CRISP

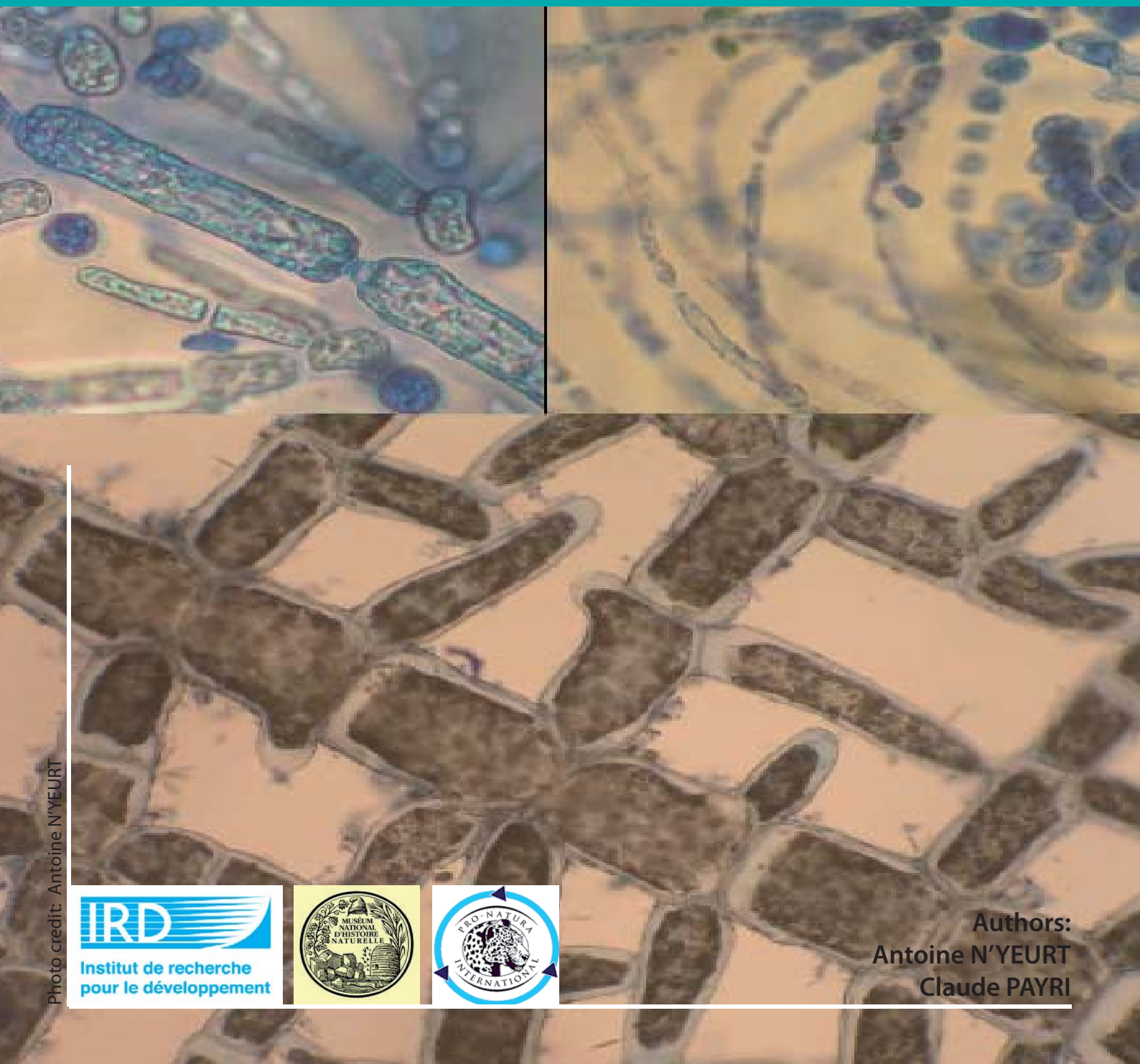
Coral Reef InitiativeS for the Pacific
Initiatives Corail pour le Pacifique

COMPONENT 2C – Project 2C2

Improving biodiversity knowledge – Taxonomy

March 2007

LIST OF ALGAE FROM THE SANTO 2006 EXPEDITION (VANUATU)



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Authors:
Antoine N'YEURT
Claude PAYRI

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Coral Reef InitiativeS for the Pacific
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The CRISP programme is implemented as part of the policy developed by the Secretariat of the Pacific Regional Environment Programme for a contribution to conservation and sustainable development of coral reefs in the Pacific.

The Initiative for the Protection and Management of Coral Reefs in the Pacific (CRISP), sponsored by France and prepared by the French Development Agency (AFD) as part of an inter-ministerial project from 2002 onwards, aims to develop a vision for the future of these unique ecosystems and the communities that depend on them and to introduce strategies and projects to conserve their biodiversity, while developing the economic and environmental services that they provide both locally and globally. Also, it is designed as a factor for integration between developed countries (Australia, New Zealand, Japan and USA), French overseas territories and Pacific Island countries.

The CRISP Programme comprises three major components:

Component 1A: Integrated Coastal Management and Watershed Management
- 1A1: Marine biodiversity conservation planning
- 1A2: Marine Protected Areas (MPAs)
- 1A3: Institutional strengthening and networking
- 1A4: Integrated coastal reef zone and watershed management

Component 2: Development of Coral Ecosystems
- 2A: Knowledge, beneficial use and management of coral ecosytems
- 2B: Reef rehabilitation
- 2C: Development of active marine substances
- 2D: Development of regional data base (ReefBase Pacific)

Component 3: Programme Coordination and Development
- 3A: Capitalisation, value-adding and extension of CRISP Programme activities
- 3B: Coordination, promotion and development of CRISP Programme

CRISP Coordinating Unit (CCU)
Programme manager: Eric CLUA
SPC - PO Box D5
98848 Noumea Cedex
New Caledonia
Tel./Fax: (687) 26 54 71
E-mail: ericc@spc.int
www.crisponline.net

COMPONENT 2C
Marine Bioprospection

Objective: contribute to the knowledge and use of coral reef ecosystem benthic invertebrates as a source of marine active substances with pharmaceutical potential.

Component contact person:
Cécile DEBITUS
IRD - UMR 152
University Paul Sabatier
Toulouse II
Science Faculty
31062 Toulouse cedex 9
France
Tel.: (33) 5 62 25 98 11
Fax: (33) 5 62 25 98 02
E-mail: cecile.debitus@ird.fr

■ **PROJECT 2C1:**
Legal framework — Upgrading island countries legislations for the sharing of benefits from development of active marine substances

■ **PROJECT 2C2:**
Taxonomy — Improvement of knowledge of benthic reef invertebrate and algae taxonomy

■ **PROJECT 2C3:**
Technological aspect — Identification of active marine substances

■ **PROJECT 2C4:**
Institutional strengthening — Training of Pacific Island resource persons

This mission took place within the framework of project 2C4 and received special funding from the Pacific Fund.

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Introduction

During the "SANTO 2006" scientific expedition, which was jointly organised and funded by the IRD, MNHN (French Museum of Natural History) and Pro-Natura , a large number of algae and marine sperm atophyte samples were collected in August 2006 as part of the activities of the Marine Module, more precisely, the Marine Algae Module directed by Claude Payri.

To our knowledge the marine algae flora of Santo had never been studied before and we have not found any publications on this biological group.

Vanuatu is group made up of some 93 islands, with a total surface area of more than 14 765 sq. km spread out over 800 km of ocean and located 100 km south-east of the Solomon Islands. Espiritu Santo is the largest island in surface area and this inventory of marine flora only covered the southern part of the island, in particular the Luganville region. Prospecting was carried out at 45 stations spread out between the surface and a depth of 60 m, in the various biotopes found in a 20-km radius of Second Canal. Nearly 1145 specimens were collected and preserved in the form of a herbarium. Most of the morphospecies were preserved in 5% buffered seawater formalin and then used for the anatomical study conducted at the Noumea lab. Taxonomic study of the collection was done in collaboration with Dr Antoine de N'Yeurt, a phycologist who was hosted by the IRD Centre in Noumea for this work, which was funded by CRISP.

The results presented here concern the phycological list produced during study of the collection. These results will have to remain confidential until they have been published by the authors in specialised journals.

Results

An inventory is given in Appendix I. All the samples were studied. Some 90% of the taxa could be identified at the species level. For the remaining 10%, at least seven (7) species were previously unknown.

There were 284 species, including 8 marine spermatophytes and 4 cyanobacteria. The 272 algae species consisted of 164 Rhodophyta, 82 Chlorophyta and 26 Ochrophyta.

There are two new red algae species on the list (*Myriogramme melanesiensis*, and *Sebdenia cerebriformis*) whose descriptions are being published for the Solomon Islands, Fiji and New Caledonia. The samples from Vanuatu were included in existing manuscripts. For that reason, there are already two papers in the process of being published about the materials from Vanuatu.

1. N'yeurt, A.D.R., & Payri, C.E. (2008). *Sebdenia cerebriformis* sp. nov. (Sebdeniaceae, Sebdeniales) from the south and western Pacific Ocean. Phycological research, 56: 13-20.

2. N'Yeurt, A.D.R., Wynne, M. and Payri, C.E. (2007). *Myriogramme melanesiensis* sp. nov. and *M. heterostroma* sp. nov. (Delesseriaceae, Rhodophyta), two common species from the Solomon Islands and Vanuatu (South Pacific). Contr. Univ. Mich. Herb. 25: 213-224.

The other six new species and the one new red algae genus (*Chondria* sp. nov., *Martensia* sp. nov., *Rhizophyllis* sp. nov., *Rhodymenia* sp. nov., Dumontiaceae gen. nov., *Hypoglossum* sp. nov. and *Dudresnaya* sp. nov.) are currently being studied.

There may, then, be nine taxa new to science in the marine algae collected in Vanuatu.

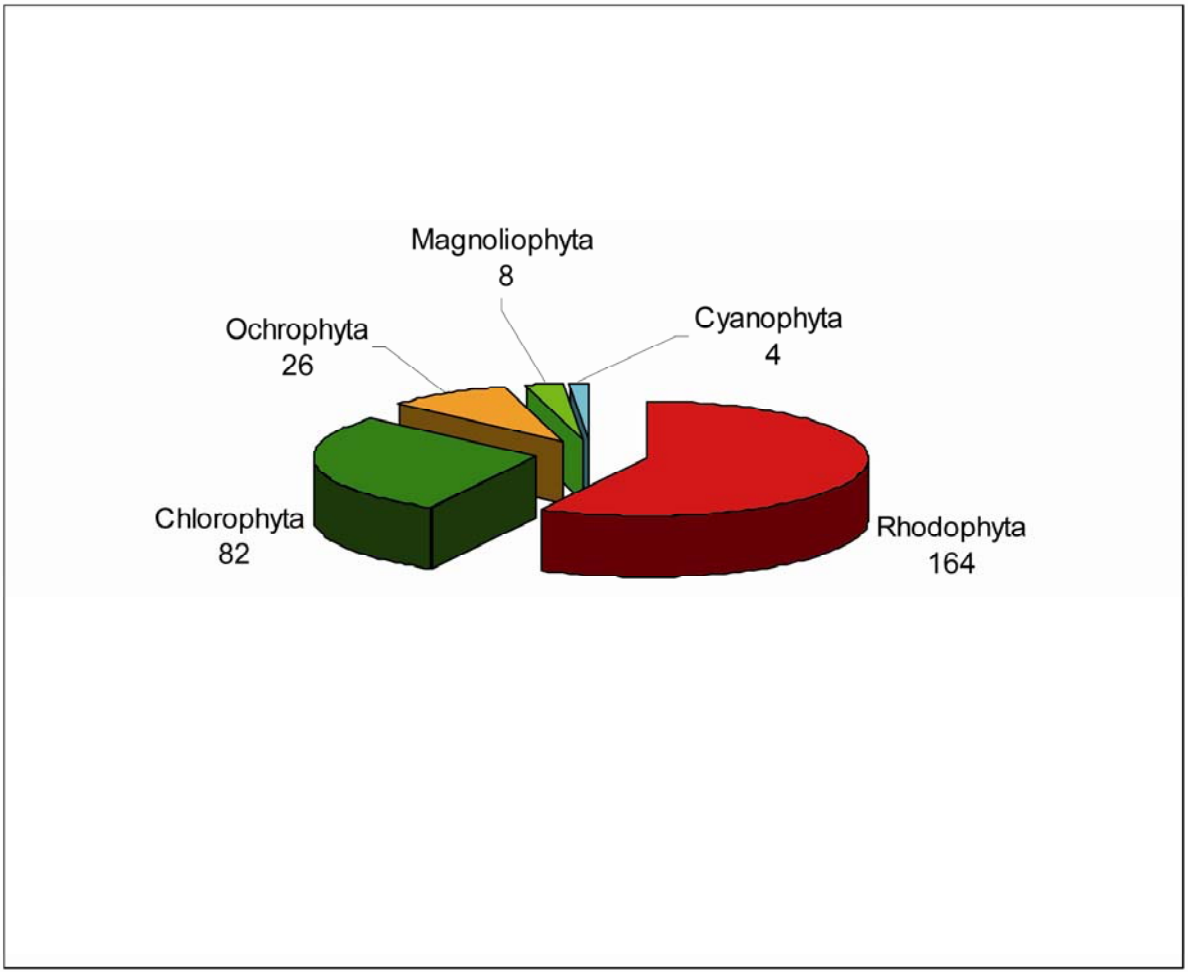

Figure 1: Distribution of the 284 species of marine flora from Santo, in the three major "algae" and marine spermatophyte divisions.

APPENDIX I

List of taxa from the Payri Santo 2006 collection (algae)

#	Division	genus	species	authority	var.	authority
1	Chlorophyta	Anadyomene	wrightii	Harvey ex J. Gray		
2	Chlorophyta	Avrainvillea	erecta	(Berkeley) A. Gepp et E. Gepp		
3	Chlorophyta	Avrainvillea	lacerata	Harvey ex J. Agardh		
4	Chlorophyta	Boergesenia	forbesii	(Harvey) J. Feldmann		
5	Chlorophyta	Boodlea	composita	(Harvey) F. Brand		
6	Chlorophyta	Boodleopsis	pusilla	(Collins) W. Taylor, Joly et Bernatowicz		
7	Chlorophyta	Bornetella	nitida	Sonder		
8	Chlorophyta	Bornetella	sphaerica	(Zanardini) Solms-Laubach		
9	Chlorophyta	Bryopsis	pennata	J.V. Lamouroux	var. secunda	(Harvey) Collins et Hervey
10	Chlorophyta	Caulerpa	biserrulata	Sonder		
11	Chlorophyta	Caulerpa	brachypus	Harvey		
12	Chlorophyta	Caulerpa	cupressoides	(Vahl) C. Agardh		
13	Chlorophyta	Caulerpa	fastigiata	Montagne		
14	Chlorophyta	Caulerpa	fergusonii	Murray		
15	Chlorophyta	Caulerpa	manorensis	Nizamuddin		
16	Chlorophyta	Caulerpa	microphysa	(Weber-van Bosse) Feldmann		
17	Chlorophyta	Caulerpa	nummularia	Harvey ex J. Agardh		
18	Chlorophyta	Caulerpa	racemosa	(Forsskål) J. Agardh	var. clavifera	Turner (Weber-van Bosse)
19	Chlorophyta	Caulerpa	racemosa	(Forsskål) J. Agardh	var. lamourouxii	(Turner) Weber-van Bosse
20	Chlorophyta	Caulerpa	racemosa	(Forsskål) J. Agardh	var. peltata	(Lamouroux) Eubank
21	Chlorophyta	Caulerpa	sedoides	C. Agardh		
22	Chlorophyta	Caulerpa	serrulata	(Forsskål) J. Agardh		
23	Chlorophyta	Caulerpa	sertularioides	(S. Gmelin) M. Howe		
24	Chlorophyta	Caulerpa	taxifolia	(Vahl) C. Agardh		
25	Chlorophyta	Caulerpa	verticillata	J. Agardh		
26	Chlorophyta	Caulerpa	webbiana	Montagne		
27	Chlorophyta	Caulerpella	ambigua	(Okamura) Prud'homme van Reine et Lokhorst		
28	Chlorophyta	Chaetomorpha	antennina	(Bory de Saint-Vincent) Kützing		
29	Chlorophyta	Chlorodesmis	fastigiata	(C. Agardh) Ducker		
30	Chlorophyta	Chlorodesmis	hildebrandtii	A. Gepp et E. Gepp		
31	Chlorophyta	Cladophora	dotyana	Gilbert		
32	Chlorophyta	Cladophora	glomerata	(L.) Kutzing		
33	Chlorophyta	Cladophora	liebetruthii	Grunow		
34	Chlorophyta	Cladophora	ohkuboana	Holmes		
35	Chlorophyta	Cladophora	prehendens	Kraft et Millar		
36	Chlorophyta	Cladophora	sp.			
37	Chlorophyta	Cladophoropsis	herpestica	(Montagne) M.A. Howe		
38	Chlorophyta	Cladophoropsis	vaucheriaeformis	(J.E Areschoug) Papenfuss		
39	Chlorophyta	Codium	arabicum	Kützing		
40	Chlorophyta	Codium	geppiorum	O.C. Schmidt		
41	Chlorophyta	Codium	mamillosum	Harvey		
42	Chlorophyta	Codium	ovale	Zanardini		
43	Chlorophyta	Dictyosphaeria	cavernosa	(Forsskål) Børgesen		
44	Chlorophyta	Dictyosphaeria	intermedia	Weber-van Bosse		
45	Chlorophyta	Dictyosphaeria	versluysii	Weber-van Bosse		
46	Chlorophyta	Halimeda	borneensis	W.R. Taylor		
47	Chlorophyta	Halimeda	cuneata	K. Hering		
48	Chlorophyta	Halimeda	cylindracea	Decaisne		
49	Chlorophyta	Halimeda	discoidea	Decaisne		
50	Chlorophyta	Halimeda	distorta	(Yamada) Hillis-Colinvaux		

51	Chlorophyta	Halimeda	gigas	W.R. Taylor
52	Chlorophyta	Halimeda	heteromorpha	N'Yeurt
53	Chlorophyta	Halimeda	lacunalis	(W.R. Taylor) Hillis
54	Chlorophyta	Halimeda	macroloba	Decaisne
55	Chlorophyta	Halimeda	macrophysa	Askenasy
56	Chlorophyta	Halimeda	micronesica	Yamada
57	Chlorophyta	Halimeda	minima	(W.R. Taylor) Colinvaux
58	Chlorophyta	Halimeda	opuntia	(Linnaeus) Lamouroux
59	Chlorophyta	Halimeda	taenicola	W.R. Taylor
60	Chlorophyta	Microdictyon	umbilicatum	(Velley) Zanardini
61	Chlorophyta	Neomeris	vanbosseae	Howe
62	Chlorophyta	Phyllodictyon	anastomosans	(Harvey) Kraft et M.J. Wynne
63	Chlorophyta	Pseudocodium	floridanum	Dawes & Mathieson
64	Chlorophyta	Rhipidosiphon	javensis	Montagne
65	Chlorophyta	Rhipilia	crassa	A.J.K. Millar & G.T. Kraft
66	Chlorophyta	Rhipilia	penicilloides	N'Yeurt et Keats
67	Chlorophyta	Rhipilia	sinuosa	Gilbert
68	Chlorophyta	Rhipilia	sp. inedit	
69	Chlorophyta	Rhipiliopsis	carolyniae	Kraft
70	Chlorophyta	Rhipiliopsis	echinocaulos	(A.B. Cribb) Farghaly
71	Chlorophyta	Rhipiliopsis	howensis	Kraft
72	Chlorophyta	Siphonocladus	sp.	
73	Chlorophyta	Siphonogramen	sp.	
74	Chlorophyta	Struvea	elegans	Børgesen
75	Chlorophyta	Tydemania	expeditionis	Weber-van Bosse
76	Chlorophyta	Udotea	argentea	Zanardini
77	Chlorophyta	Ulva	intestinalis	(Linnaeus) Nees
78	Chlorophyta	Ulva	lactuca	Linnaeus
79	Chlorophyta	Valonia	aegagropila	C. Agardh
80	Chlorophyta	Valonia	fastigiata	Harvey ex J. Agardh
81	Chlorophyta	Valonia	macrophysa	Kützing
82	Chlorophyta	Valoniopsis	pachynema	(G. Martens) Børgesen
83	Chlorophyta	Ventricaria	ventricosa	(J. Agardh) J.L. Olsen et J.A. West
84	Phaeophyceae	Dictyopteris	repens	(Okamura) Børgesen
85	Phaeophyceae	Dictyopteris	sp.	
86	Phaeophyceae	Dictyota	bartayresiana	Lamouroux
87	Phaeophyceae	Dictyota	ceylanica	Kützing
88	Phaeophyceae	Dictyota	cf. canaliculata	O. De Clerck & E. Coppejans
89	Phaeophyceae	Dictyota	cf. friabilis	Setchell
90	Phaeophyceae	Dictyota	cf. pfaffii	Schnetter
91	Phaeophyceae	Dictyota	divaricata	Lamouroux
92	Phaeophyceae	Dictyota	friabilis	Setchell
93	Phaeophyceae	Dictyota	grossedentata	De Clerck et Coppejans
94	Phaeophyceae	Dictyota	hamifera	Setchell
95	Phaeophyceae	Dictyota	sp.	
96	Phaeophyceae	Distromium	sp.	
97	Phaeophyceae	Hincksia	indica	(Sonder) J. Tanaka
98	Phaeophyceae	Lobophora	papenfussii	(W.R. Taylor) Farghaly
99	Phaeophyceae	Lobophora	variegata	(Lamouroux) Womersley ex Oliveira
100	Phaeophyceae	Padina	boryana	Thyvi
101	Phaeophyceae	Padina	melemele	Abbott et Magruder in Abbott
102	Phaeophyceae	Padina	sp.	
103	Phaeophyceae	Padina	sp. nov. 'bifide'	
104	Phaeophyceae	Sargassum	cristaefolium	C. Agardh

105	Phaeophyceae	Sargassum	spp.	
106	Phaeophyceae	Spatoglossum	asperum	J. Agardh
107	Phaeophyceae	Sphacelaria	tribuloides	Meneghini
108	Phaeophyceae	Stypopodium	flabelliforme	Weber-van Bosse
109	Phaeophyceae	Turbinaria	ornata	(Turner) J. Agardh
110	Rhodophyta	Acanthophora	pacifica	(Setchell) Kraft
111	Rhodophyta	Acanthophora	spicifera	(Vahl) Børgesen
112	Rhodophyta	Actinotrichia	fragilis	(Forsskål) Børgesen
113	Rhodophyta	Aglaothamnion	boergesenii	(Aponte et D. L. Ballantine) L'Hardy-Halos et Rueness
114	Rhodophyta	Amansia	rhodantha	(Harvey) J. Agardh
115	Rhodophyta	Amphiroa	anceps	(Lamarck) Decaisne
116	Rhodophyta	Amphiroa	crassa	Lamouroux in Quoy et Gaimard
117	Rhodophyta	Amphiroa	foliacea	Lamouroux in Quoy et Gaimard
118	Rhodophyta	Amphiroa	fragilissima	(Linnaeus) Lamouroux
119	Rhodophyta	Amphiroa	sp. inedit.	
120	Rhodophyta	Amphiroa	tribulus	(Ellis et Solander) Lamouroux
121	Rhodophyta	Amphiroa	valonioides	Yendo
122	Rhodophyta	Anotrichum	tenue	(C. Agardh) Nägeli
123	Rhodophyta	Antithamnionella	elegans	(Berthold) JHPrice & DMJohn
124	Rhodophyta	Asparagopsis	taxiformis	(Delile) Trevisan
125	Rhodophyta	Asteromenia	anastomosans	(Weber-van Bosse) G. W. Saunders, C. E. Lane, C. W. Schneider et Kraft
126	Rhodophyta	Asteromenia	pseudocoalescens	
127	Rhodophyta	Balliella	repens	Huisman et Kraft
128	Rhodophyta	Bostrychia	tenella	(J.V. Lamouroux) J. Agardh
129	Rhodophyta	Botryocladia	kuckuckii	(Weber-van Bosse) Yamada et Tanaka
130	Rhodophyta	Botryocladia	skottsbergii	(Børgesen) Levring
131	Rhodophyta	Botryocladia	spinulifera	W.R. Taylor et I.A. Abbott
132	Rhodophyta	Callophycus	densus	(Sonder) G.T. Kraft
133	Rhodophyta	Callophycus	serratus	(Harvey ex Kützing) P.C. Silva
134	Rhodophyta	Caulacanthus	ustulatus	(Turner) Kützing
135	Rhodophyta	Centroceras	clavulatum	(C. Agardh) Montagne
136	Rhodophyta	Centroceras	minutum	Yamada
137	Rhodophyta	Ceramium	flaccidum	(H.E. Petersen) Furnari et Seiro
138	Rhodophyta	Ceramium	marshallense	Dawson
139	Rhodophyta	Ceramium	upolense	South et Skelton
140	Rhodophyta	Chamaebotrys	boergesenii	(Weber-van Bosse) Huisman
141	Rhodophyta	Champia	compressa	Harvey
142	Rhodophyta	Champia	parvula	(C. Agardh) Harvey
143	Rhodophyta	Champia	vieillardii	Kützing
144	Rhodophyta	Cheilosporum	acutilobum	(Decaisne) Piccone
145	Rhodophyta	Cheilosporum	spectabile	Harvey ex Grunow
146	Rhodophyta	Chondria	armata	(Kützing) Okamura
147	Rhodophyta	Chondria	dangeardii	Dawson
148	Rhodophyta	Chondria	minutula	Weber-van Bosse
149	Rhodophyta	Chondria	ryukyuensis	Yamada
150	Rhodophyta	Chondria	simpliciuscula	Weber-van Bosse
151	Rhodophyta	Chondria	sp. inedit 'bulles'	
152	Rhodophyta	Chondrophycus	parvipapillatus	(C.K. Tseng) Garbary et Harper
153	Rhodophyta	Chondrophycus	succisus	(A.B. Cribb) K.W. Nam
154	Rhodophyta	Chrysymenia	procumbens	Weber-van Bosse
155	Rhodophyta	Coelothrix	irregularis	(Harvey) Børgesen
156	Rhodophyta	Corallophila	apiculata	(Yamada) R. Norris
157	Rhodophyta	Corynocystis	prostrata	G.T. Kraft
158	Rhodophyta	Cryptonemia	cf. lomation	(Bertoloni) Agardh

159	Rhodophyta	Cryptonemia	cf. umbraticola	Dawson
160	Rhodophyta	Cryptonemia	crenulata	(J. Agardh) J. Agardh
161	Rhodophyta	Cryptonemia	umbraticola	Dawson
162	Rhodophyta	Dasya	anastomosans	Weber-van Bosse
163	Rhodophyta	Dasya	baillouviana	(S.G. Gmelin) Montagne
164	Rhodophyta	Dasyphila	plumarioides	Yendo
165	Rhodophyta	Dichotomaria	australis	(Sonder) Huisman, J.T. Harper et G.W. Saunders
166	Rhodophyta	Dichotomaria	marginata	(Ellis et Solander) Lamarck
167	Rhodophyta	Dichotomaria	obtusata	(Ellis et Solander) Lamarck
168	Rhodophyta	Dudresnaya	capricornica	Robins et Kraft
169	Rhodophyta	Dudresnaya	hawaiiensis	R.K.S. Lee
170	Rhodophyta	Dudresnaya	sp. inedit	
171	Rhodophyta	Dumontiaceae	gen. inedit.	
172	Rhodophyta	Eucheuma	horizontale	Weber-van Bosse
173	Rhodophyta	Eucheuma	sp.	
174	Rhodophyta	Exophyllum	wentii	Weber-van Bosse
175	Rhodophyta	Frikkiella	searlesii	M.J. Wynne et C.W. Schneider
176	Rhodophyta	Galaxaura	divaricata	(Linnaeus) Huisman et Townsend
177	Rhodophyta	Galaxaura	filamentosa	R. Chou
178	Rhodophyta	Galaxaura	obtusata	(Ellis et Solander) Lamouroux
179	Rhodophyta	Galaxaura	rugosa	(Ellis et Solander) Lamouroux
180	Rhodophyta	Gelidiella	acerosa	(Forsskål) Feldmann et G. Hamel
181	Rhodophyta	Gelidiopsis	intricata	(C. Agardh) Vickers
182	Rhodophyta	Gelidiopsis	repens	(Kützing) Weber-van Bosse
183	Rhodophyta	Gelidiopsis	scoparia	(Montagne et Millardet) De Toni
184	Rhodophyta	Gelidium	cf. crinale	(Turner) Gaillon
185	Rhodophyta	Gelidium	isabelae	W.R. Taylor
186	Rhodophyta	Gibsmithia	dotyi	Hoyle
187	Rhodophyta	Gibsmithia	hawaiiensis	Doty
188	Rhodophyta	Gibsmithia	larkumii	Kraft
189	Rhodophyta	Gloiocladia	iyoensis	(Okamura) R. Norris
190	Rhodophyta	Gracilaria	dotyi	Hoyle
191	Rhodophyta	Gracilaria	sp	
192	Rhodophyta	Grateloupia	ovata	Womersley et J.A. Lewis
193	Rhodophyta	Griffithsia	heteromorpha	Kützing
194	Rhodophyta	Halichrysis	irregularis	(Kützing) A.J.K. Millar
195	Rhodophyta	Haloplegma	duperreyi	Montagne
196	Rhodophyta	Halymenia	maculata	J. Agardh
197	Rhodophyta	Halymenia	porphyraeformis	Parkinson
198	Rhodophyta	Halymenia	stipitata	I.A. Abbott
199	Rhodophyta	Haraldia	lenormandii	(Derbès et Solier) Feldmann
200	Rhodophyta	Herposiphonia	nuda	Hollenberg
201	Rhodophyta	Herposiphonia	tenella	(C. Agardh) Ambronn
202	Rhodophyta	Heterosiphonia	crispella	(C. Agardh) M.J. Wynne
203	Rhodophyta	Hypnea	cervicornis	J. Agardh
204	Rhodophyta	Hypnea	nidulans	Setchell
205	Rhodophyta	Hypnea	pannosa	J. Agardh
206	Rhodophyta	Hypnea	saidana	Holmes
207	Rhodophyta	Hypnea	spinella	(C. Agardh) Kützing
208	Rhodophyta	Hypnea	valentiae	(Turner) Montagne
209	Rhodophyta	Hypoglossum	simulans	M.J. Wynne, Price et Ballantine
210	Rhodophyta	Jania	adhaerens	Lamouroux
211	Rhodophyta	Jania	rubens	(Linnaeus) Lamouroux
212	Rhodophyta	Laurencia	brachyclados	Pilger

213	Rhodophyta	Laurencia	cf. distichophylla	J. Agardh
214	Rhodophyta	Laurencia	decumbens	Kützing
215	Rhodophyta	Laurencia	sp. 1	
216	Rhodophyta	Laurencia	sp. 2	
217	Rhodophyta	Leptofauchea	sp. 3	
218	Rhodophyta	Lomentaria	corallicola	Børgesen
219	Rhodophyta	Martensia	cf. australis	Harvey
220	Rhodophyta	Martensia	elegans	Hering
221	Rhodophyta	Martensia	flabelliforme	Harvey ex J. Agardh
222	Rhodophyta	Martensia	fragilis	Harvey
223	Rhodophyta	Martensia	sp.	
224	Rhodophyta	Meristotheca	procumbens	P. Gabrielson et Kraft
225	Rhodophyta	Monosporus	indicus	Børgesen
226	Rhodophyta	Myriogramme	melanesiensis	N'Yeurt, Wynne et Payri
227	Rhodophyta	Neosiphonia	apiculata	(Hollenberg) Masuda et Kogame
228	Rhodophyta	Nitophyllum	adhaerens	M.J. Wynne
229	Rhodophyta	Peyssonnelia	cf. boergesenii	Weber-van Bosse
230	Rhodophyta	Peyssonnelia	inamoena	Pilger
231	Rhodophyta	Peyssonnelia	sp. 1	
232	Rhodophyta	Peyssonnelia	sp. 2	
233	Rhodophyta	Pinnatiphycus	menouana	N'Yeurt, Payri et Gabrielson
234	Rhodophyta	Plocamium	sandvicense	J. Agardh
235	Rhodophyta	Plocamium	sp.	
236	Rhodophyta	Polysiphonia	scopulorum	Harvey
237	Rhodophyta	Polysiphonia	sertularioides	(Grateloup) J. Agardh
238	Rhodophyta	Polysiphonia	sp.	
239	Rhodophyta	Polysiphonia	triton	P.C. Silva
240	Rhodophyta	Portieria	hornemannii	(Lyngbye) P.C. Silva
241	Rhodophyta	Predaea	laciniosa	Kraft
242	Rhodophyta	Predaea	weldii	Kraft et I.A. Abbott
243	Rhodophyta	Prionitis	angusta	(Okamura) Okamura
244	Rhodophyta	Pterocladiella	sp.	
245	Rhodophyta	Rhizophyllis	sp. inedit.	
246	Rhodophyta	Rhodymenia	intricata	(Okamura) Okamura
247	Rhodophyta	Rhodymenia	pacifica	Kylin
248	Rhodophyta	Rhodymenia	sp. 'lanières'	
249	Rhodophyta	Rhodymenia	sp. 'ovale'	
250	Rhodophyta	Scinaia	furcata	Zablackis
251	Rhodophyta	Sebdenia	cerebriformis	N'Yeurt et Payri
252	Rhodophyta	Sebdenia	flabellata	Zablackis
253	Rhodophyta	Spirocladia	barodensis	Børgesen
254	Rhodophyta	Spyridia	hypnoides	(Bory de Saint-Vincent) Papenfuss
255	Rhodophyta	Thuretia	sp. inedit	
256	Rhodophyta	Tiffaniella	saccorhiza	(Setchell et Gardner) Doty et Menez
257	Rhodophyta	Titanophora	weberae	Børgesen
258	Rhodophyta	Tolypiocladia	glomerulata	(C. Agardh) F. Schmitz
259	Rhodophyta	Tricleocarpa	fragilis	(Linnaeus) Huisman et Townsend
260	Rhodophyta	Vanvoorstia	spectabilis	Harvey
261	Rhodophyta	Wrangelia	argus	Montagne
262	Rhodophyta	Wrangelia	elegantissima	R.E. Norris
263	Rhodophyta	Wurdemannia	miniata	(Sprengel) Feldmann et G. Hamel
264	Rhodophyta	Yamadaella	caenomyce	(Decaisne) I.A. Abbott
265	Magnoliophyta	Cymodocea	rotundata	(Hemprich et Ehrenberg) Aschers et Schweinf

266	Magnoliophyta	Cymodocea	serrulata	(R. Brown) Aschers & Magnus
267	Magnoliophyta	Enhalus	acoroides	(Linnaeus) Royle
268	Magnoliophyta	Halodule	uninervis	(Forsskål) Ascherson in Boissier
269	Magnoliophyta	Halophila	capricornii	Larkum
270	Magnoliophyta	Halophila	decipiens	Ostenfed
271	Magnoliophyta	Halophila	ovalis	(R. Brown) J.D. Hooker
272	Magnoliophyta	Thallasia	hemprichii	(Ehrenberg) Ascherson
273	Cyanobacteria	Lyngbya	majuscula	(Dillwyn) Harvey
274	Cyanobacteria	Lyngbya	sp.	
275	Cyanobacteria	Schizothrix	stricklandii	Drouet
276	Cyanobacteria	Symploca	atlantica	Gomont

APPENDIX II

Publications that include taxa found in the Santo 2006 marine algae collections:

1. *Sebdenia cerebriformis* sp. nov. (Sebdeniaceae, Sebdeniales) from the south and western Pacific Ocean, Phycological research, 56: 13-20. 2008.

2. *Myriogramme melanesiensis* sp. nov. and *M. heterostroma* sp. nov. (Delesseriaceae, Rhodophyta), two common species from the Solomon Islands and Vanuatu (South Pacific), Contr. Univ. Mich. Herb. 25: 213-224. 2007.

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Sebdenia cerebriformis sp. nov. (Sebdeniaceae, Sebdeniales) from the south and western Pacific Ocean

Antoine D. R. N'Yeurt[1*] and Claude E. Payri[1, 2]
[1]UMR 7138 'Systématique, Adaptation, Evolution', IRD-Noumea – PO BOX A5, 98848 Noumea cedex, New Caledonia and [2]University of French Polynesia, PO BOX 6570 Faa'a, 98702 Tahiti, French Polynesia

[*] To whom correspondence should be addressed. E-mail: nyeurt@gmail.com

A new species of red alga, *Sebdenia cerebriformis* N'Yeurt et Payri sp. nov. (Sebdeniaceae, Sebdeniales), is described from various localities in the South and the Western Pacific including Fiji, New Caledonia, Solomon Islands, Vanuatu, and Indonesia (Java Sea). The new species is characterised by a ruffled thallus with multiple perennial stipitate holdfasts, large conspicuous inner cortical stellate cells, and a lax filamentous medulla.

Key words: biogeography, distribution, Fiji, Indonesia, New Caledonia, new species, Rhodophyta, *Sebdenia cerebriformis* sp. nov., Sebdeniaceae, Sebdeniales, Solomon Islands, South Pacific, taxonomy, Vanuatu.

Running title: A new Sebdenia species from the Western and South Pacific

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INTRODUCTION

The family Sebdeniaceae (Kylin, 1932 emend. Schneider *et al*., 2006) currently consists of two described genera, *Sebdenia* and *Crassitegula* C. W. Schneider, C. E. Lane *et* G. W. Saunders, and a further yet undescribed *nomen nudum*, *Lesleigha* gen. ined. (Schneider *et al*., 2006). The Sebdeniaceae is distinguished from the Halymeniaceae mainly by the usual presence of medullary gland cells (Norris and Aken, 1985; Schneider and Wynne, 1991), the absence of periclinal filaments, and the non-ampullar nature of the auxiliary cell and carpogonial branches (Lewis and Kraft, 1992). Recent *rbc*L molecular sequence analyses (Gavio *et al*., 2005) have shown the position of the Sebdeniaceae to be equivocal, nested in between the newly-reinstated order Cryptonemiales and the order Rhodymeniales, and these preliminary findings were later confirmed by Withall and Saunders (2006), who erected the new order Sebdeniales to accommodate the Sebdeniaceae based on new molecular results. The Kallymeniaceae is distinguished from the Sebdeniaceae by the characteristic presence of large, often prominently lobed lower cells of the carpogonial branch system, and auxiliary cell systems with several chains of subsidiary cells (Womersley, 1994). *Crassitegula* differs mainly from *Sebdenia* by its dorsiventral habit and nemathecial tetrasporangia. Its position in the Sebdeniales is further supported by molecular SSU sequence analyses (Schneider *et al*., 2006).

After a tortuous taxonomic history (P. C. Silva in Guiry, 2006), the genus *Sebdenia* was erected by Berthold (1882) with two species: *S. monardiana* (Montagne) Berthold and *S. dichotoma* Berthold (*nomen nudum*). *Sebdenia dichotoma* was later validated by Berthold (1884). Schmitz (1889) then designated *S. monardiana* as the type species of the genus. *Sebdenia dichotoma* (J. Agardh) Berthold is an illegitimate combination erroneously attributed to Berthold by Codomier (1973), and later attributed to Codomier by Parkinson (1980: 15). However, it is a later homonym of *S. dichotoma* Berthold (1884). Reproduction in *Sebdenia* was documented in detail by Codomier (1972, 1973) and Hansen (1989).

The genus *Sebdenia* currently consists of 13 species (Table 1), ranging from tropical to sub-temperate regions of the world. Four additional species, *S. actinophysa* (Howe) E. Soler-Onís (in de Jong, 1998: 114), *S. amoena* (Bory) E. Soler-Onís (in de Jong, 1998: 114), *S. macaronesica* Soler-Onís, Haroun et Prud'homme van Reine (in Guiry, 2001) and *S. senegalensis* (M. Bodard) E. Soler-Onís (in de Jong, 1998: 115, table 6.1) are as yet formally unpublished manuscript names requiring verification; the poor taxonomic practices used in creating these names suggest that they may never be published and could not be considered in the interim as valid species. Kylin (1956) was of the opinion that *Sebdenia yamadae* Okamura *et* Segawa (in Segawa, 1938) could represent a species of *Sarcodia* J. Agardh. N'Yeurt (2001) examined Japanese material of *S. yamadae* in SAP, finding zonate tetrasporangia and several other characters different from *Sebdenia*, indicating that the species does not belong in the Sebdeniaceae.

In this paper we report a new species of marine Rhodophyta from the Fiji Islands, New Caledonia, the Solomon Islands, Santo island (Vanuatu) and the Java Sea of Indonesia, belonging to the genus *Sebdenia* but with a suite of characters unlike any previously described species.

MATERIALS AND METHODS

Collection and analysis of material

Material was collected by underwater breathing apparatus; part was stored in 5% buffered Formalin in seawater, and the rest was dried as herbarium specimens. Dried material was rehydrated in weak detergent solution prior to sectioning using a freezing microtome. Sections were stained using either cotton blue / lactophenol or 1% aniline blue in 60% clear corn syrup, and made permanent if necessary by mounting in 60% clear corn syrup.

Drawings and photography
Drawings were made using a microscope with a camera-lucida attachment. Macrophotographs were either taken with a Canon EOS 350D digital camera (Canon Inc., Tokyo, Japan) or a Nikon E-995 digital camera (Nikon Corporation, Tokyo, Japan); photomicrographs were obtained using an Olympus BH2 compound microscope fitted with an Olympus C-5050 digital camera (Olympus Optical Co. Ltd., Tokyo, Japan), and the resulting files processed into figures by computer software.

Herbarium specimens
Voucher specimens have been deposited in the herbaria of PC, NOU-IRD (Phycological Herbarium, Institut de Recherche pour le Développement, Nouméa, New Caledonia) and SUVA-A (Phycological Herbarium, The University of the South Pacific School of Marine Studies, Suva, Fiji). Herbarium abbreviations are in accordance with Holmgren *et al*. (1990). Accession numbers preceded by the letter 'S' refer to microscope slide collections.

RESULTS
Order Sebdeniales: Family Sebdeniaceae
Sebdenia cerebriformis N'Yeurt *et* Payri sp. nov.
(Figs 1-16)

Thallus atroruber, 3-10 cm latus, compressus vel applanatus, mollis lubricusque, ex lobis mamillatis irregulariter ramosis, cerebriformis ubi vivus, ad substratum per hapteron multiple, perennial teretem basalem; in arescendo papyro bene adhaerens. Cortex uni- vel bistratus, pseudoparenchymatus, cellulis extimis ovoideis subrectangularibusve, 3-5 µm diametro; cellulae interiores subsphaericae, 12-25 µm diametro, foveis conjungentibus secondariis numerosis instructae, unaquaeque vulgo 3 cellulas extimas fulcrans. Sub cortice pars ex filamentis laxis (5) 10-20 (30) µm diametro constans et medulla ex cellulis magnis stellatis (30) 35-50 (70) µm diametro constans quae 4-5 conjunctiones filamentosas ad cellulas medullosas externas irregulariter stellatas 22-27 µm diametro producunt. Rami carpogoniales tres-cellulares, extrinsecus evoluti, in cellulis corticalibus interior locati. Initia gonimoblastorum extrinsecus evoluta; carposporophyta sine involucris ampullaribus. Cystocarpia protuberentia, 1.0-1.2 mm diametro, in paginis laminarum, ostiola distincta destituta. Tetrasporangia 10-20 µm diametro, cruciatim divisa, in cortice exteriore dispersa. Spermatangia globosa, 1.5-2.0 µm diametro, binatum ab cellulis extimis corticalibus leviter elongatis abscissa.

Holotype and type locality: *D. W. Keats*, 1 Dec. 1994, - 30 m, SUVA-A 5522L (cystocarpic, Fig. 1), Fish Patch, Suva Reef, Fiji (18° 09.2 S, 178° 24. 0 E).

Paratypes: Îles des Pins, New Caledonia, 30 Nov. 2005, *leg. C. E. Payri*, - 28 m PC 0062764 (carpogonial); Fish Patch, Suva Reef, Fiji, 1 Dec. 1994, *leg. D. W. Keats*, - 30 m, SUVA-A 5521L (tetrasporic); Vangunu Island, Solomon Islands, 3 Jul. 2004, *leg. C. E. Payri & J.-L. Menou*, - 25 m PC 0062765 (spermatangial).

Other material examined: Fish Patch, Suva Reef, Fiji, *leg. D. W. Keats*, - 30 m, 1 Dec. 1994, SUVA-A 913L; Passe de la Fourmi, New Caledonia, 2001, *leg. C. E. Payri & J.-L. Menou*, - 20 m, NOU-IRD 460, 461 (cystocarpic); Touho, New Caledonia, 03 Dec. 2004, *leg. C. E. Payri*, - 52 m, NOU-IRD 458; Passe Amoss, New Caledonia, 2004, *leg. C. E. Payri*, - 40 m, NOU-IRD 457; Uitoé, New Caledonia, 28 Feb. 2005, *leg. J.-L. Menou*, -55 m, NOU-IRD 456 (tetrasporic); Îles des Pins, New Caledonia, 26 Nov. 2005, *leg. C. E. Payri*, - 45 m, NOU-IRD 1508, Îles des Pins, New Caledonia, 01 Dec. 2005, *leg. C. E. Payri*, - 50 m, NOU-

IRD 1509; Vangunu Island, Solomon Islands, 3 Jul. 2004, *leg. C. E. Payri*, - 8 m, NOU-IRD 463; Honiara, Guadalcanal, 09 Jul. 2004, *leg. C. E. Payri*, - 25 m, NOU-IRD 466; Three Sisters Islands, Solomon Islands, 19 Jul. 2004, *leg. C. E. Payri & J.-L. Menou*, - 25 m, NOU-IRD 455; Marau Lagoon, Guadalcanal, Solomon Islands, 22 Jul. 2004, *leg. C. E. Payri & J.-L. Menou*, - 20 m, NOU-IRD 464; Tuvana island, Santo, Vanuatu, 31 Aug. 2006, *leg. C. E. Payri, C. Geoffray & J.-L. Menou*,- 50 m, NOU-IRD 1507;Tanjung Belusun, Sumbawa Island, Indonesia, 2 Nov. 2004, *leg. J. R. Indy*, Herbarium Marine Botany, Graduate School of Fisheries Sciences, Faculty of Fisheries, Hokkaido University, Japan, JRI 0574 (tetrasporic), JRI 11006 (spermatangial).

Etymology: the specific epithet refers to the convoluted, infolded appearance of living plants, and is derived from the Latin word '*cerebriformis*', meaning 'having an irregular brain-like appearance'.

Habitat: Growing in colonies or as a single individual on coral substratum, at depths from 8 down to 55 m.

Distribution: So far only reported in the South Pacific Ocean from the Melanesian region including the Solomon Islands, Vanuatu, New Caledonia and Fiji, and from Sumbawa Island in the Java Sea, Indonesia.

Description: Plants deep red, to 10 cm broad, compressed to aplanate, soft and lubricous, with distinctive mamillate lobes, convoluted and infolded (Figs 1-3), attached to the substratum by multiple, terete to compressed, perennial basal holdfasts 0.6-1.0 mm in diameter, with distinct concentric growth lines 700-800 µm apart. Holdfast initiation seems to occur in marginal regions of the thallus, where cortical cells become elongate, apically divided and filamentous holdfast initials, eventually being bundled-up as parallel, irregularly branched filaments 8-10 µm in diameter (Figs 4, 7). Margins smooth to slightly undulate, lacking innovations. Plants are nitent and adhere well to herbarium paper on drying.

Cortex 3-4 layered, pseudoparenchymatous, the outermost cells densely pigmented, ovoid to subrectangular, 3-5 µm in diameter; inner cells subspherical, 7.5-8 µm in diameter. Innermost cortical cells hyaline, 12-25 µm in diameter, with peripheral chloroplasts (Fig. 5). Below the cortex lies a subtending region of large, 4-5 armed stellate cells (30) 35-50 (70) µm in diameter (Fig. 6). The medulla is lax, composed of cylindrical filaments (5) 10-20 (30) µm in diameter (Fig. 8).

Carpogonial branches are 3-celled, outwardly directed, located on inner cortical cells (Figs 9-10). The supporting cell is subspherical and about 20 µm in diameter, while the first two cells of the carpogonial branch are ovoid, 10-15 µm in diameter. The carpogonium itself is typically small and triangular-angular, 8-10 µm wide, bearing from its outward corner a relatively stout, recurved trichogyne 8-10 µm in diameter and 50-60 µm long, protruding from the outer cortex. Deeply staining subsidiary cells 10-15 µm in diameter are usually linked to the supporting cell. Auxiliary cells are subspherical, 15-20 µm in diameter, intercalary in separate cortical filaments from those bearing carpogonial branches, and the two systems are linked together by connecting filaments. The auxiliary cell system (Fig. 11) consists of 2-5 spherical subsidiary cells connected to the auxiliary cell. Post-fertilization stages were not seen in our material. Mature cystocarps (Figs 12-13) are protuberant, 1.0-1.2 mm in diameter, scattered on the blade surfaces and lack distinct ostioles. Gonimoblast initials are outwardly directed, with gonimoblasts forming a compact mass 900-1050 µm in diameter composed mostly of carposporangia 15-23 µm in diameter (Fig. 14); carposporophytes are accomodated by modifications of the inner and outer cortex and no ampullar involucres are present.

Spermatangia are spherical, 1.5-2.0 µm in diameter, cut off in pairs from slightly elongate outermost cortical cells (Fig. 15) and occur in dense patches on the thallus surface; nemathecia are absent. Tetrasporangia are 10-20 µm in diameter, cruciately divided, scattered

in the outer cortex, displacing normal outer cortical cells and lacking any involucres (Fig. 16). Tetrasporophytes are isomorphic with gametophytes.

No other reproductive structures were seen in male plants, suggesting that the species might be dioecious.

DISCUSSION

Sebdenia cerebriformis is superficially comparable to a number of other flattened members of the genus, but is distinct in its unique combination of characters (Table 1). The most obvious unique features are the convoluted, infolded appearance of the thallus surface, and the multiple, perennial marginal holdfasts, so far not reported in any other species, which all have smooth surfaces with a single, inconspicuous or stiped basal holdfast. It is closest in external habit to *Sebdenia dawsonii* (I. A. Abbott) G. I. Hansen from Baja California, but that species differs by its single holdfast, compact medulla and absence of surface infoldings.

The multiple, peg-like holdfasts of *S. cerebriformis* are perennial since they show regular concentric growth marks in longitudinal sections, and are analogous to the holdfast structure of the Halymeniaceae in the genera *Codiophyllum* Gray, *Cryptonemia* J. Agardh and *Thamnoclonium* Kützing, which are also composed of densely packed longitudinal filaments with periodic meristematic activity (Scott *et al*., 1982; 1984). The typically ruffled appearance of *S. cerebriformis*, quite marked in freshly collected plants, seems to be a variable character, sometimes almost absent from some specimens especially when young or not well developed while always prominent in broad blades. Distal areas of the thallus usually show more infoldings than proximal regions. The numerous, prominent, 4-5 long-armed stellate subtending cells in *S. cerebriformis* are a further characteristic feature of the species, not encountered in many other algae.

N'Yeurt *et al*. (1996) previously reported *S. cerebriformis* from Fiji under the misapplied name *Sebdenia yamadae*. *Sebdenia cerebriformis* is pictured from an undisclosed location, but not elaborated upon, on the back cover (third photo from the top) of the South Pacific algae field guide by Littler & Littler (2003), and has also been recently reported from Sumbawa Island in the Java Sea, Indonesia (J. R. Indy, pers. com.). The Indonesian plants are in most respects similar to the South Pacific material, except for a markedly lesser predominance of stellate subtending cells. To date the species has not been reported east of the Fiji Islands, suggesting that it has a southwestern Pacific distribution, with a probable center of origin in the Indonesian region. Moreover, this species has a broad distribution range from typical tropical areas to a more cool-temperate zone in the south of New Caledonia and especially in the 'Île des Pins'. So far, *Sebdenia cerebriformis* is the only representative of the genus in Indonesia, Solomon Islands and Vanuatu, while in New Caledonia and Fiji it occurs with the fastigiately branched *Sebdenia flabellata* (J. Agardh) P. G. Parkinson (N'Yeurt 2001; Payri 2006).

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Table 1. A comparison of selected characters between *Sebdenia cerebriformis* and other current *Sebdenia* species

Species and sources	Type locality	Habit	Surface infoldings	Holdfast(s)	Adhesion to paper	Margin	Subtending cells	Medulla
Sebdenia cerebriformis (this study)	Suva Reef, Fiji	compressed to aplanate, irregularly lobed	abundant	multiple, distinct, perennial	good	smooth to slightly undulate	stellate, 50-70 µm in diameter	lax; broad filaments 15-30 µm in diameter
Sebdenia afuerensis W. R. Taylor 1945a: 75, pl. 10 fig. 2	Lobos de Afuera Island, Peru	strap-shaped, irregularly subdichotomous axes	absent	single, small, discoid	poor	irregular	oval, 7-15 µm in diameter	lax; slender filaments 3-7 µm in diameter
Sebdenia chichensis W. R. Taylor 1945a: 74, pl. 10 fig. 1	Chinchas Island, Peru	cuneate-expanded blade	absent	single, small, discoid	poor	crenate, crisped	rounded, 10-20 µm in diameter	narrow; compact filaments
Sebdenia dawsonii (I. A. Abbott) G. I. Hansen 1989: 59 (=*Schizymenia dawsonii* Abbott 1967: 168; = *Sebdenia rubra* W. R. Taylor 1945b: 220, pl. 73 fig. 1; see Hansen 1989)	Santo Tomás, Baja California	entire to deeply cleft ovate to obovate thallus	absent	single basal stipe	not seen	smooth	stellate, 40-50 µm in diameter	lax; filaments 7-18 µm in diameter
Sebdenia dichotoma Berthold 1884: 21, pl. 2	Marseilles, France	terete to compressed, dichotomously branched axes	absent	single, basal disc	not seen	smooth	stellate, 40-70 µm in diameter	lax; filaments 8-12 µm in diameter
Sebdenia flabellata (J. Agardh) P. G. Parkinson 1980: 12	Guadeloupe	terete to compressed, fastigiately	absent	single, inconspicuous	good	smooth	stellate, 13-20 µm in diameter	lax; filaments 3-5 µm in diameter

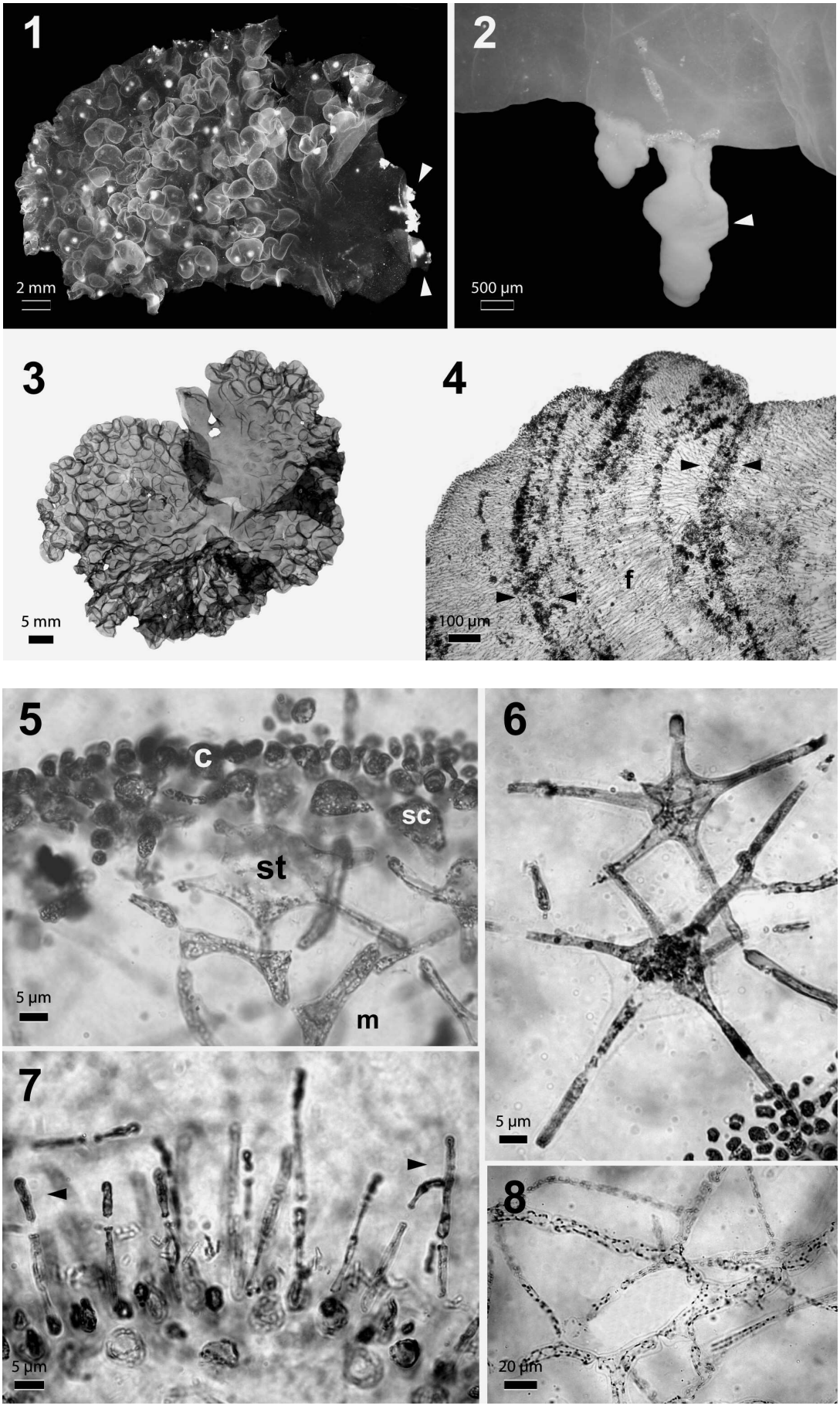
		branched						
Sebdenia heteronema Howe 1914: 163, pl. 58	Bay of Sechura, Peru	subpalmate, elliptic oblong	absent	single, basal	poor	profusely innovate	substellate, 40-50 µm in diameter	compact; slender filaments 5-10 µm in diameter
Sebdenia integra Gavio, Hickerson et Fredericq 2005: 48	Offshore Louisiana, Gulf of Mexico	subspherical, entire flat thallus	absent	single, basal, discoid	not seen	smooth	stellate, 20-30 µm in diameter	relatively compact, filaments 5-6µm in diameter
Sebdenia lapathifolia (Kützing) Howe 1914: 162	Lima, Peru	elongate-lanceolate, pertuse	absent	single, discoid	not seen	undulate, sometimes dentate or proliferate	ellipsoid, 10-20 µm in diameter	lax; slender filaments 3-7 µm in diameter
Sebdenia limensis (Sonder) Howe 1914 : 160	Lima, Peru	palmatifid-orbicular	absent	single, short-stipitate	not seen	sparingly proliferate, undulate or dentate	ovate, 10-25 µm in diameter	compact; filaments 4-8 µm in diameter
Sebdenia lindaueri Setchell ex V.J. Chapman 1979: 290, fig. 79	Long Beach, Bay of Islands, New Zealand	repeatedly dichotomous blade	absent	single, discoid	not seen	smooth	10-22 µm in diameter	5.0-7.5 µm in diameter
Sebdenia monardiana (Montagne) Berthold 1882: 530	Gulf of Naples, Italy	palmatifid to fan-shaped, irregularly di- to trichotomous blade	absent	single; basal disc	not seen	smooth	not seen	not seen
Sebdenia okamurae Yamada 1938: 129, pl. 29 ("*Okamurai*")	Hayama, Sagami Province, Japan	palmatifid, dichotomously to pinnately branched blade	absent	single; basal disc	not seen	smooth	not seen	not seen

Sebdenia rodrigueziana (Feldmann) P.G. Parkinson 1980: 13	Banyuls-sur-Mer, France	erect cuneate blade	absent	single; basal disc	not seen	proximally smooth; distally laciniate	oval to stellate, 50-80 µm in diameter	lax; filaments 10-20 µm in diameter

LEGENDS TO FIGURES

Figs 1-8. *Sebdenia cerebriformis*: vegetative morphology. Fig. 1. Habit of Holotype (SUVA-A 5522L), showing convoluted surface and multiple marginal holdfasts (arrowheads). Fig. 2. Detail of marginal holdfast, showing growth rings (arrowhead). Fig. 3. Habit of pressed specimen from 'Île des Pins', New Caledonia (PC 0062764). Fig. 4. Transverse section of perennial holdfast, showing parallel bundles of multicellular filaments (f) and seasonal growth rings (arrowheads) (SUVA-A 5522L). Fig. 5. Transverse section of thallus (PC 0062764) showing small diameter cortical cells (c), ovoid subcortical cells (sc), stellate cells (st) and medullary filaments (m). Fig. 6. Detail of a pair of subtending stellate cells, showing 5 elongate arms (PC0062764). Fig. 7. Basal region of cortex, showing elongate filamentous initials of holdfast (arrowheads) (SUVA-A 5522L). Fig. 8. Detail of medullary filaments (SUVA-A 5521L).

Figs 9-16. *Sebdenia cerebriformis*: reproductive morphology. Figs 9-10. Detail of 3-celled carpogonial branches with protruding, outwardly directed trichogyne (t) and supporting cell (su) (PC 0062764). Fig. 11. Detail of auxiliary cell (au) remote from carpogonial branch, with four subsidiary cells (sb) (PC 0062764). Fig. 12. Closeup surface view of scattered cystocarps on female plant (SUVA-A 5522L), showing globose carposporophytes (arrows). Fig. 13. Transverse section of cystocarp, showing compact mass of carposporangia (SUVA-A 5522L). Fig. 14. Detail of carposporangia (SUVA-A 5522L). Fig. 15. Transverse section of cortex of male plant, showing terminal spermatangia (arrowheads) (PC 0062765). Fig. 16. Transverse section of tetrasporophyte, showing cruciate tetrasporangia (arrowhead) scattered in cortex (SUVA-A 5521L).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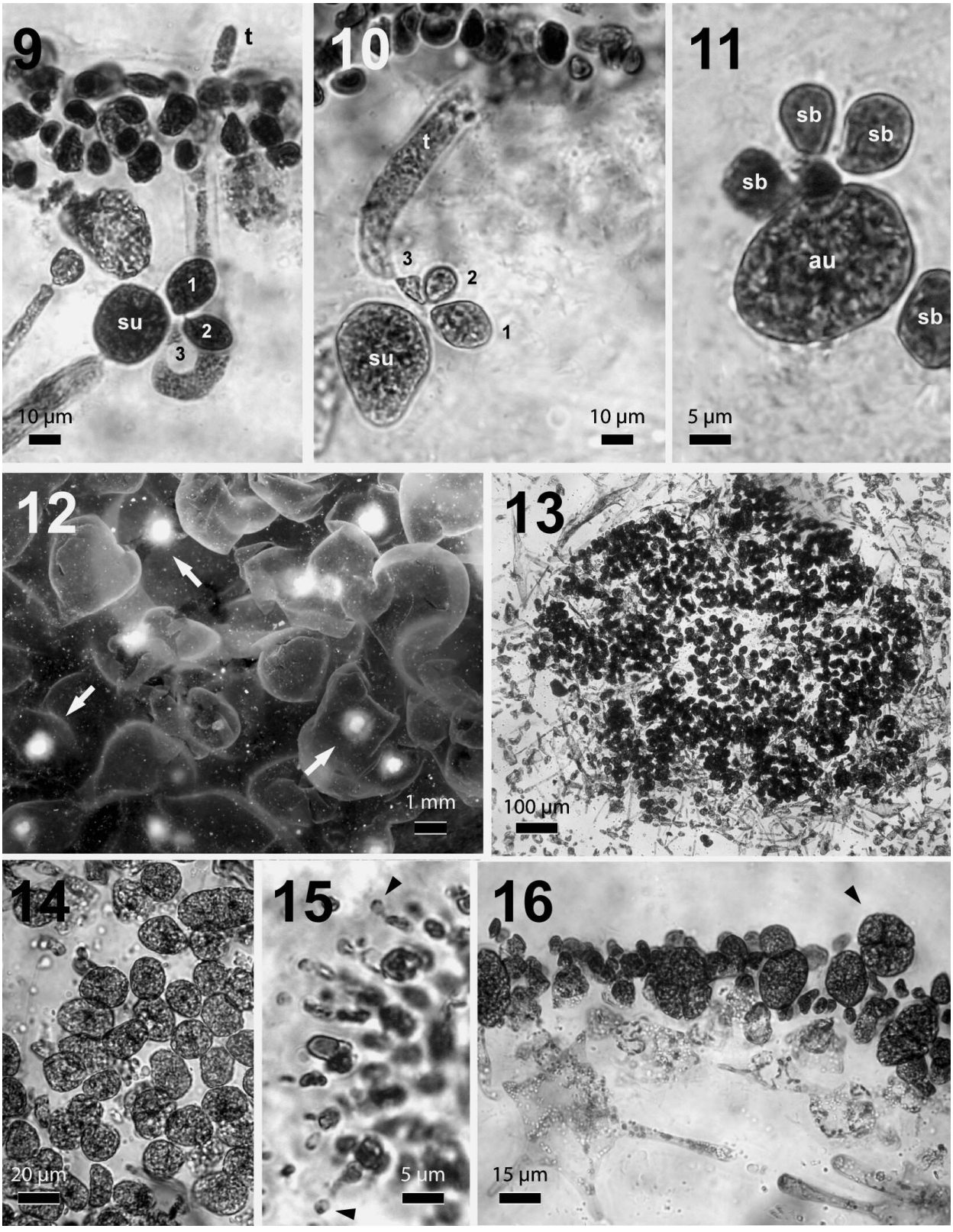
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Myriogramme melanesiensis sp. nov. and *M. heterostroma* sp. nov. (Delesseriaceae, Rhodophyta), two common species from the Solomon Islands and Vanuatu (South Pacific)

Antoine D. R. N'Yeurt[1*], Michael J. Wynne[2] and Claude E. Payri[1, 3]
[1]UMR 7138 'Systématique, Adaptation, Evolution', IRD-Noumea - PO BOX A5, 98848 Noumea cedex, New Caledonia, [2]University of Michigan Herbarium, 3600 Varsity Drive, Ann Arbor, Michigan 48108-2287 U.S.A. and [3]University of French Polynesia, PO BOX 6570 Faa'a, 98702 Tahiti, French Polynesia

[*] To whom correspondence should be addressed. E-mail: nyeurt@gmail.com

Two new species of the red algal genus *Myriogramme*, *M. melanesiensis* sp. nov. and *M. heterostroma* sp. nov., are described from subtidal habitats in the Solomon Islands and Vanuatu, South Pacific. *Myriogramme melanesiensis* is characterized by a tristromatic thallus with layers composed of subrectangular cells of approximately equal height, smooth margins lacking any spines or proliferations, and multiple ovoid to elongate two-layered, submarginal tetrasporangial sori. *Myriogramme heterostroma* is distinguished by its tri- to pentastromatic thallus, with a single large layer of clear medullary cells and smaller pigmented cortical cells, and tetrasporangia occurring in single, large, median sori.

Running title: New Myriogramme species from Melanesia

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Previous published records of the marine algal flora of the Solomon and Vanuatu Islands are few and scattered. From the Solomon Islands, the most comprehensive work to date is that of Womersley & Bailey (1970), listing some 233 species. To our knowledge, however, there are no previously published records of the marine algae of Vanuatu, although some seven species were seen by the first author in collections of the Natural History Museum, London (BM). This Vanuatu material is poorly documented, and ancient. A few anonymous and undated collections of *Halimeda* from Vanuatu are recorded in Hillis-Colinvaux's monograph (Hillis, 1959). The Solomon Islands occupy a total land area of 27,556 km^2 spread over 992 islands aligned over more than 1,500 km in the southwestern Pacific Ocean, encompassing coral reefs amongst those with the highest global biodiversity (Lovell *et al*., 2004; Payri *et al*., 2004). Vanuatu is an archipelago of some 93 islands with a total land area of over 14 765 km^2 aligned over 800 km, located 100 km to the southeast of the Solomon Islands. Recent collections from the Solomon Islands and Espiritu Santo, the largest island of Vanuatu, sampled by the third author from June to July 2004 and August 2006, respectively, have yielded many new records from previously unexplored habitats (Payri *et al*., 2004; in prep.).

The genus *Myriogramme* was erected by Kylin (1924) and currently comprises some 28 species. In this paper we report two new, locally abundant subtidal benthic marine algae that belong in the genus *Myriogramme* but do not conform to any previously described species.

MATERIALS AND METHODS

Collection and analysis of material

Material was collected by SCUBA; part was stored in 5% buffered Formalin in seawater, and the rest was dried as herbarium specimens. Dried material was re-hydrated in weak detergent solution prior to sectioning using a freezing microtome. Sections were stained using 1% aniline blue in 60% clear corn syrup, and made permanent if necessary by adding more 60% clear corn syrup and allowing to dry.

Photography

Macrophotographs were taken with a Nikon E-995 digital camera (Nikon Corporation, Tokyo, Japan); photomicrographs were obtained using an Olympus BH2 compound microscope fitted with an Olympus C-5050 digital camera (Olympus Optical Co. Ltd., Tokyo, Japan), and the resulting files processed into figures by computer software.

Herbarium specimens

Voucher specimens have been deposited in the herbaria of PC, NOU-IRD (Phycological Herbarium, Institut de Recherche pour le Développement, Nouméa, New Caledonia) and MICH. Herbarium abbreviations are in accordance with Holmgren *et al*. (1990). Accession numbers preceded by the letter 'S' refer to microscope slide collections.

RESULTS

Ceramiales: Delesseriaceae

Myriogramme melanesiensis N'Yeurt, M.J. Wynne *et* Payri sp. nov.

(Figs 1-8)

Thallus 5-15 mm in altitudine, roseus in colore, lobatus irregulariter. Laminae 75-80 µm in crassitudine, tristromaticae, stratis cellular in diametro circa aequali. Cellulae rectangulares – subquadratae in sectione transversali, circa 25 x 50 µm. Margines laeves, partes distales clavatae - rotundatae, sine dentibus; partes proximales ligulatae – dichotomae irrregulariter. Regio mediana nervi 400-600 µm lata adest in areis proximalibus aliquot thallorum grandioribus veteribus, cellulis grandis 70-100 mm in diametro. Rhizoidea marginalia 90-100 µm in diametro et 1.0-1.2 mm longa, 6-7 filorum fasciclulatorum multicellularum constanta, secus peripheriam thalli dispersorum. Chloroplastae peripherales et numerosae. Tetrasporangia divisa crucialiter, 60-90 µm in diametro, in soribus dispersi ovalibus aut in taeniis, elongatis, monostromaticis vel distromaticis sori 0.5-1.0 mm latis et 1.8-4.0 mm longis, in partibus distalibus laminae.

Thallus 5-15 mm high, pinkish red in color, irregularly lobed. Blades 75-80 µm in thickness, tristromatic, with cell layers of approximately equal diameter. Cells rectangular to subquadrate in transverse section, about 25 x 50 µm. Margins smooth, distal portions clavate-rounded, without dentations; proximal portions strap-shaped to irregularly dichotomous. A median 'nerve' region 400-600 µm wide present in proximal areas of some larger, more aged thalli, consisting of large cells 70-100 µm in diameter. Marginal rhizoids 90-100 µm in diameter and 1.0-1.2 mm long, composed of 6-7 bundled multicellular filaments, scattered along periphery of thallus. Chloroplasts peripheral and numerous. Tetrasporangia cruciately divided, 60-90 µm in diameter, in scattered oval to ribbon-like, elongate one- to two-layered sori 0.5-1.0 mm wide and 1.8-4.0 mm long, in distal portions of blade.

Holotype and type locality: Nggela Sule, Mbugana Island, Solomon Islands (09° 11.055' S, 160° 11.982' E), *leg. C. E. Payri*, 11 Jul. 2004, PC 0062772 (tetrasporangial), - 10 m,

Isotype: NOU-IRD S483 (tetrasporangial).

Paratype: Makaira, San Cristobal Island, Solomon Islands, 20 Jul. 2004, -12 m, *leg. C. E. Payri*, NOU-IRD S482

Other material examined: Solomon Islands, *leg. C. E. Payri*: Hele Passage, Vangunu Island, 04 Jul. 2004, -3 m, NOU-IRD 478, 477; Kolo Lagoon, New Georgia Island, 08 Jul. 2004, -20 m, NOU-IRD 474, 475 (SUVA-A); Nugu Matthews Shoal, Guadalcanal, 10 July 2004, -35 m, NOU-IRD 481; Nggela Island, 12 Jul. 2004, -0.8 m, NOU-IRD 476. Vanuatu, Espiritu Santo, 24 Aug. 2006, *leg. C. E. Payri,* NOU-IRD 1396 (tetrasporic).

Etymology: The specific epithet refers to Melanesia, the presently known range of this new species.

Habitat: Growing at depths of 3-35 m on coastal reef slopes, nested amidst branched corals.

Distribution: So far only known from the Solomon Islands and Vanuatu.

Myriogramme heterostroma N'Yeurt, M.J. Wynne *et* Payri sp. nov.

(Figs 9-16)

Thallus 3-12 mm in altitudine iridescens, roseus in colore, lobatus irregulariter vel ligulatus cum anastomosibus frequentibus. Laminae 70-80 µm in crassitudine, 3-5 stratorum cellularum constantes altitudinis inaequalis. Stratum medullosum singulare, cellulis magnis subquatris hyalinis; cortex 1-2 stratis cellularum pigmentiferorum gradatim parviorum 5-18 µm in diametro constans. Cellulae extimae parvae, subsphaericae, 5-7 µm in diametro, dense pigmentiferae. Cellulae interiores corticales sparsae, 7.5-18.0 µm in diametro, gangliiformes, cum numerosis conjunctionibus secundariis. Margines laeves, partes distales lobatae, sine

dentibus. Rhizoidea marginalia adsunt; affixi per haptera dispersa lata marginalia. Chloroplastae peripherales et numerosae. Tetrasporangia divisa crucialiter, 18-20 µm in diametro, in soris magnis distromaticis, singularibus medianis 1500-1800 µm in diametro, in partibus distalibus laminae.

Thallus 3-12 mm high, slightly iridescent pinkish red in color, irregularly lobed to strap-shaped, with frequent anastomoses. Blades 70-80 µm in thickness, composed of 3-5 cell layers, of unequal height. Medullary layer single, of large subquadrate hyaline cells 40 to 42 µm in diameter; cortex composed of 1-2 layers of progressively smaller pigmented cells 5 to 18 µm in diameter. Outermost cells small, subsphaerical, 5 - 7 µm in diameter, densely pigmented. Inner cortical cells sparse, 7.5-18.0 µm in diameter, ganglionic, with multiple secondary pit connections. Margins smooth, distal portions lobed, without dentations. Marginal rhizoids absent; attachment via scattered broad marginal haptera. Chloroplasts peripheral and numerous. Tetrasporangia cruciately divided, 18-20 µm in diameter, in large, single, median two-layered sori 1500-1800 µm in diameter, in distal portions of blade.

Holotype and type locality: Tanavula Point, Nggela Sule, Solomon Islands (09° 02.804' S, 160° 03.711' E), *leg. C. E. Payri*, 11 Jul. 2004, -10 m. (tetrasporangial), PC 0062773.

Paratype: Anuta Paina Island, Malaita, Solomon Islands, *leg. C. E. Payri*, 18 Jul. 2004, NOU-IRD S484 (tetrasporangial).

Other material examined: Rendova Island, New Georgia, Solomon Islands, 05 Jul. 2004, *leg. C. E. Payri*, -20 m, SUVA-A; Honiara, Guadalcanal Island, Solomon Islands, *leg. C. E. Payri*: 09 Jul. 2004, -20 m, NOU-IRD 480.

Etymology: The specific epithet refers to the different sizes of the cells of the medullary layer and the cortical layers.

Habitat: Growing at depths of 6-20 m on vertical reef slopes, nested amidst branched corals.

Distribution: Thus far, endemic in the Solomon Islands.

DISCUSSION

Probably more than any other genus in the family, *Myriogramme* has long served as a "catch-all" category, to which many disparate species have been assigned. As Wynne (1983) earlier stated, much of the ill-defined nature of the limits of this genus relates back to Kylin's (1924) basing much of his account on his new genus on *M. minuta* Kylin, a Mediterranean species, but yet designating *M. livida* (J.D. Hook. *et* Harv.) Kylin a species from the Falkland Islands, as the type of the genus. Kylin (1924) assigned a total of 18 species to his new genus, and the forms of the thalli expressed in these species showed much variation, including very small to large, robust sizes, veinless blades to blades with pronounced nerves, and great variation in the position of tetrasporangial sori . Where known, the cystocarps in species of *Myriogramme* were said to produce carposporangia in chains. Wynne (1983) said that a critical examination of the type species was necessary for as proper circumscription of *Myriogramme* to be made. That study of *M. livida* was done by Hommersand & Fredericq (1997a), and follow-up publications (Hommersand & Fredericq, 1997b; Lin *et al.*, 2001) have contributed to better defining the characters of sometimes similar appearing genera. In addition, over the years a number of species formerly assigned to *Myriogramme* have been removed and placed in other genera, as the circumscription of *Myriogramme* has been more precisely defined. Such attrition has been carried out by Zinova (1981), who established *Haraldiophyllum* on the basis of *Myriogramme bonnemaisonii* Kylin and *Hideophyllum* on the basis of *M. yezoensis* Yamada *et* Tokida (Yamada, 1935). Maggs & Hommersand (1993) transferred *M. minuta* and *Haraldiophyllum heterocarpum* [also known as *Myriogramme*

versicolor] to Ernst & Feldmann's (1957) *Drachiella*. *Myriogramme erosa* (Harvey) Kylin was transferred to *Haraldiophyllum* by Millar & Huisman (1996). When *Augophyllum* was described by Lin *et al*. (2004), they included in it *Myriogramme marginifructa* R.E. Norris et M.J. Wynne (1987). Womersley (2003) based his new genus *Nitospinosa* on *Myriogramme pristoidea* (Harv.) Kylin. Despite this ongoing "cleansing" of the genus, there still remain a number of poorly known species assigned to *Myriogramme*.

The tri- to pentastromatic nature of the blades, and the rare presence of a basal nerve are among the features that help us conclude that these two relatively commonly found algae in the Solomon and Vanuatu Islands belong to undescribed species. We are able to eliminate the great majority of species of *Myriogramme* (and some related genera) fairly easily, in particular, those species with blades bearing pronounced nerves throughout their thalli. In *M. melanesiensis*, the presence of a median 'nerve' region appears to be a relatively rare feature strongly dependent on age and maturity of the thallus, being more pronounced in proximal areas of some larger plants. The majority of plants in a given population do not show any clear nerves or veins. We have compared the two new species with a group of somewhat similar species in Table 1, examining important morphological traits.

Myriogramme alliacea (P. Crouan *et* H. Crouan) Athanasiadis, a species occurring on the coast of Brittany, France (Crouan & Crouan, 1851), has a distinctive rose-wine color in well-preserved samples. The blades have smooth margins and are tristromatic for almost all of their length. The cells in cross-section are of uniform size. Tetrasporangia are arranged in small sori over the central part of the thallus (Magne, 1959). But thalli are taller (3-6 cm) than those in the new species, and the release of the odor of onions when thalli are immersed in fresh water and then emersed, is a distinctive feature of *M. alliaceum* (Crouan & Crouan, 1851).

Another species of *Myriogramme* with a tristromatic organization is *M. goaensis* V. Krishnamurthy *et* Varadarajan (in Krishnamurthy, 1992), described from India. Only tetrasporangiate thalli were described, and the tetrasporangia were said to be in scattered, small sori (Krishnamurthy & Varadarajan, 1990), although their fig. 13 depicts a blade with only a single large sorus. Also, although the thalli were described as being "stipitate, deeply divided into small, sinuate, linear to lanceolate blades," the blades in fig. 13 appear to be simple. The presence of marginal teeth-like projections with transversely dividing apical cells would separate this Indian species from both new species from the Solomon Islands.

Another species from India is *Myriogramme quiloneensis* Anil Kumar *et* Panikkar (1993). Thalli are essentially distromatic throughout, and the blade margins bear short spine-like projections as well as tufts of rhizoidal initials for attachment purposes, so it is easily distinguished from the new species herein.

Myriogramme repens, known from the Pacific coast of North America (Hollenberg, 1945) has a rhizome bearing simple blades less than 10 mm in height and with very small, scattered sori of tetrasporangia. These features as well as the monostromatic nature of the blades distinguish it from the new species.

Myriogramme prostrata was originally described as *Haraldia prostrata* from Pacific Mexico (Dawson *et al*., 1960), but was later reported from the tropical-subtropical western Atlantic (Wynne, 1990; Littler & Littler, 2000; Ballantine *et al*., 2004), the South Pacific (Skelton & South 2002; South & Skelton, 2003). Littler & Littler (2000) described the blades to exhibit a "blue-green sheen", thus somewhat iridescent like the new species *M. heterostroma*. The species was also reported, but with a query, from Kwazulu-Natal, South Africa (De Clerck *et al*., 2005), but that plant, with a mottled, strongly iridescent aspect and with numerous marginal teeth, seems unlike genuine *M. prostrata*, which is basically a prostrate alga with frequent marginal rhizoids for attachment. A monostromatic, marginally dentate blade arising from a prostrate axis, with marginal rhizoids, and bearing large scattered

tetrasporangial sori was reported and illustrated from Fiji in the South Pacific, at first as *Myriogramme* sp. (South *et al*., 1993) and later as *M. prostrata* (South & Skelton, 2003) and also from Samoa (Skelton & South, 2002). The occasional small marginal dentations, the monostromatic nature of the blades, as well as the presence of scattered large tetrasporangial sori confined to marginal regions all distinguish *M. prostrata* from the new species.

Myriogramme cartilaginea (Harvey) Womersley is a little-known species occurring in Western Australia (Harvey, 1855), and the fact that cystocarpic plants have not yet been observed makes its assignment to *Myriogramme* uncertain (Womersley, 2003). But its thalli are 4-8 cm tall and with abundant irregularly alternate branching often with crispate margins and a cartilaginous texture. The blades become tristromatic and later become polystromatic in the central regions. These features easily separate it from the new species.

Myriogramme variegata Yamada, with a type locality of Sagami Bay, Japan (Yamada, 1944), has also been reported from California (Abbott & Hollenberg, 1976). Its habit consists of a discoid base giving rise to stipitate simple or rarely divided small blades, reaching only 1.5 cm in height. The blades are monostromatic and were said to have margins both entire and minutely dentate. Tetrasporangial sori are small, and produced on the leafy parts of the blade (Yamada, 1944). The monostromatic nature of the blade and the minute marginal teeth distinguish this species from the new species.

Myriogramme distromatica Boudouresque was based on material in the Thuret-Bornet Herbarium in Paris bearing the manuscript name "*Nitophyllum distromaticum* Rodriguez". The type was a Rodriguez collection of May, 1897, from a submarine cave at a depth of 90 m off Port Mahon, Menorca, Balearic Islands in the western Mediterranean. This species has also been reported from deep waters off the coast of North Carolina and South Carolina (Schneider & Searles, 1991). The small (to 15 mm across) prostrate blades are consistently distromatic, with the ventral layer of cells larger than those of the surface layer. Multicellular rhizoids are frequent on the under-surface and attach the blade to the substratum. Reproduction is not known in this species. The single parietal fenestrate chloroplast per cell clearly indicates that this species does not belong to *Myriogramme* (Hommersand & Fredericq, 1997a).

Nitophyllum tristromaticum Rodriguez ex Mazza (Mazza, 1903) bears discussion in that Boudouresque *et al*. (1984) intended to transfer it to *Myriogramme*, but their proposal was not valid (Greuter *et al*., 2000). This Mediterranean species, described from Menorca, Balearic Islands (Mazza, 1903), has a tristromatic organization, and there is a central layer of relatively large cells, with cortical layers of smaller cells, as occurs in *M. heterostroma*. According to Gómez Garreta *et al*. (2001), however, the cells bear a single parietal, plate-like chloroplast per cell, a feature that precludes its being placed within either *Nitophyllum* or *Myriogramme*.

Schizoseris bombayensis (Børgesen) Womersley is another small Delesseriacean species with a wide range in tropical and warm temperate waters of the Pacific Ocean, including the South Pacific (Millar & Kraft, 1993; Abbott, 1999; Littler & Littler, 2003; Lobban & N'Yeurt, 2006). The blades in this species are usually 1-2 (-5) cm high, irregularly to dichotomously branched, with median macroscopic nerves usually coursing from the base to distal regions of the thallus (Abbott, 1999; Womersley, 2003). The blades are monostromatic in most regions of the thallus between the nerves (Børgesen, 1931; Segawa, 1941, as *Myriogramme subdichotoma*; Dawson, 1950, as *S. pygmaea*) but may become distromatic in older regions (Børgesen, 1931). The chloroplasts have been shown to be dissected and ribbon-like (Lobban & N'Yeurt, 2006) and the species has never been reported as being iridescent. These differences distinguish this species from the new species of *Myriogramme*.

Another Delesseriacean alga with superficial resemblance to *Myriogramme melanesiensis* and *M. heterostroma* is *Drachiella minuta* (Kylin) Maggs *et* Hommersand. Based on a collection from the vicinity of Naples, Italy (Kylin, 1924), this species was described as being non-stipitate small blades, 1-2 cm tall, irregularly sinuate or lobed, distally monostromatic, but tristromatic below, and lacking veins. Tetrasporangial sori are small and scattered in the distal portions of the blades, and the tetrasporangia are produced in two layers. Magne (1956, 1957) provided detailed observations on the distinctive cellular organization of this species and its distinctive process of many chloroplasts undergoing a fusion process to form a single lobed chloroplast. Maggs & Hommersand (1993) described specimens to be of rare occurrence in southwestern England and the Channel Islands, where they form thalli 5 cm in height and 5 cm in width. The thalli become decumbent and at times show a strong blue iridescence. The blade in cross-section showed the cell layers to be of uniform size. Tetrasporangia are produced in sori directly on the primary blade in this species, quite unlike the production of small specialized tetrasporophylls in *Drachiella spectabilis* Ernst *et* Feldmann (1957), the type of the genus. This led Wynne (1994) to express doubt of the placement of *M. minuta* in *Drachiella*. It seems that the primary justification for the proposed transfer by Maggs & Hommersand (1993) was that, as in *D. spectabilis*, there is a large ribbon-like to convoluted chloroplast per cell rather than many small discoid chloroplasts per cell. This caution led Gómez Garreta *et al*. (2001) to retain *M. minuta* in *Myriogramme*. But suffice it to say, this species is distinct from both new species because of its different cellular organization. These two new species increase our knowledge of algal diversity in this region of the world, and enrich the Delesseriaceae from the Solomon Islands, for which Womersley & Bailey (1970) had not reported the genus *Myriogramme* among the 6 taxa listed for this family.

Key to the species of *Myriogramme* from the Solomon Islands and Vanuatu

1. Medullary layer of approximately same dimensions as cortical layers; attachment via marginal rhizoids; tetrasporangia in multiple irregular marginal sori.....*M. melanesiensis*
1. Medullary layer much larger than cortical layers; attachment via marginal haptera; tetrasporangia in large, single median sori.....*M. heterostroma*

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Table 1. A comparison of selected characters between *Myriogramme melanesiensis*, *M. heterostroma* and related species

Species and sources	Type locality	Habit	Cell layers	Margins	Iridescence	Veins	Tetrasporangial sori
M. melanesiensis (this study)	Mbugana Island, Solomon Islands	simple to irregularly lobed blades, to 15 mm tall	3, of equal height	smooth	absent	absent	submarginal, multiple, elongate to ovoid
M. heterostroma (this study)	Nggela Sule, Solomon Islands	simple to irregularly lobed blades, to 12 mm tall	3-5, of unequal height	smooth	slight	absent	median, single, ovoid, large
M. alliacea (P. Crouan *et* H. Crouan) Athanasiadis, 1996	Rade de Brest, Brittany, France	lobed, divided blade, 30-60 mm tall	3	smooth	absent	absent	apparently two-layered (Magne, 1959)
M. cartilaginea (Harvey) Womersley, 2003: 111	Garden Island, Western Australia	irregularly alternately branched complanate thallus, to 80 mm tall	2-4, usually 3	crispate or with short dentitions	absent	absent	scattered
M. distromatica Boudouresque, 1971: 76	Mahon, Menorca, Balearic Islands, western Mediterranean	lobed, irregularly divided blade 10-15 mm in diameter	2	smooth	absent	absent	unknown
M. goaensis V. Krishnamurthy *et* K. Varadarajan, 1990 ('*goaense*')[1]	Calangute, Goa, India	linear, deeply divided blades, 20-30 mm tall	3	occasional teeth, numerous marginal	absent	absent	scattered small sori in median region

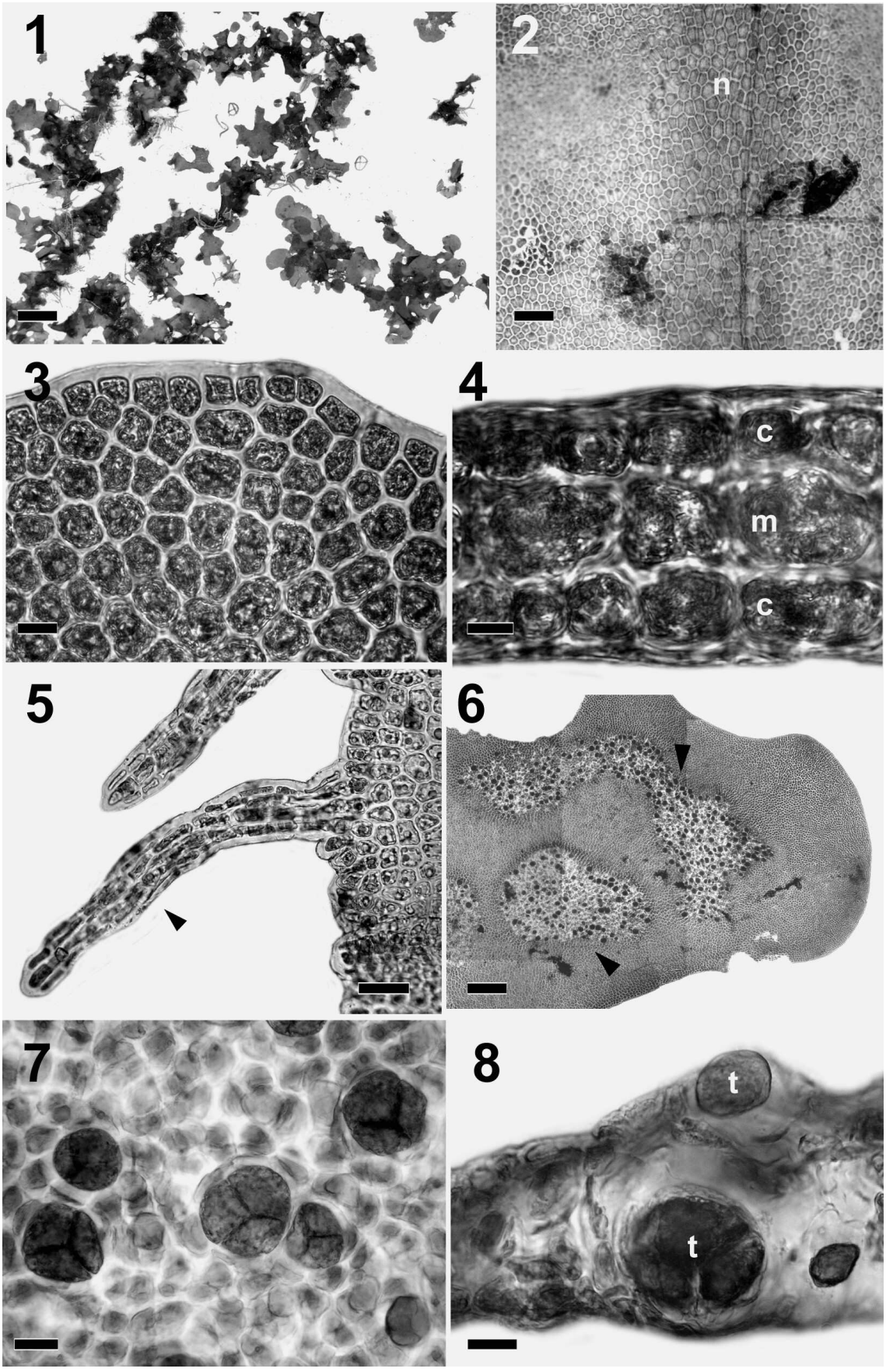
[1] This species has scattered transversely dividing initials along the margins, and is likely a species of *Polyneura*, not *Myriogramme*.

				rhizoids			
M. prostrata E.Y. Dawson, Neushul *et* Wildman) M.J. Wynne, 1990	Islas San Benitos, Baja California, Mexico	lobed blades to 35 mm wide, 25 mm long	1	with small dentations	present	absent	in large scattered sori near blade margins
M. quilonensis Anil Kumar *et* Panikkar, 1993	Thirumullavaram, Kerala, India	small lobed thallus to 15 mm high	2 throughout	with small dentations	absent	absent	in large sori
M. repens Hollenberg, 1945	Point Vicente, Los Angeles County, California, USA	simple blade to 8 mm high	1, 3 in fertile regions	smooth	absent	absent	in small scattered sori
M. variegata Yamada, 1944	Sagami Bay, Japan	thin blade to 15 mm high, 3-4 mm wide	1	smooth or minutely dentate	absent	absent	in small scattered sori
Nitophyllum tristromaticum Rodriguez ex Mazza, 1903: 106	Port Mahon, Menora, Balearic Islands, western Mediterranean	lobed blade to 5 mm wide	3, one large central and two small cortical	smooth	absent	absent	unknown
Drachiella minuta (Kylin) Maggs *et* Hommersand, 1993: 236	Naples, Italy	lobed, irregularly divided thallus 25-30(50) mm tall	1-3	smooth	present	absent	unknown

LEGENDS TO FIGURES

Figs 1-8. *Myriogramme melanesiensis*: habit and vegetative morphology (PC 0062772 except where otherwise stated). Fig. 1. Habit of Holotype. Scale = 10 mm. Fig. 2. Proximal region of older blade from Vanuatu (NOU-IRD 1396), showing 'nerve' region (n) (the cross-like runner on the nerve is an epiphytic bryozoan). Scale = 200 µm. Fig. 3. Surface view of cortical cells. Scale = 50 µm. Fig. 4. Transverse section of the thallus, showing the medullary layer (m) of the same height as cortical layers (c). Scale = 25 µm. Fig. 5. Detail of multicellular marginal rhizoids (arrowhead). Scale = 100 µm. Fig. 6. Detail of fertile submarginal region of blade, showing elongate, ribbon-like to ovoid tetrasporangial sori (arrowheads). Scale = 700 µm. Fig. 7. Detail of tetrasporangia. Scale = 50 µm. Fig. 8. Cross section of a two-layered tetrasporangial sorus (t). Scale = 50 µm.

Figs 9-16. *Myriogramme heterostroma*: habit and vegetative morphology (PC 0062773). Fig. 9. Habit of Holotype. Scale = 5 mm. Fig. 10. Detail of thallus, showing dense layer of small outer cortical cells and blade anastomosis (arrowhead). Scale = 1 mm. Fig. 11. Surface view of cortical cells. Scale = 20 µm. Fig. 12. Detail of a marginal attachment pad. Scale = 20 µm. Figs 13-14. Transverse sections in two different regions of the thallus, showing a large, clear single medullary layer (m) and much smaller, pigmented cortical layers (c). Scale = 10 µm. Fig. 15. Detail of a large median tetrasporangial sorus (s). Scale = 200 µm. Fig. 16. Detail of tetrasporangia (arrowhead). Scale = 20 µm.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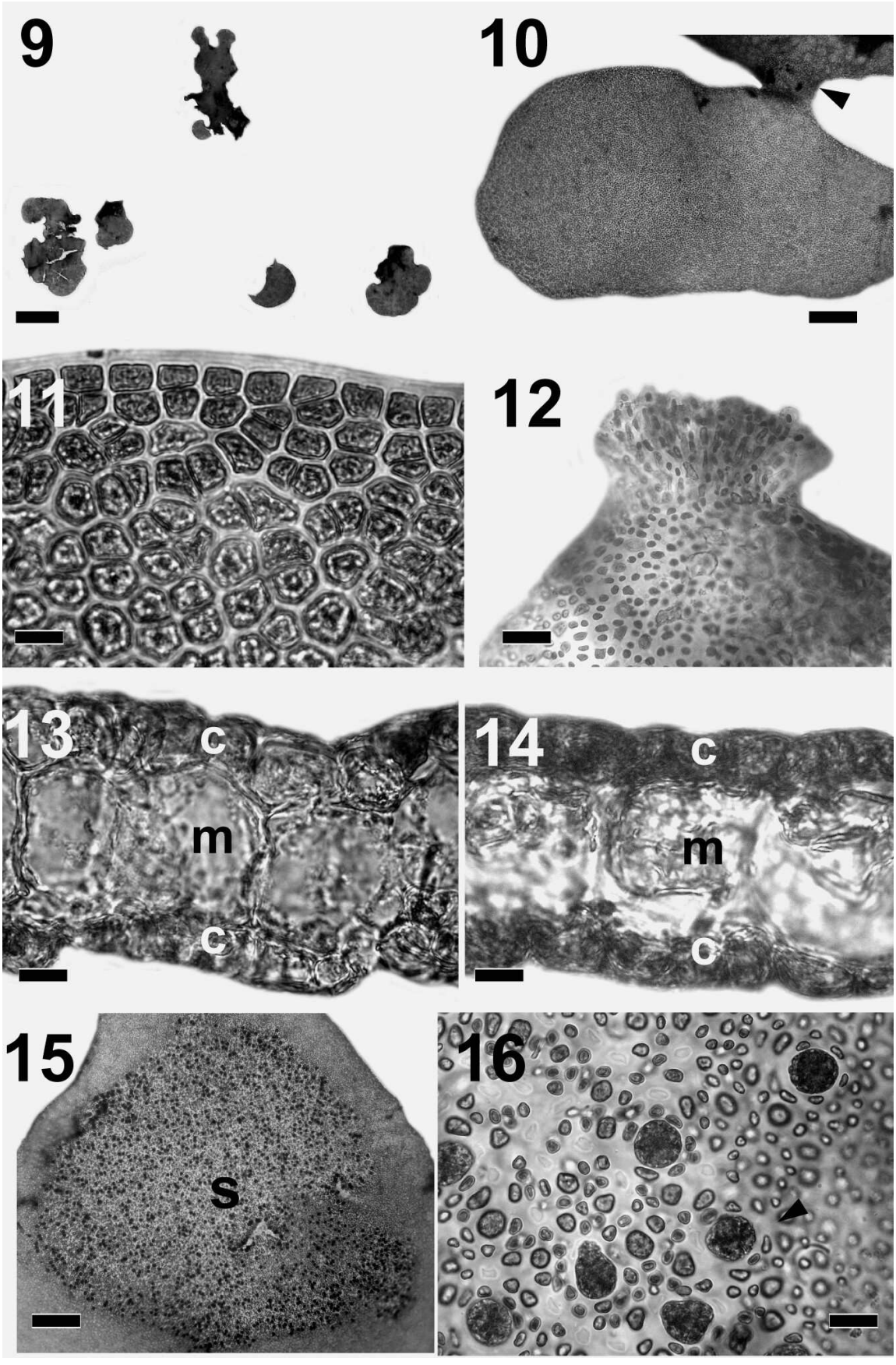
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PROJECT 2C2 -
Improving biodiversity knowledge – Taxonomy

March 2007

LIST OF ALGAE FROM THE SANTO 2006 EXPEDITION

ABSTRACT

Institut de recherche pour le développement

In August 2006, the seven participants in the 2006 Santo expedition's Algae Workshop collected samples in just the southern part of the island of Santo. Nearly 1 500 samples, covering both calcareous and "soft" algae, were collected at the 41 stations spread throughout a range of habitats from the seashore to a depth of 60 m. The results of the taxonomic study reported 284 species (excluding calcareous red algae) including 8 marine spermatophytes and 4 cyanobacteria. The 272 algae species consisted of 164 Rhodophyta, 82 Chlorophyta and 26 Ochrophyta. Nine taxa may be new to science. This inventory joins those done in the Solomon Islands (2004) and Fiji (2007) as part of the CRISP Program and those done in New Caledonia and French Polynesia as part of projects funded by those territories.
The southern part of Santo appears to be a relatively rich site and it forms part of the diversity gradient extending from the zone richest in species, which is located in the Indo-Malay region, to the poorest zone, in the eastern Pacific. This study is an initial inventory of Vanuatu's marine flora.