961).

Order Dasycladales

Family Dasycladaceae

- Bornetella sphaerica* (Zanardini) Solms-Laubach. YAP: Trono (1968).
- Neomeris annulata* Dickie. YAP: Amesbury et al. (1976), Tsuda et al. (1978). IFALIK: Abbott (1961). ULITHI: Tsuda et al. (1978).
- Neomeris dumetosa* Lamouroux. YAP: Okamura (1904), Tokida (1939).
- Neomeris van-bosseae* Howe. YAP: Tsuda and Belk (1972), Amesbury et al. (1977), Orcutt et al. (1989). IFALIK: Abbott (1961).

Family Polyphysaceae

- Acetabularia clavata* Yamada. SOROL: Trono (1968).
- Acetabularia exigua* Solms-Laubach. SOROL: Trono (1968).

Acetabularia parvula Solms-Laubach [= *A. moebii* Solms-Laubach]. YAP: Lassuy (1980)
as *A. moebii*. IFALIK: Abbott (1961).

Halicoryne wrightii Harvey. IFALIK: Abbott (1961).

Division PHAEOPHYTA (Brown Algae)

Class Phaeophyceae

Order Ectocarpales

Family Ectocarpaceae

Feldmannia indica (Sonder) Womersley & Bailey [= *Ectocarpus indicus* Sonder]. YAP:
Tsuda and Belk (1972) as *Ectocarpus indicus*, Amesbury et al. (1976).

Hinckesia mitchelliae (Harvey) P. Silva [= *Ectocarpus mitchelliae* Harvey and *Giffordia
mitchelliae* (Harvey) G. Hamel]. IFALIK: Abbott (1961) as *Ectocarpus mitchelliae*.

Order Sphacelariales

Family Sphacelariaceae

Sphacelaria tribuloides Meneghini. YAP: Reinbold (1901), Schmidt (1928), Tokida (1939),
Amesbury et al. (1976).

Order Dictyotales

Family Dictyotaceae

Dictyota acutiloba J. Agardh. YAP: Tsuda and Belk (1972) and Amesbury et al. (1976,
1977) as *Dictyota cervicornis* Kützing.

Dictyota bartayresiana Lamouroux [= *Dictyota bartayresii* Lamouroux]. YAP: Hedlund
and Tsuda (1978), Tsuda (1978) and Tsuda et al. (1978) as *D. bartayresii*; Amesbury
and Tsuda (2002). ULITHI: Tsuda et al. (1978) as *D. bartayresii*.

Dictyota ceylanica Kützing [*Dictyota dichotoma* (Hudson) Lamouroux = *Dictyota divaricata*
Lamouroux]. YAP: Okamura (1904), Tokida (1939), Trono (1969) and Tsuda et al.
(1978) as *D. divaricata*.

Dictyota dichotoma (Hudson) Lamouroux [= *Dictyota apiculata* J. Agardh]. YAP: Tsuda
and Belk (1972), Amesbury et al. (1976, 1977) and Orcutt et al. (1989) as *D.
apiculata*.

Dictyota friabilis Setchell. YAP: Trono (1969), Amesbury et al. (1976), Orcutt et al. (1989).
ULITHI: Tsuda et al. (1978).

- Lobophora variegata* (Lamouroux) Womersley ex Oliveira [= *Gymnosorus variegatus* (Lamouroux) J. Agardh and *Pocockiella variegata* (Lamouroux) Papenfuss]. YAP: Okamura (1916), Schmidt (1928) and Tokida (1939) as *Gymnosorus corallis* (C. Agardh) J. Agardh, Amesbury et al. (1976, 1977), Hedlund and Tsuda (1978), Tsuda et al. (1978), Lassuy (1980), Orcutt et al. (1989). IFALIK: Abbott (1961) as *Pocockiella variegata*. ULITHI: Tsuda et al. (1978).
- Padina boryana* Thivy in Taylor [= *Padina tenuis* (C. Agardh) Bory]. YAP: Amesbury et al. (1976, 1977), Hedlund and Tsuda (1978), Tsuda et al. (1978) and Orcutt et al. (1989) as *P. tenuis*.
- Padina minor* Yamada. YAP: Tsuda and Belk (1972), Orcutt et al. (1989). ULITHI: Tsuda et al. (1978).
- Padina pavonica* (Linnaeus) Thivy [= *Padina pavonia* Linnaeus]. YAP: Reinbold (1901), Okamura (1904, 1916) and Tokida (1939) as *P. pavonia*.
- Styopodium* sp. YAP: Reinbold (1901)

Order Scytosiphonales

Family Scytosiphonaceae

- Colpomenia sinuosa* (Mertens ex Roth) Derbès & Solier. YAP: Okamura (1904), Schmidt (1928), Tokida (1939).
- Hydroclathrus clathratus* (C. Agardh) Howe [= *Hydroclathrus cancellatus* Bory de Saint-Vincent]. YAP: Reinbold (1901), Okamura (1904), Schmidt (1928) and Tokida (1939) as *H. cancellatus*, Trono (1969), Amesbury et al. (1976, 1977), Tsuda et al. (1978).
- Rosenvingea intricata* (J. Agardh) Børgesen [= *Asperococcus intricatus* J. Agardh]. YAP: Okamura (1904) and Tokida (1939) as *Asperococcus intricatus*, Amesbury et al. (1976, 1977).

Order Fucales

Family Sargassaceae

- Sargassum crassifolium* J. Agardh. ULITHI: DeWreede (1973) as *Sargassum cristaefolium* C. Agardh, Tsuda (1976).
- Sargassum cristaefolium* C. Agardh. YAP: Reinbold (1901) as *Sargassum duplicatum* J. Agardh.
- Sargassum polycystum* C. Agardh. YAP: DeWreede (1973) as *Sargassum granuliferum*, Tsuda (1977, 1988).
- Turbinaria ornata* (Turner) J. Agardh. YAP: Reinbold (1901), Okamura (1904) as *Turbinaria* sp., Tokida (1939), Trono (1969), Hedlund and Tsuda (1978), Tsuda et al. (1978), Orcutt et al. (1989).

Division RHODOPHYTA (Red Algae)
Class Rhodophyceae

Subclass Bangiophycidae

Order Porphyridiales

Family Porphyridiaceae

Chroodactylon ornatum (C. Agardh) Basson [= *Asterocytis ornata* (C. Agardh) G. Hamel].
IFALIK: Abbott (1961) as *Asterocytis ornata*.

Stylonema alsidii (Zanardini) K. Drew [= *Goniotrichum elegans* (Chauvin) Zanardini].
IFALIK: Abbott (1961) as *Goniotrichum elegans*.

Order Erythropeltiales

Family Erythrotrichiaceae

Erythrotrichia carnea (Dillwyn) J. Agardh. IFALIK: Abbott (1961).

Subclass Florideophycidae

Order Acrochaetiales

Family Acrochaetiaceae

Acrochaetium sp. YAP: Lassuy (1980).

Order Nemaliales

Family Galaxauraceae

Actinotrichia fragilis (Forsskål) Børgesen [= *Actinotrichia rigida* (Lamouroux) Decaisne].
YAP: Okamura (1904), Schmidt (1928) and Tokida (1939) as *A. rigida*; Trono
(1969); Tsuda et al. (1978); Orcutt et al. (1989).

Galaxaura filamentosa R. Chou. YAP: Trono (1968). IFALIK: Abbott (1961).

Galaxaura marginata (Ellis & Solander) Lamouroux. YAP: Amesbury et al. (1977).

Tricheocarpa cylindrica (Ellis & Solander) Huisman & Borowitzka (= *Galaxaura fastigiata*
Decaisne]. IFALIK: Abbott (1961) as *Galaxaura fastigiata*.

Tricheocarpa fragilis (Linnaeus) Huisman & Townsend [= *Galaxaura oblongata* (Ellis &
Solander) Lamouroux]. YAP: Amesbury et al. (1977) as *Galaxaura* cf. *oblongata*.

Family Liagoraceae

- Liagora ceranoides* Lamouroux. IFALIK: Abbott (1961).
Liagora kahukuana Abbott. IFALIK: Abbott (1961).

Order Gelidiales

Family Gelidiaceae

- Gelidium divaricatum* G. Martens. ULITHI: Tsuda et al. (1978).
Gelidium pulchellum (Turner) Kützinger. YAP: Tsuda and Belk (1972).
Gelidium pusillum (Stackhouse) Le Jolis. YAP: Reinbold (1901), Okamura (1916), Schmidt (1928), Tokida (1939), Tsuda et al. (1978), Lassuy (1980). ULITHI: Tsuda et al. (1978).
Pterocladia caloglossoides (Howe) Dawson [= *Pterocladia parva* Dawson]. ULITHI: Tsuda et al. (1978) as *P. parva*.

Family Wurdemanniaceae (After Taylor, 1960)

- Wurdemannia miniata* (Sprengel) J. Feldmann & G. Hamel. IFALIK: Abbott (1961).

Order Gracilariales

Family Gracilariaceae

- Gracilaria canaliculata* Sonder [= *Gracilaria crassa* Harvey]. YAP: Amesbury et al. (1976, 1977) as *G. crassa*.
Gracilaria eucheumoides Harvey. YAP: Tsuda (1978), Meneses and Abbott (1987).
Gracilaria hauckii P. Silva [= *Gracilaria radicans* Hauck]. YAP: Tokida (1939) as *G. radicans*.
Gracilaria salicornia (C. Agardh) Dawson [= *Corallopsis cacalia* J. Agardh, *Corallopsis minor* (Sonder) J. Agardh and *Gracilaria cacalia* (J. Agardh) Dawson]. YAP: Reinbold (1901) as *Corallopsis minor*, Okamura (1904) as *Corallopsis cacalia*, Tokida (1939) as *Corallopsis cacalia* and *C. minor*, Amesbury et al. (1976, 1977), Tsuda et al. (1978), Tsuda (1985), Tsuda et al. (1987), Meneses and Abbott (1987), Orcutt et al. (1989).
Gracilaria tsudae (Abbott & Meneses) Abbott [= *Polycavernosa tsudae* Abbott & Meneses]. YAP: Tsuda et al. (1987) as *Gracilaria* sp., Meneses and Abbott (1987), Orcutt et al. (1989) as *Gracilaria* sp.

Order Bonnemaisoniales

Family Bonnemaisoniaceae

Asparagopsis taxiformis (Delile) Trevisan. YAP: Trono (1969). ULITHI: Tsuda et al. (1978).

Order Cryptonemiales

Family Halymeniaceae

Halymenia durvillaei Bory. YAP: Trono (1969), Hedlund and Tsuda (1978).

Halymenia floresia (Clemente y Rubio) C. Agardh. YAP: Trono (1969).

Halymenia lacerata Sonder. YAP: Okamura (1916), Schmidt (1928), Tokida (1939).

Family Peyssonneliaceae

Peyssonnelia rubra (Greville) J. Agardh. YAP: Reinbold (1901) as *Peyssonnelia* sp., Hedlund and Tsuda (1978), Tsuda (1978).

Family Rhizophyllidaceae

Portieria hornemannii (Lyngbye) P. Silva [= *Chondrococcus hornemannii* (Lyngbye) Schmitz and *Desmia hornemannii* Lyngbye]. YAP: Okamura (1916), Schmidt (1928) and Tokida (1939) as *Chondrococcus hornemannii*; Trono (1969) as *Desmia hornemannii*.

Order Corallinales

Family Corallinaceae

Amphiroa foliacea Lamouroux. YAP: Trono (1969), Amesbury et al. (1976, 1977), Hedlund and Tsuda (1978).

Amphiroa fragilissima (Linnaeus) Lamouroux. YAP: Reinbold (1901), Trono (1969), Amesbury et al. (1976, 1977), Hedlund and Tsuda (1978), Tsuda et al. (1978), Orcutt et al. (1989). ULITHI: Tsuda et al. (1978).

Hydrolithon farinosum (Lamouroux) Penrose & Y.M. Chamberlain [= *Fosliella farinosa* (Lamouroux) Howe]. IFALIK: Abbott (1961) as *Fosliella farinosa*.

Hydrolithon gardineri (Foslie) Verheij & Prud'homme van Reine [= *Porolithon gardineri* (Foslie) Foslie]. IFALIK: Abbott (1961) as *Porolithon gardineri*.

Hydrolithon onkodes (Heydrich) Penrose & Woelkerling [= *Porolithon onkodes* Foslie], YAP: Tsuda et al. (1978) as *Porolithon onkodes*. IFALIK: Abbott (1961) as *P. onkodes*.

- Hydrolithon* sp. [= *Porolithon aequinoctiale* (Foslie) Foslie]. IFALIK: Abbott (1961) as *Porolithon aequinoctiale*.
- Jania capillacea* Harvey. YAP: Trono (1969), Hedlund and Tsuda (1978), Tsuda et al. (1978), Lassuy (1980). IFALIK: Trono (1969). ULITHI: Tsuda et al. (1978).
- Jania decussatodichotoma* (Yendo) Yendo. YAP: Trono (1969). SOROL: Trono (1969).
- Jania tenella* (Kützting) Grunow. YAP: Trono (1969). ULITHI: Tsuda (1978).
- Jania unguolata* (Yendo) Yendo. YAP: Trono (1969). SOROL: Trono (1969).
- Mastophora rosea* (C. Agardh) Setchell. YAP: Tsuda et al. (1978).
- Metagoniolithon radiatum* (Lamarck) Ducker [= *Metagoniolithon charoides* (Lamouroux) Weber-van Bosse]. YAP: Amesbury et al. (1976) as *M. charoides*.
- Metagoniolithon* sp. YAP: Tsuda and Belk (1972).
- Neogoniolithon brassica-florida* (Harvey) Setchell & Mason [= *Goniolithon frutescens* Foslie and *Neogoniolithon frutescens* (Foslie) Setchell & Mason]. IFALIK: Abbott (1961) as *Goniolithon frutescens*.

Order Gigartinales

Family Hypneaceae

- Hypnea musciformis* (Wulfen) Lamouroux. YAP: Hedlund and Tsuda (1978) and Orcutt et al. (1989) as *H. esperi*. SOROL: Trono (1969) as *H. esperi*.
- Hypnea nidulans* Setchell. IFALIK: Abbott (1961).
- Hypnea pannosa* J. Agardh. YAP: Trono (1969), Orcutt et al. (1989).
- Hypnea spinella* (C. Agardh) Kützting. IFALIK: Abbott (1961).
- Hypnea valentiae* (Turner) Montagne. YAP: Trono (1969).

Order Rhodymeniales

Family Champiaceae

- Champia parvula* (C. Agardh) Harvey. YAP: Schmidt (1928), Tokida (1939), Amesbury et al. (1977).
- Chylocladia rigens* (C. Agardh) J. Agardh. YAP: Reinbold (1901).

Family Rhodymeniaceae

- Ceratodictyon spongiosum* Zanardini. YAP: Trono (1969), Amesbury and Tsuda (2002).
- Coelothrix irregularis* (Harvey) Børgesen. YAP: Trono (1969).
- Gelidiopsis intricata* (C. Agardh) Vickers [= *Gelidium intricatum* (C. Agardh) Kützting]. YAP: Reinbold (1901) as *Gelidium intricatum*, Amesbury et al. (1977), Hedlund and Tsuda (1978), Lassuy (1980), Orcutt et al. (1989). SOROL: Trono (1969).
- Gelidiopsis pannosa* (Grunow) Schmitz. YAP: Okamura (1916), Schmidt (1928), Tokida (1939).

Leptofaucheia anastomosans (Weber-van Bosse) R. Norris & Aken. YAP: Hedlund and Tsuda (1978) as ?*Rhodymenia anastomosans* Weber-van Bosse, Tsuda (1978) as *Rhodymenia* sp. IFALIK: Abbott (1961) as *Rhodymenia* sp.

Order Ceramiales

Family Ceramiaceae

Anotrichium tenue (C. Agardh) Nägeli [= *Griffithsia tenuis* C. Agardh]. IFALIK: Abbott (1961) as *Griffithsia tenuis*.

Antithamnion sp. IFALIK: Abbott (1961). ULITHI: Tsuda et al. (1978).

Callithamnion sp. YAP: Lassuy (1980).

Centroceras clavulatum (C. Agardh) Montagne [= *Ceramium clavulatum* C. Agardh]. YAP: Reinbold (1901), Okamura (1916) and Tokida (1939) as *Ceramium clavulatum*; Trono (1969), Amesbury et al. (1977), Lassuy (1980). IFALIK: Abbott (1961). SOROL: Trono (1969).

Centroceras minutum Yamada. IFALIK: Abbott (1961).

Ceramium fimbriatum Setchell & Gardner. YAP: Lassuy (1980).

Ceramium flaccidum (Harvey ex Kützing) Ardisone [= *Ceramium byssoideum* Harvey, *Ceramium gracillimum* (Kützing) Zanardini and *Ceramium transversale* Collins & Hervey]. YAP: Lassuy (1980) as *C. gracillimum*.

Ceramium macilentum J. Agardh [= *Ceramium mazatlanense* Dawson]. YAP: Lassuy (1980) as *C. mazatlanense*.

Ceramium vagans P. Silva [= *Ceramium vagabundum* Dawson]. YAP: Trono (1969) as *C. vagabunde*.

Corallophila huysmansii (Weber-van Bosse) R. Norris [= *Ceramium huysmansii* Weber-van Bosse]. YAP: Lassuy (1980) as *Ceramium huysmansii*.

Dasyphila plumarioides Yendo. YAP: Hedlund and Tsuda (1978), Tsuda (1978).

Griffithsia rhizophora Grunow ex Weber-van Bosse. IFALIK: Abbott (1961).

Haloplegma duperreyi Montagne. IFALIK: Abbott (1961).

Monosporus sp. (= *Neomonosporus* sp.). YAP: Lassuy (1980) as *Neomonosporus* sp.

Spyridia biannulata J. Agardh. YAP: Reinbold (1901).

Spyridia filamentosa (Wulfen) Harvey. YAP: Okamura (1904), Schmidt (1928), Tokida (1939), Amesbury et al. (1976, 1977).

Family Dasyaceae

Dasya adhaerens Yamada. IFALIK: Abbott (1961).

Heterosiphonia crispella (C. Agardh) Wynne [= *Heterosiphonia wurdemanii* (J. Bailey ex Harvey) Falkenberg]. YAP: Amesbury et al. (1977) as *Heterosiphonia* sp. IFALIK: Abbott (1961) as *H. wurdemanii*.

Family Delesseriaceae

- Hypoglossum attenuatum* Gardner. YAP: Tsuda et al. (1978). ULITHI: Tsuda et al. (1978).
Hypoglossum minimum Yamada. IFALIK: Abbott (1961).
Martensia fragilis Harvey [*Hemitrema fragilis* (Harvey) Dawson]. YAP: Amesbury et al. (1976) as *Hemitrema fragilis*.

Family Rhodomelaceae

- Acanthophora spicifera* (Vahl) Børgesen [= *Acanthophora orientalis* J. Agardh]. YAP: Tokida (1939) as *A. orientalis*, Amesbury et al. (1976, 1977).
Chondria sp. YAP: Amesbury et al. (1977).
Chondrophyllum papillosa (C. Agardh) Garbary & Harper [= *Laurencia papillosa* (C. Agardh) Greville]. YAP: Reinbold (1901), Tokida (1939), Trono (1969), Amesbury et al. (1977), Tsuda et al. (1978). All as *Laurencia papillosa*.
Herposiphonia delicatula Hollenberg. YAP: Hollenberg (1968b), Trono (1969).
Herposiphonia dendroidea Hollenberg. IFALIK: Hollenberg (1968b), Trono (1969). SOROL: Trono (1969).
Herposiphonia pacifica Hollenberg. IFALIK: Hollenberg (1968b), Trono (1969). SOROL: Hollenberg (1968b), Trono (1969).
Herposiphonia parca Setchell. YAP: Hollenberg (1968b), Trono (1969). SOROL: Hollenberg (1968b).
Herposiphonia secunda (C. Agardh) Ambronn [= *Herposiphonia tenella* (C. Agardh) Nägeli]. YAP: Reinbold (1901), Schmidt (1928), Tokida (1939). IFALIK: Abbott (1961) as *H. tenella*.
***Herposiphonia trichia* Hollenberg (1968b) from Yap.** YAP: Trono (1969).
Laurencia cartilaginea Yamada. YAP: Tsuda (1978).
Laurencia majuscula (Harvey) Lucas. YAP: Tsuda and Belk (1972).
Laurencia mariannensis Yamada. IFALIK: Abbott (1961).
Laurencia parvipapillata Tseng. YAP: Tsuda (1978), Orcutt et al. (1989).
Laurencia perforata (Bory de Saint-Vincent) Montagne. YAP: Reinbold (1901). IFALIK: Abbott (1961).
Laurencia yamadana Howe. YAP: Trono (1969).
Leveillea jungermannioides (Hering & Martens) Harvey. IFALIK: Abbott (1961). ULITHI: Tsuda et al. (1978).
Melanamansia glomerata (C. Agardh) R.E. Norris [= *Amansia glomerata* C. Agardh]. YAP: Tsuda (1978) as *Amansia glomerata*.
Polysiphonia apiculata Hollenberg. YAP: Hollenberg (1968a), Trono (1969).
Polysiphonia delicatula Hollenberg. IFALIK: Trono (1969).
Polysiphonia howei Hollenberg. YAP: Amesbury et al. (1977).
Polysiphonia poko Hollenberg. SOROL: Trono (1969).
Polysiphonia scopulorum Harvey. YAP: Tsuda and Belk (1972), Lassuy (1980). IFALIK: Hollenberg (1968a).

- Polysiphonia subtilisima* Montagne. IFALIK: Abbott (1961).
Polysiphonia tepida Hollenberg. YAP: Amesbury et al. (1976, 1977), Lassuy (1980).
Polysiphonia upolensis Grunow. SOROL: Trono (1969).
Tolypocladia glomerulata (C. Agardh) Schmitz [= *Roschera glomerulata* (C. Agardh) Weber-van Bosse]. YAP: Okamura (1904), Tokida (1939) as *Roschera glomerulata*, Amesbury and Tsuda (2002). ULITHI: Tsuda et al. (1978).
Womersleyella setacea (Hollenberg) R. Norris [= *Polysiphonia setacea* Hollenberg], YAP: Hollenberg (1968a) and Trono (1969) as *Polysiphonia setacea*.

DISCUSSION

The 224 species of marine benthic algae (106 genera) from Yap State consist of 11 species (7 genera) of Cyanophyta, 92 species (33 genera) of Chlorophyta, 20 species (12 genera) of Phaeophyta and 101 species (54 genera) of Rhodophyta (Table 1). Two species, *Herposiphonia trichia* Hollenberg (1968a) and *Avrainvillea hollenbergii* Trono (1971), were described as new based on the type specimens from Yap and Ifalik Atoll, respectively.

Aside from the 161 species reported around the islands of Yap, marine benthic algae have been reported from only three atolls within Yap State, i.e., Ifalik (81 species), Ulithi (31 species) and Sorol (16 species).

Table 1. Number of species reported from Yap, Ifalik, Sorol and Ulithi.

Island and Atoll	Number of Algal Species				Total
	Cyanophyta	Chlorophyta	Phaeophyta	Rhodophyta	
Yap	11	61	18	71	161
Ifalik	1	43	2	35	81
Sorol	0	7	0	9	16
Ulithi	3	12	5	11	31
Yap State	11	92	20	101	224

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