

Supplementary Materials

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Supplementary Table S1. A list of species used for molecular work in this study, including newly generated *rbcL* and COI-5P sequences, and downloaded GenBank sequences

Species	Accession No.	Location and collecting data	Marker	Reference
<i>Ceramium kondoii</i> Yendo	DQ350388	Japan, Niigata, Itoigawa, C1315	<i>rbcL</i>	Yang et al. (2008)
<i>Chondria capensis</i> (Harvey) Askenasy	KY927799	South Africa, Western Cape, Mauritius Bay leg. M. Rothman; Mar 2, 2011; #1004	<i>rbcL</i>	Francis et al. (2017)
<i>Chondria collinsiana</i> M. A. Howe	GU330225	Brazil, Rio de Janeiro, Armação dos Búzios, Praia Rasa; V. Cassano, J. C. De-Paula; SP399.865	<i>rbcL</i>	Cassano et al. (2012b)
<i>Chondria crassicaulis</i> Harvey	GU223872	Japan, Niigata Pref., Kashiwazaki, Kujira-nami; May 3, 2008; Kashiwazaki-A4	COI-5P	Kurihara et al. (2010)
<i>Chondria dangeardii</i> E. Y. Dawson	GU223879	USA, Hawaii, Molokai; Mar 21, 2008; ARS03592	COI-5P	Kurihara et al. (2010)
<i>Chondria dasypylla</i> (Woodward) C. Agardh	U04021	USA, North Carolina, Carteret County, Bogue Sound; D. W. Freshwater; Apr 1990	<i>rbcL</i>	Fredericq et al. (1996)
<i>Chondria decipiens</i> Kylin	MG272232	USA, California, San Nicolas Island; Nov 14, 2012; UC2025838	COI-5P	Sutti et al. (2018)
<i>Chondria scintillans</i> G. Feldmann	KF492717	France, Brittany, Roscoff-Theven; Dec 5, 2002; F. Rousseau, JML0048	COI-5P	Machín-Sánchez et al. (2014)
<i>Chondria succulenta</i> (J. Agardh) Falkenberg	KY120336	Australia, NSW, Batehaven; Y. Metti; May 30, 2005; YM309, NSW879470	<i>rbcL</i>	Metti et al. (2015)
<i>Chondria tumulosa</i> A. R. Sherwood & J. M. Huisman	MT039621	USA; T. Willians; Aug 1, 2019; ARS09882	COI-5P	Sherwood et al. (2020)
<i>Chondrophycus dotyi</i> (Y. Saito) K. W. Nam	HQ423050	USA, Hawaii, Oahu, Waikiki Natatorium; K. Shultz; Apr 27, 2007; BISH669750 (#00693)	COI-5P	Sherwood et al. (2010)
<i>Chondrophycus dotyi</i>	KX815263	USA, Hawaii, Oahu, Sandy Beach; May 31, 2015; E. Stein, SP 469.710	<i>rbcL</i>	Sentíes et al. (2016)
<i>Chondrophycus</i> sp.	KX146174	New Caledonia, Loyalty Islands, Beautemps/Beaupré; C. Payri; Apr 6, 2005; JML0250	<i>rbcL</i>	Rousseau et al. (2017)
<i>Chondrophycus</i> sp.	KX258813	New Caledonia, Loyalty Islands; C. Payri; May 6, 2005; JML0250	COI-5P	Rousseau et al. (2017)
<i>Chondrophycus</i> sp.	KX258815	New Caledonia, Loyalty Islands; C. Payri; May 6, 2005; JML0251	COI-5P	Rousseau et al. (2017)
<i>Chondrophycus</i> sp.	KX815262	Mexico, Quintana Roo, Isla Mujeres, Garrafon de Castilla; A. Sentíes, M. C. Gil-Rodríguez; Feb 12, 2007; UAMIZ1240	<i>rbcL</i>	Sentíes et al. (2016)
<i>Chondrophycus</i> sp.	KY120337	Australia, Norfolk Island, Collins Head, intertidal; Y. Metti, A. Millar; Mar 21, 2005; YM296, NSW900770	<i>rbcL</i>	Metti et al. (2015)
<i>Chondrophycus succisus</i> (A. B. Cribb) K. W. Nam	GU223884	USA, Molokai; Feb 11, 2007; ARS02583	COI-5P	Kurihara et al. (2010)
<i>Chondrophycus tronoii</i> (E. Gazon-Fortes) K. W. Nam	AF489864	Philippines	<i>rbcL</i>	GenBank (http://www.ncbi.nlm.nih.gov)
<i>Chondrophycus undulatus</i> (Yamada) Garbary & Harper	HQ422996	USA, Hawaii, Oahu, Hauula Beach Park; A. Kurihara; Sep 18, 2007; #02922	COI-5P	Sherwood et al. (2010)
<i>Chondrophycus undulatus</i>	HQ423055	USA, Hawaii, Oahu, Hanauma Bay; R. Okano; May 1, 2007; BISH663223 (#00733)	COI-5P	Sherwood et al. (2010)

Supplementary Table S1. Continued

Species	Accession No.	Location and collecting data	Marker	Reference
<i>Chondrophycus cf. undulatus</i> (Yamada) Garbarey & Harper	FJ785307	New Caledonia, Maré, Loyalty Is.; C. Payri; Mar 22, 2005; IRD100	rbcL	Martin-Lescanne et al. (2010)
<i>Corynecladia clavata</i> (Sonder) J. Agardh	MF094079	Australia, Victoria, Walkerville; P. Díaz-Tapia, M. Brookes; Jan 20, 2015; PD1300	rbcL	Díaz-Tapia et al. (2017)
<i>Corynecladia clavata</i>	MH704456	Australia, Victoria, The Caves; P. Díaz-Tapia, M. Brookes; Jan 21, 2015; SPF58163	COI-5P	GenBank (http://www.ncbi.nlm.nih.gov)
<i>Corynecladia elata</i> (C. Agardh) Cassano, M. C. Oliveira, M. T. Fujii	KY120339	Australia, Western Australia, Rottnest Island, subtidal; James Eu; Nov 15, 2008; JE01, NSW900764	rbcL	Metti et al. (2015)
<i>Corynecladia nova</i> (Metti) Cassano, M. C. Oliveira, M. T. Fujii	KY120340	Australia, NSW, Jervis Bay, Plantation Pt, subtidal; Y. Metti, A. Millar; Feb 15, 2005; YM194, NSW900767	rbcL	Metti et al. (2015)
<i>Kallymenia cribrosa</i> Harvey	EU349216	Australia, Tarcoola Beach; M. H. & F. Hommersand; Sep 21, 1995	rbcL	Krayesky et al. (2009)
<i>Laurencia aldingensis</i> Saito & Womersley	JF810351	Brazil, Rio de Janeiro, Armação dos Búzios, Praia Rasa; V. Cassano, J. C. De-Paula; Jan 13, 2005	rbcL	Cassano et al. (2012b)
<i>Laurencia bronniartii</i> J. Agardh	KY120341	Australia, Norfolk Island; Y. Metti, A. Millar; Mar 16, 2005; YM245	rbcL	Metti et al. (2015)
<i>Laurencia caduciramulosa</i> Masuda & Kawaguchi	KJ700867	USA, Key Biscayne, Crandon Park, Florida; Aug 13, 2013	rbcL	Collado-Vides et al. (2014)
<i>Laurencia catarinensis</i> Cordeiro-Marino & Fujii	KF492723	Spain, Canary Islands, Tenerife, Punta del Hidalgo; M. C. Gil-Rodríguez, M. Machín-Sánchez; Jun 22, 2012; MMS0151	COI-5P	Machín-Sánchez et al. (2014)
<i>Laurencia decussata</i> (A. B. Cribb) Metti (as <i>L. rigida</i> J. Agardh)	AY920852	Australia, Botany Bay, NSW; May 11, 2000; G21	rbcL	Zuccarello and West (2006)
<i>Laurencia decussata</i> (A. B. Cribb) Metti	KY120344	Australia, NSW, Arrawarra Headland (30°03'32.3" S, 153°12'19.4" E); Y. Metti; Jul 28, 2004; NSW857588:YM069	rbcL	This study
<i>Laurencia decussata</i>	OM328148	Australia, NSW, Newcastle, Newcastle Harbour (32°55'20.3" S, 151°47'26.3" E); Y. Metti; Feb 8, 2005; NSW1114921:YM139	COI-5P	This study
<i>Laurencia decussata</i>	OM328121	Australia, NSW, Newcastle, Newcastle Harbour (32°55'20.3" S, 151°47'26.3" E); Y. Metti; Feb 8, 2005; NSW1114921:YM139	rbcL	This study
<i>Laurencia decussata</i>	OM328149	Australia, NSW, Sydney, La Perouse, Bare Island (33°59'29.1" S, 151°13'55.8" E); Y. Metti, A. J. K. Millar; Feb 9, 2005; NSW1114922:YM153	COI-5P	This study
<i>Laurencia decussata</i>	OM328122	Australia, NSW, Sydney, La Perouse, Bare Island (33°59'29.1" S, 151°13'55.8" E); Y. Metti, A. J. K. Millar; Feb 9, 2005; NSW1114922:YM153	rbcL	This study
<i>Laurencia decussata</i>	OM328151	Australia, Jervis Bay, Plantation Point (35°04'16.1" S, 150°41'48.8" E); Y. Metti, A. J. K. Millar; Feb 15, 2005; NSW1114923:YM171	COI-5P	This study
<i>Laurencia decussata</i>	OM328123	Australia, Jervis Bay, Plantation Point (35°04'16.1" S, 150°41'48.8"E); Y. Metti, A. J. K. Millar; Feb 15, 2005; NSW1114923:YM171	rbcL	This study
<i>Laurencia decussata</i>	OM328152	Australia, Jervis Bay, Plantation Point (35°04'16.1" S, 150°41'48.8" E); Y. Metti, A. J. K. Millar; Feb 15, 2005; NSW1114924:YM178	COI-5P	This study
<i>Laurencia decussata</i>	OM328124	Australia, Jervis Bay, Plantation Point (35°04'16.1" S, 150°41'48.8" E); Y. Metti, A. J. K. Millar; Feb 15, 2005; NSW1114924:YM178	rbcL	This study
<i>Laurencia decussata</i>	OM328150	Australia, Jervis Bay, Plantation Point (35°04'16.1" S, 150°41'48.8" E); Y. Metti, A. J. K. Millar; Feb 16, 2005; NSW1114926:YM212	COI-5P	This study
<i>Laurencia decussata</i>	OM328125	Australia, Jervis Bay, Plantation Point (35°04'16.1" S, 150°41'48.8" E); Y. Metti, A. J. K. Millar; Feb 16, 2005; NSW1114926:YM212	rbcL	This study

Supplementary Table S1. Continued

Species	Accession No.	Location and collecting data	Marker	Reference
<i>Laurencia decussata</i>	OM328145	Australia, NSW, Emerald Beach (30°10'18.3" S, 153°11'25.8" E); Y. Metti; Jul 25, 2004; NSW1114915:YM047	COI-5P	This study
<i>Laurencia decussata</i>	OM328119	Australia, NSW, Emerald Beach (30°10'18.3" S, 153°11'25.8" E); Y. Metti; Jul 25, 2004; NSW1114915:YM047	rbcL	This study
<i>Laurencia decussata</i>	OM328146	Australia, NSW, Emerald Beach (30°10'18.3"S, 153°11'25.8" E); Y. Metti; Jul 25, 2004; NSW1114916:YM049	COI-5P	This study
<i>Laurencia decussata</i>	OM328118	Australia, NSW, Emerald Beach (30°10'18.3"S, 153°11'25.8"E); Y. Metti; Jul 25, 2004; NSW1114916:YM049	rbcL	This study
<i>Laurencia decussata</i>	OM328156	Australia, NSW, Arrawarra Headland (30°03'32.3" S, 153°12'19.4" E); Y. Metti; Jul 28, 2004; NSW857588:YM069	COI-5P	This study
<i>Laurencia decussata</i>	OM328147	Australia, NSW, Arrawarra Headland (30°03'32.3" S, 153°12'19.4" E); Y. Metti; Jul 28, 2004; NSW1114918:YM070	COI-5P	This study
<i>Laurencia decussata</i>	OM328120	Australia, NSW, Arrawarra Headland (30°03'32.3" S, 153°12'19.4" E); Y. Metti; Jul 28, 2004; NSW1114918:YM070	rbcL	This study
<i>Laurencia decussata</i>	OM328126	Australia, Queensland, North Stradbroke Island, Adder Rock Beach (27°25'15.9" S, 153°30'54.8" E); Y. Metti; Oct 7, 2018; NSW1114934:YM779	rbcL	This study
<i>Laurencia dendroidea</i> J. Agardh	EF686000	Spain, Puerto Cruz Tenerife-Islas Canarias; Gil-Rodríguez, M. T. Fujii, A. Sentíes; Jul 13, 2006; TFC Phyc. N# 13131	rbcL	Cassano et al. (2012a, 2012b)
<i>Laurencia dendroidea</i>	GU330222	Brazil, Prainha, Arraial do Cabo, Rio de Janeiro; V. Cassano; 2005; SP399.900	rbcL	Cassano et al. (2012a, 2012b)
<i>Laurencia dendroidea</i>	GU330230	Brazil, Praia do Forno, Armacao dos Buzios, Rio de Janeiro; A. Oliveira; 2008; SP399.790	rbcL	Cassano et al. (2012a, 2012b)
<i>Laurencia dendroidea</i>	KF492725	Spain, Canary Islands, La Gomera, Punta de La Dama; Eva Aylagas, M. Machín-Sánchez; Sep 21, 2009; MMS0183	COI-5P	Machín-Sánchez et al. (2014)
<i>Laurencia dendroidea</i>	MT822857	Australia, Norfolk Island, Little Organ, subtidal; Y. Metti, A. Millar; Mar 18, 2005; NSW879477 (YM288)	COI-5P	Metti 2017
<i>Laurencia dendroidea</i>	MT822858	Australia, NSW, Arrawarra Headland; Y. Metti; Jul 28, 2004; NSW879475 (YM075)	COI-5P	Serio et al. (2020)
<i>Laurencia elegans</i> A. H. S. Lucas	OM328155	Australia, Lord Howe Island; Y. Metti, A. Millar; Oct 26, 2005; YM340	COI-5P	Metti (2017)
<i>Laurencia filiformis</i> (C. Agardh) Montagne	MH704449	Western Australia, Geraldton, Tarcoola Beach; M. H. Hommersand, F. H. Hommersand; Sep 21, 1995	rbcL	Cassano et al. (2019)
<i>Laurencia flexuosa</i> Kutz	AF465815	South Africa, Palm Beach, Kwa-Zulu-Natal; S. Fredericq; Feb 7, 2001; LAF#:7.2.01.1.19, L44	rbcL	Fujii et al. (2006)
<i>Laurencia heteroclada</i> Harvey	OM328137 OM328153	Australia, Western Australia, Rottnest Island; J. Eu; Nov 15, 2008; NSW1114935:JE04	rbcL COI-5P	This Study
<i>Laurencia intricata</i> Lamouroux	AF465809	Mexico, Yucatan, Champoton, Campeche Bay; C. F. Gurgel; Feb 14, 1999; LAF#:L45	rbcL	Fujii et al. (2006)
<i>Laurencia mutueae</i> Sentíes, Cassano & Dreckman	MK159177	Mexico, Guerrero, Acapulco, Isla la Roqueta (16°49'35" N, 99°54'18" W); A. Sentíes, K. M. Dreckmann; Jun 7, 2017; holotype UAMIZ 1325	rbcL	Sentíes et al. (2019)
<i>Laurencia natalensis</i> Kylin	AF465816	South Africa, Palm Beach, Kwa-Zulu-Natal; S. Fredericq; Feb 7, 2001; LAF#:7.2.01.1.20, L49	rbcL	Fujii et al. (2006)
<i>Laurencia natalensis</i>	MH388715	Venezuela, Falcon, Cabo San Roman; G. Garcia-Soto; Oct 6, 2012; UA1133	COI-5P	Garcia-Soto and Lopez-Bautista (2018)
<i>Laurencia nidifica</i> J. Agardh	HQ422750	USA, Hawaii, Oahu, Laie; A. Kurihara; Apr 8, 2007; #02526	COI-5P	Sherwood et al. (2010)

Supplementary Table S1. Continued

Species	Accession No.	Location and collecting data	Marker	Reference
<i>Laurencia nipponica</i> Yamada	GU223874	Russia, Sakhalin Island, Tangi; T. Abe; Jun 23, 2003; Russia-C5	COI-5P	Kurihara et al. (2010)
<i>Laurencia obtusa</i> (Hudson) J. V. Lamouroux	AF281881	Ireland, Co. Donegal, Fanad Head (intertidal pool); Jul 6, 1998; #455	rbcL	Nam et al. (2000)
<i>Laurencia obtusa</i>	KX258828	France, Languedoc-Roussillon, Pyrenees-Orientales, Cap Beart, Banyuls-sur-Mer; L. Bittner; Jul 11, 2007; LBC0053	COI-5P	Rousseau et al. (2017)
<i>Laurencia pacifica</i> Kylin	HQ544189	USA; B. Clarkston, K. Hind, S. Toews; May 20, 2010; GWS022084	COI-5P	GenBank (http://www.ncbi.nlm.nih.gov)
<i>Laurencia pyramidalis</i> Bory ex Kützing	KF492756	Spain, Canary Islands, Fuerteventura, Garcey; M. Machín-Sánchez; Sep 10, 2012, MMS0154	COI-5P	Machín-Sánchez et al. (2014)
<i>Laurencia saitoi</i> Perestenko	KM254876	USA, California, McAbee Beach, Monterey; B. Clarkston, K. Hind, S. Toews; May 21, 2010; GWS022248	COI-5P	Saunders (2014)
<i>Laurencia venusta</i> Yamada	KY120346	Australia, Lord Howe Island; Y. Metti, A. Millar; Oct 28, 2005; YM380	rbcL	Metti et al. (2015)
<i>Laurencia viridis</i> Gil-Rodríguez & Haroun	KF492760	Portugal, Azores, Santa Maria, Boca de ribeira seca; M. T. Fujii, A. Neto, J. Pombo, M. Machín-Sánchez; Jul 2, 2011; MMS0038	COI-5P	Machín-Sánchez et al. (2014)
<i>Laurenciella yamadana</i> M. A. Howe	GQ252550	USA, Hawaii, Maui, Kihei; Apr 5, 2006; AC193	rbcL	Carlile (2009)
<i>Laurenciella marilzae</i> (Gil-Rodríguez, Sentíes, Díaz-Larrea, Cassano & M. T. Fujii) Gil-Rodríguez, Sentíes, Díaz-Larrea, Cassano & M. T. Fujii	GU938189	Brazil, Laje de Santos Marine State Park, Parcel do Sul, Sao Paulo; R. Rocha-Jorge; 2007; SP399814	rbcL	Rocha-Jorge et al. (2010)
<i>Laurenciella marilzae</i>	KF492769	Spain, Canary Islands, Tenerife, Punta del Hidalgo; M. C. Gil-Rodríguez, M. Machín-Sánchez; Jan 13, 2012; MMS0097	COI-5P	Machín-Sánchez et al. (2014)
<i>Laurenciella marilzae</i>	MT822847	Italy, Sicily, San Vito Lo Capo (TP); Jul 9, 2017; MCZ6	COI-5P	Serio et al. (2020)
<i>Laurenciella mayaimii</i> L. Collado-Vides, Cassano & M. T. Fujii	MG004176	USA, Florida, Biscayne Bay, Deering Estate; Aug 12, 2013; SPF58079	COI-5P	Collado-Vides et al. (2018)
<i>Laurenciella mayaimii</i>	MG004182	USA, Florida, Biscayne Bay, Deering Estate; Aug 12, 2013; SPF58079	rbcL	Collado-Vides et al. (2018)
<i>Laurenciella</i> sp.	MG004179	USA, Florida, Key Biscayne, Crandon Park; Aug 12, 2013; SPF57893	COI-5P	Collado-Vides et al. (2018)
<i>Laurenciella</i> sp.	MG004184	USA, Florida, Key Biscayne, Crandon Park; Aug 12, 2013; SPF57893	rbcL	Collado-Vides et al. (2018)
<i>Ohelopapa flexilis</i> (Setchell) F. Rousseau, Martin-Lescanne, Payri & L. LeGall	KX146187	French Polynesia, Tahiti, Tahara reef; A. Apham; Mar 24, 2007; 01A07	rbcL	Rousseau et al. (2017)
<i>Ohelopapa flexilis</i>	KX258830	French Polynesia, Tahiti, Tahara reef; A. Apham; Mar 24, 2007; 01A07	COI-5P	Rousseau et al. (2017)
<i>Osmundea hybrida</i> (A. P. deCandolle) K. W. Nam	KX258831	France, Brittany, Finistere, Roscoff; F. Rousseau; May 12, 2002; JML0051	COI-5P	Rousseau et al. (2017)
<i>Osmundea osmunda</i> (S. G. Gmelin) K. W. Nam & Maggs	AF281877	Ireland, Co. Donegal, St. John's Point; Oct 12, 1999; #1038	rbcL	Nam et al. (2000)
<i>Osmundea osmunda</i>	FJ785318	France, Roscoff, Brittany; F. Rousseau; Dec 5, 2002; PC0146009 (JML0049)	rbcL	Martin-Lescanne et al. (2010)
<i>Osmundea osmunda</i>	KJ960860	France, Brittany, Le Loup; L. Couceiro, M. Robuchon; Aug 30, 2011; RMAR2969	COI-5P	GenBank (http://www.ncbi.nlm.nih.gov)
<i>Osmundea osmunda</i>	KX258832	France, Brittany, Finistere, Roscoff; F. Rousseau; May 12, 2002; JML0049	COI-5P	Rousseau et al. (2017)
<i>Osmundea pinnatifida</i> (Hudson) Stackhouse	JX828140	Ireland, Galway, Black Head; H. -G. Choi, M. D. Guiry; Jan 6, 2003; ch528	rbcL	Baárbara et al. (2013)

Supplementary Table S1. Continued

Species	Accession No.	Location and collecting data	Marker	Reference
<i>Osmundea pinnatifida</i>	KF492770	Portugal, Azores, Pico, Lajes do Pico-Fabrica da Baleia; E. Nogueira, V. Cassano, A. Senties; Jun 29, 2011; MMS0030	COI-5P	Machín-Sánchez et al. (2014)
<i>Osmundea silvae</i> M. Machín-Sánchez & M. C. Gil-Rodríguez	KU566561	Portugal, Madeira, Madeira, Porto da Cruz; M. T. Fujii, A. Neto, H. Encarnacao, M. Machín-Sánchez; Jul 6, 2011; MMS0060	rbcL	Machín-Sánchez et al. (2016)
<i>Osmundea sinicola</i> (Setchell & N. L. Gardner) K. W. Nam	AY588407	USA, California, Orange Co., Crescent Beach; S. Murray; May 28, 2002; LAF#:680	rbcL	Fujii et al. (2006)
<i>Osmundea spectabilis</i> (Postels & Ruprecht) K. W. Nam	GQ252562	USA, Washington, Clallam County; A. L. Carlile, J. R. Waaland; Aug 28, 2004; AC163	rbcL	GenBank (http://www.ncbi.nlm.nih.gov)
<i>Osmundea splendens</i> (Hollenberg) K. W. Nam	KM254322	USA, California, Santa Cruz (Four Mile); B. Clarkston, K. Hind, S. Toews; May 19, 2010; GWS021984	COI-5P	Saunders (2014)
<i>Palisada cervicornis</i> (Harvey) Collado-Vides, Cassano & M. T. Fujii	MG020476	USA; Alain Duran; Aug 14, 2013; FTG:167768	rbcL	Collado-Vides et al. (2017)
<i>Palisada corallopis</i> (Montagne) Senties, M. T. Fujii & Díaz-Larrea	MG020477	USA; L. Collado-Vides, A. Duran, M. T. Fujii, V. Cassano, J. Díaz-Larrea; Aug 12, 2013; FTG:167918	rbcL	Collado-Vides et al. (2017)
<i>Palisada cruciata</i> (Harvey) K. W. Nam	OM328154	Australia, NSW, Sydney, La Perouse, Bare Island; Y. Metti, A. Millar, Aug 29, 2004; NSW1115023:YM085	COI-5P	This study
<i>Palisada cf. cruciata</i>	JF785319	New Caledonia, Ile des Pins; C. Payri; Dec 4, 2005; IRD127	rbcL	Martin-Lescanne et al. (2010)
<i>Palisada crustiformans</i> (K. J. McDermid) A. R. Sherwood, A. Kurihara, K. W. Nam	KX258841	USA, Hawaii, Oahu, Makapuu; A. Kurihara; May 26, 2007; ARS3327	COI-5P	Rousseau et al. (2017)
<i>Palisada cf. robusta</i> K. W. Nam	FJ785321	Lifou, New Caledonia; C. Payri; Mar 23, 2005; IRD92	rbcL	Martin-Lescanne et al. (2010)
<i>Palisada cf. perforata</i> (Bory) K. W. Nam	FJ785320	Lifou, New Caledonia; C. Payri; Mar 23, 2005; IRD93	rbcL	Martin-Lescanne et al. (2010)
<i>Palisada flagellifera</i> (J. Agardh) K. W. Nam	KF492772	Spain, Canary Islands, Tenerife, Punta del Hidalgo; M. C. Gil-Rodríguez, M. Machín-Sánchez; Jan 13, 2012; MMS0095	COI-5P	Machín-Sánchez et al. (2014)
<i>Palisada flagellifera</i>	GU330227	Brazil, Praia do Cemiterio, Rio das Ostras, Rio de Janeiro; V. Cassano; 2005; SP399.941.	rbcL	Cassano et al. (2012a, 2012b)
<i>Palisada papillosa</i> (C. Agardh) K. W. Nam	EU256325	Spain, Canary Islands, Tenerife, Playa Paraiso; M. C. Gil-Rodríguez, A. Senties, G. & M. T. Fujii; Jul 14, 2006; TFC Phyc 13134	rbcL	Cassano et al. (2009)
<i>Palisada perforata</i> (Bory) K. W. Nam	KF492773	Spain, Canary Islands, Tenerife, Punta del Hidalgo; M. C. Gil-Rodríguez, M. Machín-Sánchez; Jan 13, 2012; MMS0093	COI-5P	Machín-Sánchez et al. (2014)
<i>Palisada rigida</i> (J. Agardh) Metti	OM328132	Australia, Queensland, Redcliffe (27°13'59.7" S, 153°07'03.7" E); A. Millar, P. Ogilvie; May 30, 2013; NSW1114936:Q009	rbcL	This study
<i>Palisada rigida</i>	OM328131	Australia, Queensland, Redcliffe (27°13'59.7" S, 153°07'03.7" E); A. Millar, P. Ogilvie; May 30, 2013; NSW1114937:Q014	rbcL	This study
<i>Palisada rigida</i>	OM328130	Australia, Queensland, Caloundra, Shelly Beach headlands (26°48'02.0" S, 153°08'59.8" E); Y. Metti; May 21, 2014; NSW1114938:Q038	rbcL	This study
<i>Palisada rigida</i>	OM328138	Australia, Jervis Bay, Plantation Point (35°04'16.1" S, 150°41'48.8" E); Y. Metti; Feb 16, 2005; NSW1114925:YM208	COI-5P	This study
<i>Palisada rigida</i>	OM328128	Australia, Jervis Bay, Plantation Point (35°04'16.1" S, 150°41'48.8" E); Y. Metti; Feb 16, 2005; NSW1114925:YM208	rbcL	This study
<i>Palisada rigida</i>	OM328139	Australia, Jervis Bay, Plantation Point (35°04'16.1" S, 150°41'48.8" E); Y. Metti; Feb 16, 2005; NSW1114927:YM219	COI-5P	This study
<i>Palisada rigida</i>	OM328129	Australia, Jervis Bay, Plantation Point (35°04'16.1" S, 150°41'48.8" E); Y. Metti; Feb 16, 2005; NSW1114927:YM219	rbcL	This study

Supplementary Table S1. Continued

Species	Accession No.	Location and collecting data	Marker	Reference
<i>Palisada rigida</i>	OM328143	Australia, Norfolk Island, Kingston Lagoon, Slaughter Bay (29°03'32.5" S, 167°57'27.7" E); Y. Metti, A. J. K. Millar; Mar 15, 2005; NSW1114928:YM230	COI-5P	This study
<i>Palisada rigida</i>	OM328144	Australia, Norfolk Island, Kingston Lagoon, Slaughter Bay (29°03'32.5" S, 167°57'27.7" E); Y. Metti, A. J. K. Millar; Mar 15, 2005; NSW1114929:YM234	COI-5P	This study
<i>Palisada rigida</i>	OM328133	Australia, Norfolk Island, Kingston Lagoon, Slaughter Bay (29°03'32.5" S, 167°57'27.7" E); Y. Metti, A. J. K. Millar; Mar 15, 2005; NSW1114929:YM234	rbcL	This study
<i>Palisada rigida</i>	OM328140	Australia, NSW, Batehaven, Observation Point (35°43'47.9" S, 150°12'24.1" E); Y. Metti; May 30, 2005; NSW1114930:YM315	COI-5P	This study
<i>Palisada rigida</i>	OM328134	Australia, NSW, Batehaven, Observation Point (35°43'47.9" S, 150°12'24.1" E); Y. Metti; May 30, 2005; NSW1114930:YM315	rbcL	This study
<i>Palisada rigida</i>	OM328141	Australia, NSW, Botany Bay, Kurnell (34°00'27.2" S, 151°12'24.9" E); Y. Metti, A. J. K. Millar; Nov 17, 2005; NSW1114931:YM385	COI-5P	This study
<i>Palisada rigida</i>	OM328136	Australia, NSW, Botany Bay, Kurnell (34°00'27.2" S, 151°12'24.9" E); Y. Metti, A. J. K. Millar; Nov 17, 2005; NSW1114931:YM385	rbcL	This study
<i>Palisada rigida</i>	OM328142	Australia, NSW, Lake Macquarie (33°05'35.3" S, 151°33'36.4" E); Y. Metti; Feb 4, 2007; NSW1114932:YM394	COI-5P	This study
<i>Palisada rigida</i>	OM328135	Australia, NSW, Lake Macquarie (33°05'35.3" S, 151°33'36.4" E); Y. Metti; Feb 4, 2007; NSW1114932:YM394	rbcL	This study
<i>Palisada rigida</i>	OM328127	Australia, NSW, Tuggerah Lakes, Budgewoi, Lake Munmorah (33°13'16.1" S, 151°33'19.4" E); Y. Metti, S. Skinner; Sep 30, 2016; NSW1114936:Q009	rbcL	This study
<i>Palisada</i> sp.	KX146190	USA, Hawaii, Oahu, Makapuu; A. Kurihara; Dec 26, 2009; ARS02061	rbcL	Rousseau et al. (2017)
<i>Palisada</i> sp.	KX146194	New Caledonia, Ilot Bayes; C. Payri; Jan 1, 2001; JML0221	rbcL	Rousseau et al. (2017)
<i>Palisada</i> sp.	KX258834	USA, Hawaii, Oahu, Makapuu; A. Kurihara; Dec 26, 2009; ARS02061	COI-5P	Rousseau et al. (2017)
<i>Palisada</i> sp.	KX258835	New Caledonia, Isle of Pines; C. Payri; Jan 1, 2005; JML0231	COI-5P	Rousseau et al. (2017)
<i>Palisada</i> sp.	KX258838	New Caledonia, Isle of Pines; C. Payri; Dec 2, 2005; JML0228	COI-5P	Rousseau et al. (2017)
<i>Palisada yamadana</i> (M. A. Howe) K. W. Nam	HQ422794	USA, Hawaii; ARS03490	COI-5P	Sherwood et al. (2010)
<i>Rhodomela confervoides</i> (Hudson) P. C. Silva	KX146197	France, Brittany, Finistere, Roscoff; T. Silberfeld; Oct 19, 2008; TJS0210	rbcL	Rousseau et al. (2017)
<i>Spyridia hypnoides</i> (Bory) Papenfuss	U04025	USA, NC, New Hanover Co., Wrightsville Beach	rbcL	Freshwater et al. (1994)
<i>Yuzurua poiteaui</i> var <i>gemmaifera</i> (Harvey) M. J. Wynne	EF061650	Cuba, Rincon de Guanabo, La Havana; J. Díaz-Larrea, A. A. Mallea; 2005	rbcL	Díaz-Larrea et al. (2007)
<i>Yuzurua poiteaui</i> var <i>poiteaui</i> (J. V. Lamouroux) Martin-Lescanne	EF061653	Mexico, Playa del Carmen, Cancun, Yucatan; J. Díaz-Larrea, A. Sentíes; 2005	rbcL	Díaz-Larrea et al. (2007)
<i>Yuzurua</i> sp.	KX146198	Guadeloupe, Antilles, Caribbean, Chenal ilet Colas, Grand Cul-de-Sac Marin; F. Rousseau, Y. Buske, J. Espinosa, M. Snyder, G. Dirberg; May 3, 2012; FRA1041	rbcL	Rousseau et al. (2017)
<i>Yuzurua</i> sp.	KX258843	Guadeloupe, Antilles, Caribbean, Chenal ilet Colas, Grand Cul-de-Sac Marin; F. Rousseau, Y. Buske, J. Espinosa, M. Snyder, G. Dirberg; May 3, 2012; FRA1041	COI-5P	Rousseau et al. (2017)

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Supplementary Table S2. Comparison of morphological features between *Laurencia rigida*, *L. heteroclada f. decussata*, and three other morphologically similar taxa

Morphological features	<i>L. rigida</i>	<i>L. heteroclada f. decussata</i>	<i>L. heteroclada</i>	<i>L. arbuscula</i>	<i>L. botryoides</i>
Color	Dark red, brown, light green	Dark red, light orange/red, dark purple	Various shades of pink	Dark red-brown to red	Dark red to red-brown
Terete vs. compressed	Terete	Terete	Terete	Terete	Terete, somewhat compressed
Epidermal cell shape	Often palisade-like in cross section	Oblong X isodiametric to inversely triangular	Non-palisade	Isodiametric to slightly elongated	Isodiametric near apices, becoming lengthened below
Lenticular thickenings	None	Few	Sometimes - variable	None	None
Holdfast	Small, discoid, rarely stoloniferous	Densely tangled mass of stolons, multiple attachment sites	Discoid with accessory stoloniferous branches	Stoloniferous holdfast	Dense stoloniferous
Secondary pit connections	No	Yes	Yes	Yes	Yes
Branching shape	Ultimate branches very short compared to supporting branch; inserted at a wide angle into supporting branch	Ultimate branchlets form column, pressed close along supporting branch, multiple uprights developing from holdfast	Ultimate branches longer, not forming a column, lower branches are long, branching angles in general fairly narrow	Radial, irregular, abundant short lateral branches, often crowded and overlapping, pyramidal in outline, often widely spread, sometimes denuded below	Essentially complanate, laterals alternate, distichous, and botyoidal clusters of very short ramuli whether reproductive or not
Main axes width (mm)	0.7–1.2	~1.5	0.6–1.0	0.5–1.5	1.5–3
Epidermal cell projections	None	None or slightly at apices	None	None	?
<i>Corps en cerise</i>	None observed	One in surface and trichoblast cells	?	?	?
Tetrasporic plants	Fertile branchlets compound, almost corymbose, yet regularly arranged along supporting branch	Branchlets compound, numerous, densely grouped, pressed closely to supporting axis	Branches compound	Stichidial ramuli short, densely branched, often clustered in groups, becoming fastigiate	Stichidial branchlets compound, botyoidal clusters of very short wart-like single ramuli
Tetrasporangia alignment	Perpendicular	Parallel to main axes	Parallel to main axes	Parallel	Unclear
Sterile pericentral cells on tetrasporangial axis	One	Two	?	?	?
Carposporic plants	Cystocarps develop between branchlets close to apex, imbedded into supporting branch	Fertile branchlets single with one cystocarp each	?	Bearing cystocarps laterally on ramuli	Crowded cystocarps on the ramuli
Cystocarps	Widely ovate, with protruding ostiole	Ovate, circular no protruding ostiole	Ovate	Ovoid-conical, no or slight protruding ostiole	Globular, prominent ostiole
Distributions	Southern Queensland to Victoria, and Norfolk and Lord Howe Islands	Southern Queensland and NSW	Southern WA and Queensland	Southern WA to VIC and Northern TAS	SA, VIC, TAS and Flinders Is.
References	Yamada (1931), Saito's comments attached to type specimen (1972), this study	Cribb (1958), this study	Harvey (1855), Cribb (1958), Saito and Womersley (1974), Masuda (1997), Wynne et al. (2005)	Saito and Womersley (1974)	Saito and Womersley (1974)

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