

Supplementary Materials

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Supplementary Table S1. Voucher and GenBank accession information for sequences used in phylogenetic analyses in the current study

Species	Specimen vouchers	COI	<i>rbcL</i>	LSU
<i>Halopeltis adnata</i>	GWS018249; South Korea; Schneider et al. (2012)	JQ907538	JQ907552	JQ907563
<i>H. australis</i>	G0253; Western Australia; LeGall et al. (2008); Saunders and McDonald (2010)	HM033026	JQ858281	EU624152
	GWS002531; Western Australia; Saunders and McDonald (2010)	HM033028	-	-
<i>H. cuneata</i>	GWS001504; Tasmania; Saunders and McDonald (2010)	HM033031	-	HM033163
	GWS001521; Tasmania; Saunders and McDonald (2010)	HM033032	JQ858283	HM033164
<i>H. gracilis</i>	GWS002049; Lord Howe Island, Australia; Saunders and McDonald (2010)	HM033033	-	HM033165
	GWS002051; Lord Howe Island, Australia; Schneider et al. (2012)	HM915982	JQ907554	-
<i>H. nuahilihilia</i>	ARS 09898; Hawai'i Island, Hawai'i; this study	ON464701	ON464714	ON730776
	ARS 09912; 'Au'au Channel (W. Maui), Hawai'i; this study	ON464706	ON464720	ON689389
	ARS 10478; 'Au'au Channel (W. Maui), Hawai'i; this study	-	ON464724	-
	ARS 10479; Penguin Bank (W. Moloka'i), Hawai'i; this study	ON464709	ON464725	ON730777
<i>H. pellucida</i>	BDA0369; Bermuda; Schneider et al. (2012)	HQ933375	JQ907555	JQ907565
<i>H. prostrata</i>	GWS001592; Australia; Saunders and McDonald (2010)	HM033044	JQ858280	HM033166
<i>Halopeltis</i> sp.1 LH	GWS002041; Australia; Ballantine et al. (2007)	EF101938	-	DQ343678
<i>Halopeltis</i> sp.1 LH	GWS023017; Lord Howe Island, Australia; Schneider et al. (2012)	JQ907542	JQ907556	-
<i>Halopeltis</i> sp.1 SA	GWS008826; South Africa; Schneider et al. (2012)	HM918824	JQ907549	JQ907562
<i>Halopeltis</i> sp.1 Tas	GWS024940; Western Australia; Schneider et al. (2012)	JQ907543	JQ907557	-
<i>Halopeltis</i> sp.1 Tas	GWS002596; Tasmania; Saunders and McDonald (2010)	HM033050	-	HM033167
<i>Halopeltis</i> sp.1 WA	G0402; Western Australia; Ballantine et al. (2007)	EF101939	-	DQ343679
<i>Halopeltis</i> sp.2 LH	GWS002061; Lord Howe Is., Australia; Saunders and McDonald (2010)	HM033051	-	HM033168
<i>Halopeltis</i> sp.2 LH	GWS022825 Lord Howe Is., Australia; Schneider et al. (2012)	JQ907544	JQ907558	-
<i>H. tanakae</i>	TNS:AL 209873; Japan; Suzuki and Terada (2021)	LC605134	LC605128	LC605141
	TNS:AL 209875; Japan; Suzuki and Terada (2021)	LC605135	-	LC605129
<i>H. verrucosa</i>	GWS001501; Tasmania; Saunders and McDonald (2010)	HM033062	-	HM033169
	GWS001912; Tasmania; Schneider et al. (2012)	-	JQ858282	-
	GWS002532; Australia; Saunders and McDonald (2010)	-	-	HM033170
<i>H. willisii</i>	GWS011431; North Carolina, USA; Schneider et al. (2012)	HM915686	JQ907553	JQ907564
<i>Leptofauchea chiloensis</i>	GWS000503; Chile; Filloramo and Saunders (2015)	-	KR140338	DQ873285
<i>L. cocosana</i>	GWS037755; Australia; Filloramo and Saunders (2015)	KR140330	KR140340	KR140334
<i>L. coralligena</i>	ODC1501; Spain; Rodríguez-Prieto and de Clerck (2009)	-	-	EU418774
<i>L. earleae</i>	LAF26-5-00-1-1; Louisiana, USA; Gavio and Fredericq (2005)	-	HQ400570	-
<i>L. huawelau</i>	ARS 09895; Penguin Bank, Hawai'i; this study	-	ON464726	ON689381
	ARS 09896; Penguin Bank, Hawai'i; this study	ON376332	ON464712	ON730775
	ARS 09900; Penguin Bank, Hawai'i; this study	ON464702	ON376333	ON689384
	ARS 09905; Penguin Bank, Hawai'i; this study	ON464703	ON464716	-
	ARS 09907; Penguin Bank, Hawai'i; this study	ON464704	ON464717	ON689386
	ARS 09909; Penguin Bank, Hawai'i; this study	ON464705	ON464719	ON689388
	ARS 10228; Penguin Bank, Hawai'i; this study	ON464708	ON464723	ON689391
<i>L. leptophylla</i>	GWS018362; South Korea; Filloramo and Saunders (2015)	KR140329	KR140339	KR140333
	GWS018540; South Korea; Filloramo and Saunders (2015)	KR140327	KR140336	-
<i>L. lucida</i>	ARS 09891; Penguin Bank, Hawai'i; this study	-	ON464710	ON689379
	ARS 09892; Penguin Bank, Hawai'i; this study	-	ON464711	ON689380
	ARS 09901; Penguin Bank, Hawai'i; this study	-	ON464715	ON689385
	ARS 09908; Penguin Bank, Hawai'i; this study	-	ON464718	ON689387
	ARS 10068; Penguin Bank, Hawai'i; this study	-	ON464722	-
<i>L. lucida</i>	G0400; Western Australia; Filloramo and Saunders (2015)	HM915831	KR085194	DQ873287
<i>L. munseomica</i>	GWS018532; South Korea; Filloramo and Saunders (2015)	HQ544094	KR140337	KR140331
<i>L. nitophylloides</i>	GWS032631; Australia; Filloramo and Saunders (2015)	KR085173	KR085190	KR085179
<i>L. pacifica</i>	GWS010140; British Columbia, Canada; Filloramo and Saunders (2015)	HM916176	KR085195	-
<i>L. pacifica</i>	JD032; British Columbia, Canada; Saunders (2005)	AY970566	-	DQ873286
<i>Leptofauchea</i> sp. 2	ARS 09897; Hawai'i Island, Hawai'i; this study	ON464700	ON464713	ON689382
<i>Leptofauchea</i> sp. 1	ARS 09899; Penguin Bank, Hawai'i; this study	-	-	ON689383
<i>Leptofauchea</i> sp. 3	ARS 10013; Manawai, Hawai'i; this study	ON464707	ON464721	ON689390

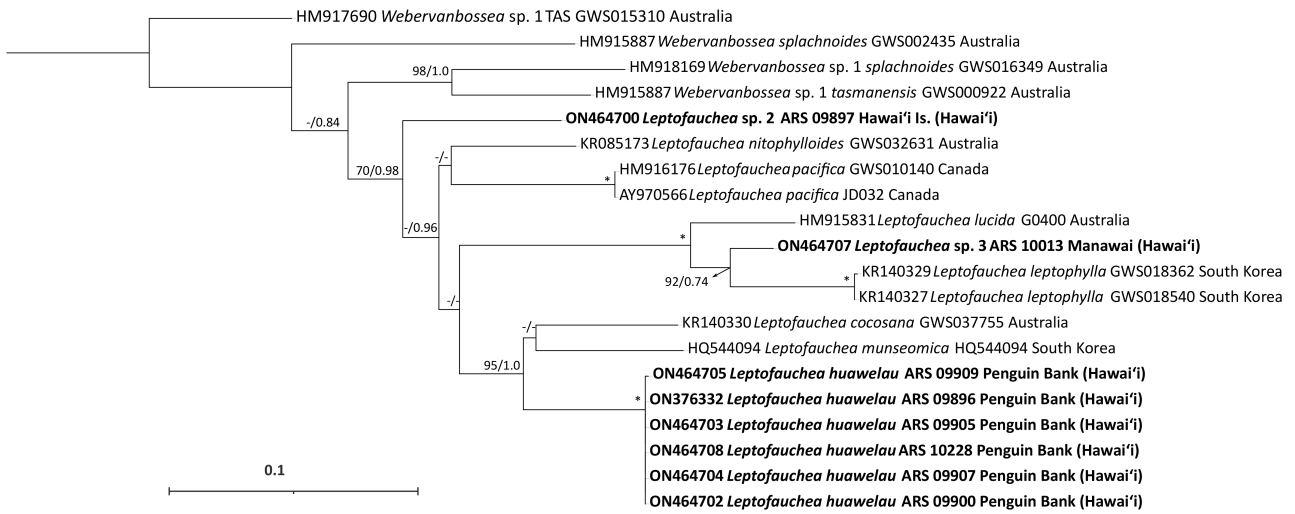
Supplementary Table S1. Continued

Species	Specimen vouchers	COI	<i>rbcL</i>	LSU
Outgroups				
<i>Cephalocystis furcellata</i>	GWS000958; Australia; Schneider et al. (2012) G0133; LeGall and Saunders (2007)	JQ907535	JQ907550	- EF033621
<i>Halichrysis concrescens</i>	GWS002090; Lord Howe Is., Australia; Ballantine et al. (2007) GWS022802; Lord Howe Is., Australia; Schneider et al. (2012)	-	-	DQ343672
<i>Halichrysis corallinarius</i>	6268BAL; Puerto Rico; Saunders (2005)	JQ907536	JQ907551	-
<i>Halichrysis micans</i>	GWS001065; Australia; Ballantine et al. (2007)	AY970628	JQ858279	DQ343674
<i>Irvinea ardreana</i>	ABMMC10568-10 COI and <i>rbcL</i> ; Portugal; Schneider et al. (2012); G0173 LSU (Withall and Saunders 2006)	EF101937	JQ858278	DQ343673
<i>Leptosomia rosea</i>	G0147; Australia; Schneider et al. (2012) G0384; Australia; Le Gall et al. (2008)	JQ907545	JQ907559	DQ343714
<i>Microphyllum robustum</i>	G0147; Australia; Schneider et al. (2012) G0384; Australia; Le Gall et al. (2008) GWS002047; Lord Howe Is., Australia; Saunders and McDonald (2010) GWS002057; Lord Howe Is., Australia; Saunders and McDonald (2010)	JQ907546	JQ907560	- EU624147
<i>Sparlingia pertusa</i>	GWS002047; Lord Howe Is., Australia; Saunders and McDonald (2010) GWS002057; Lord Howe Is., Australia; Saunders and McDonald (2010)	HM033071	JQ858277	-
<i>Sparlingia pertusa</i>	GWS000581; British Columbia, Canada; Filloramo and Saunders (2015) TNS:AL 164014; Japan; Suzuki and Terada (2021)	KU934267	JQ907561	DQ343677
<i>Webervanbossea</i> sp. 1 <i>splachnoides</i>	GWS016349; Tasmania; Filloramo and Saunders (2015)	LC605137	AB383123	LC605143
<i>Webervanbossea</i> sp. 1 TAS	GWS015310; Tasmania; Filloramo and Saunders (2015)	HM918169	KR085185	KR085175
<i>Webervanbossea</i> sp. 1 <i>tasmanensis</i>	GWS000922; Australia; Filloramo and Saunders (2015)	HM917690	KR085193	KR085182
<i>Webervanbossea splachnoides</i>	GWS002435; Australia; Filloramo and Saunders (2015)	HM915887	KR085196	KR085200
		HM916011	KR085186	DQ873288

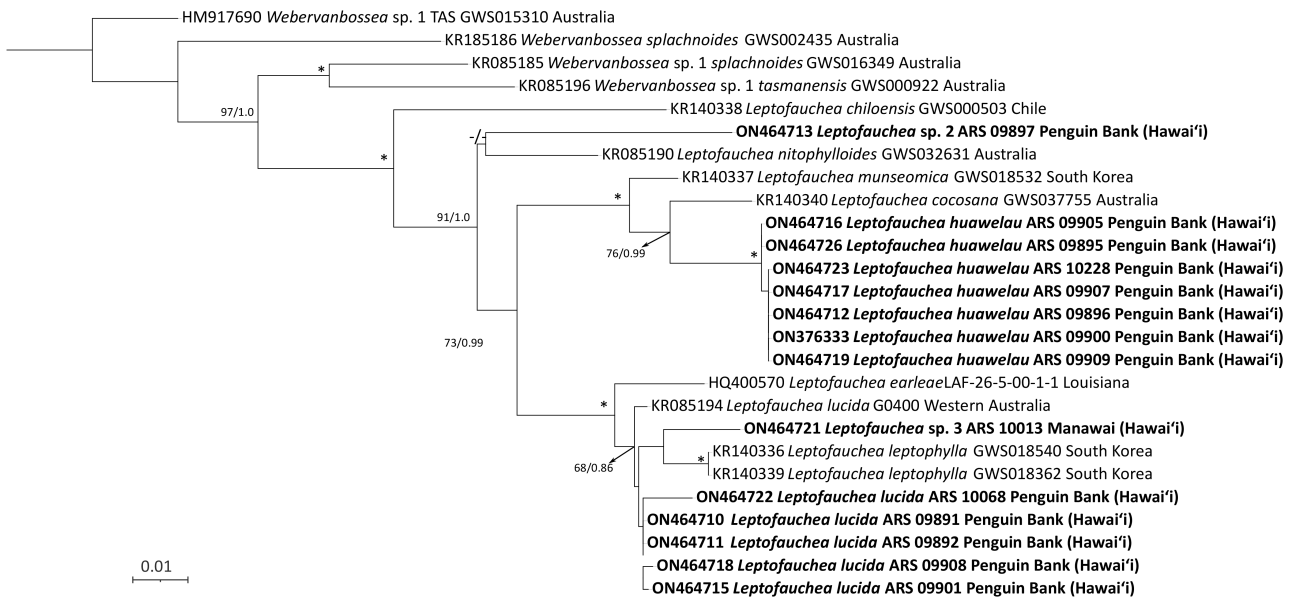
Specimens sequenced as part of this study are indicated in bold.

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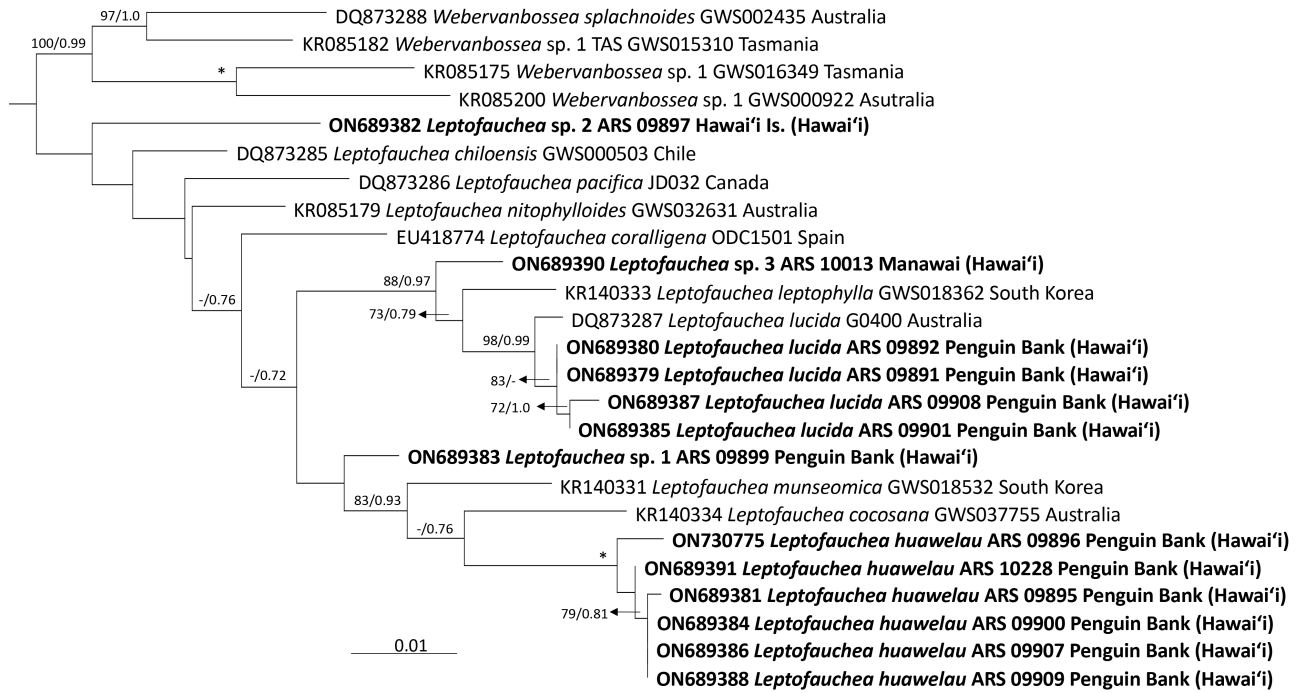
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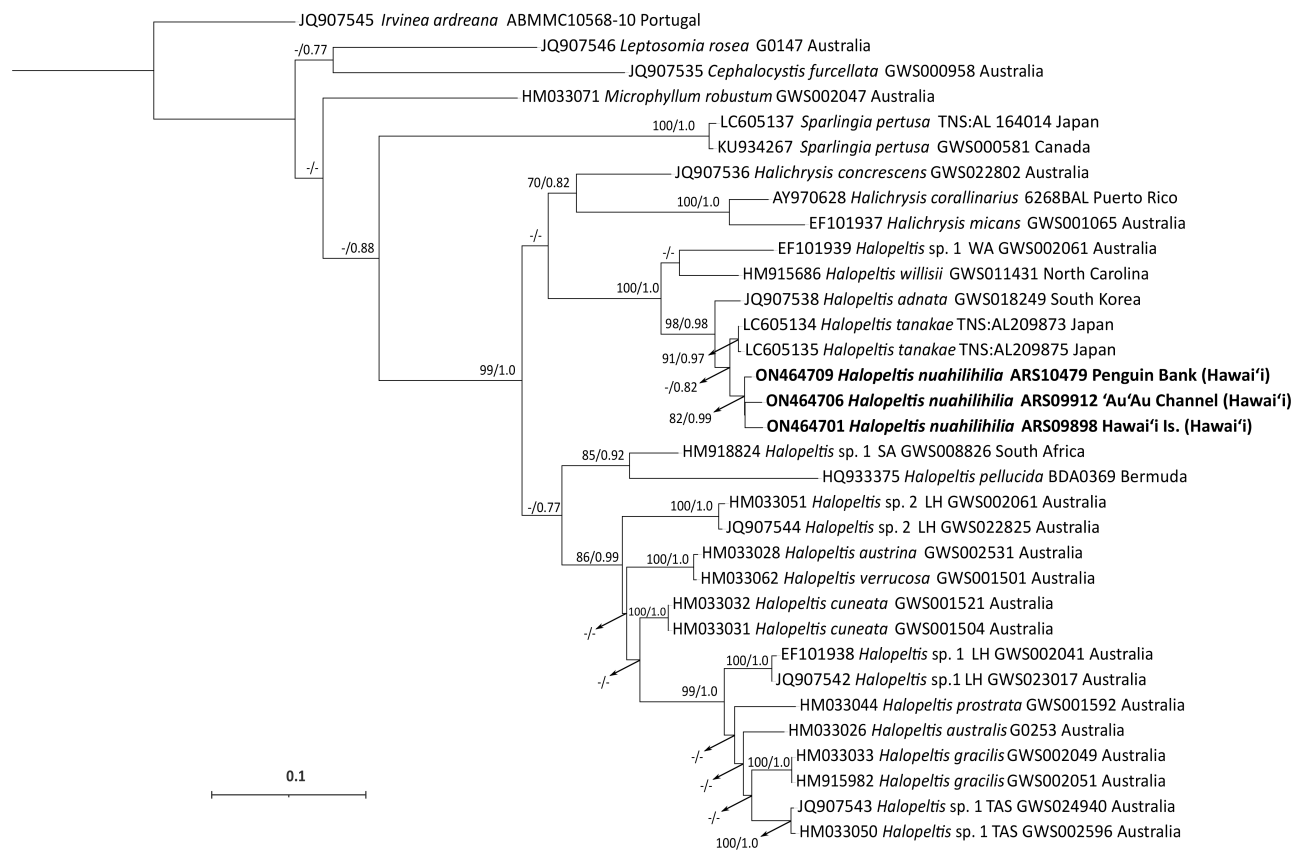
Supplementary Fig. S1. Phylogenetic tree of the genus *Leptofaucha* based on 5' end of the mitochondrial cytochrome c oxidase I sequences. Sequences generated in the current study are indicated in bold. Bayesian and maximum likelihood support values shown at the nodes, the first value represents the maximum likelihood bootstrap support (BP) value and the second is the Bayesian posterior probability (PP) support value. Full support is indicated with an asterisk (*) while support less than 70% BP / 0.70 PP is shown with a dash (-). Scale bar represents: substitutions per site.



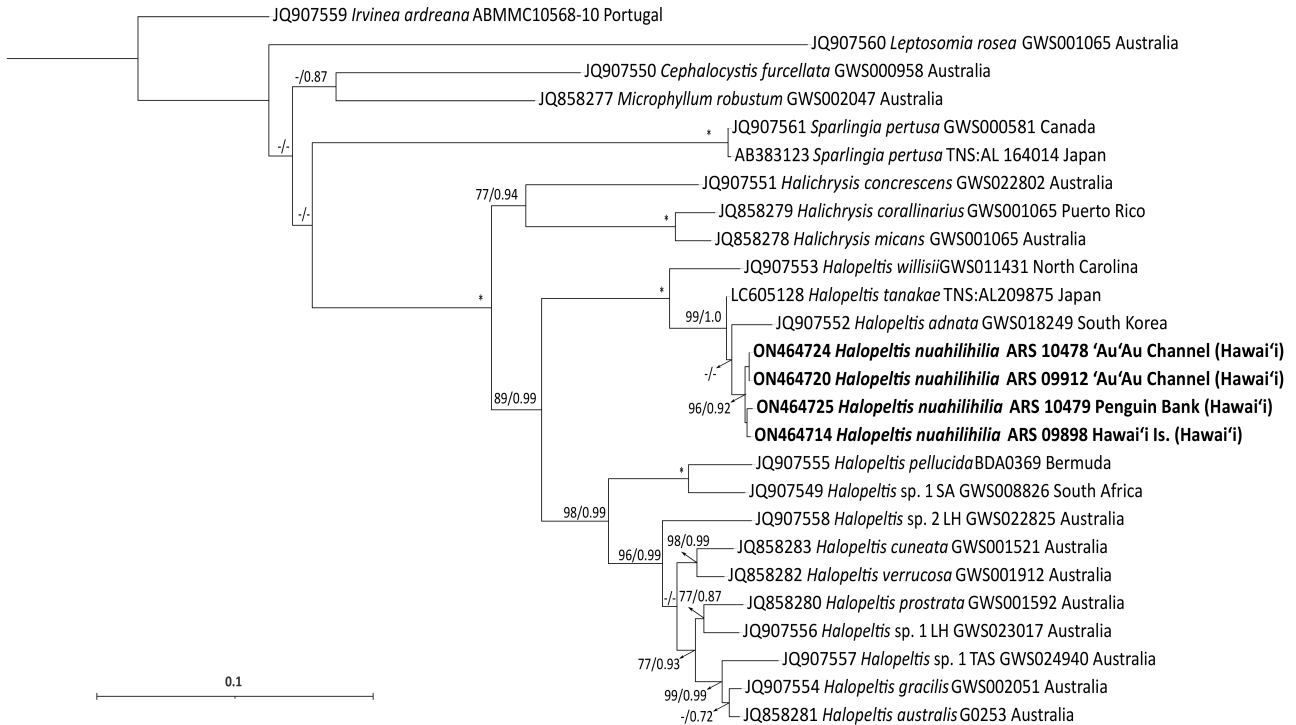
Supplementary Fig. S2. Phylogenetic tree of the genus *Leptofaucha* based on *rbcL* sequences. Sequences generated in the current study are indicated in bold. Bayesian and maximum likelihood support values shown at the nodes, the first value represents the maximum likelihood bootstrap support (BP) value and the second is the Bayesian posterior probability (PP) support value. Full support is indicated with an asterisk (*) while support less than 70% BP / 0.70 PP is shown with a dash (-). Scale bar represents: substitutions per site.



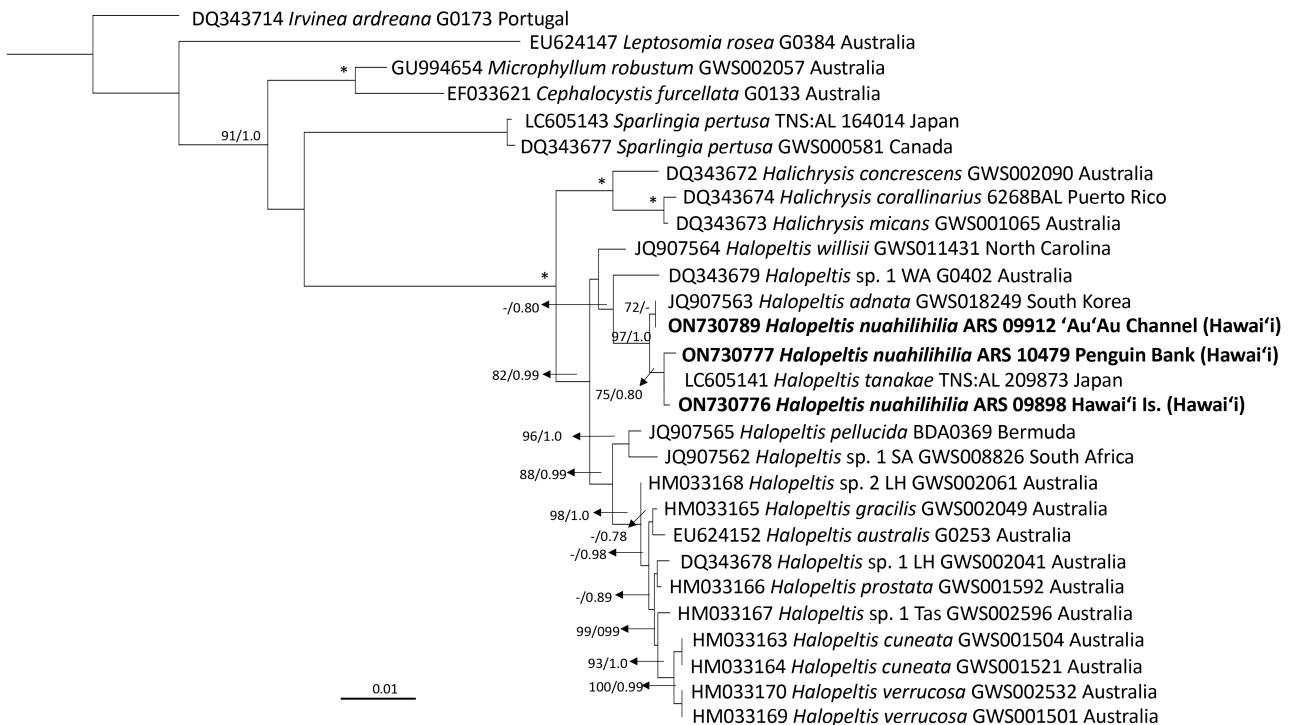
Supplementary Fig. S3. Phylogenetic tree of the genus *Leptofaucha* based on large subunit ribosomal DNA sequences. Sequences generated in the current study are indicated in bold. Bayesian and maximum likelihood support values shown at the nodes, the first value represents the maximum likelihood bootstrap support (BP) value and the second is the Bayesian posterior probability (PP) support value. Full support is indicated with an asterisk (*) while support less than 70% BP / 0.70 PP is shown with a dash (-). Scale bar represents: substitutions per site.



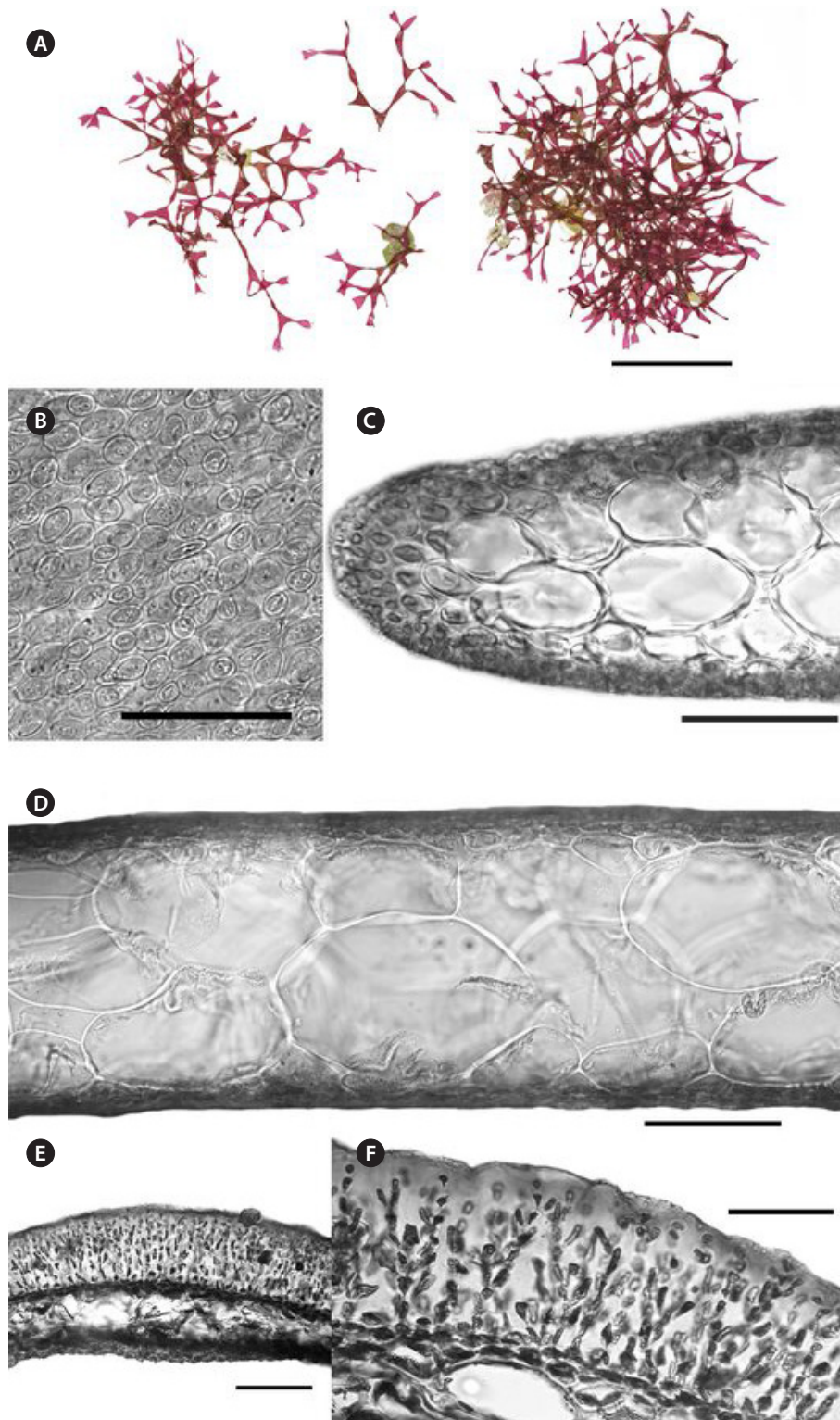
Supplementary Fig. S4. Phylogenetic tree of the genus *Halopeltis* based on 5' end of the mitochondrial cytochrome c oxidase I sequences. Sequences generated in the current study are indicated in bold. Bayesian and maximum likelihood support values shown at the nodes, the first value represents the maximum likelihood bootstrap support (BP) value and the second is the Bayesian posterior probability (PP) support value. Full support is indicated with an asterisk (*) while support less than 70% BP / 0.70 PP is shown with a dash (-). Scale bar represents: substitutions per site.



Supplementary Fig. S5. Phylogenetic tree of the genus *Halopeltis* based on *rbcL* sequences. Sequences generated in the current study are indicated in bold. Bayesian and maximum likelihood support values shown at the nodes, the first value represents the maximum likelihood bootstrap support (BP) value and the second is the Bayesian posterior probability (PP) support value. Full support is indicated with an asterisk (*) while support less than 70% BP / 0.70 PP is shown with a dash (-). Scale bar represents: substitutions per site.



Supplementary Fig. S6. Phylogenetic tree of the genus *Halopeltis* based on large subunit ribosomal DNA sequences. Sequences generated in the current study are indicated in bold. Bayesian and maximum likelihood support values shown at the nodes, the first value represents the maximum likelihood bootstrap support (BP) value and the second is the Bayesian posterior probability (PP) support value. Full support is indicated with an asterisk (*) while support less than 70% BP / 0.70 PP is shown with a dash (-). Scale bar represents: substitutions per site.



Supplementary Fig. S7. Morphology of *Leptofaucha lucida*. (A) Habit of multiple branches connected by anastomization, both images also have *Halimeda* present which is commonly found growing among this species *in situ* (BISH 785509, ARS 09892). (B) Surface view of the thallus. (C) Apical cross-section depicting the shape of medullary cells and the multilayered cortex (BISH 785509, ARS 09892). (D) Medial cross-section (BISH 785509, ARS 09892). (E) Tetrasporangial paraphyses growing from the thallus surface (BISH 785508, ARS 09891). (F) Close up of the tetrasporangial paraphyses growing from the thallus surface (BISH 785508, ARS 09891). Scale bars represent: A, 5 cm; B, C & F, 50 µm; D & E, 100 µm.