





# Supplementary Materials: Isolation, Characterization and Biotechnological Potentials of Thraustochytrids from Icelandic Waters

Magnús Örn Stefánsson <sup>1,2,\*</sup> , Sigurður Baldursson <sup>1,2†</sup>, Kristinn P. Magnússon <sup>1,3</sup> , Arnheiður Eyþórsdóttir <sup>1</sup>  and Hjörleifur Einarsson <sup>1</sup> 

## 1 Electronic Supplementary Material

2 Taxa and GenBank accession numbers of sequences, that were used in current study can be  
3 viewed in Table S1. The table also shows node numbers of reconstructed phylogenetic trees.

4 Location and material sampled for the isolation of thraustochytrid strains in Iceland are shown in  
5 Table S2.

6 The evolutionary history of selected Labyrinthulomycetes isolates as inferred on the basis of 18S  
7 rRNA gene sequence variation among strains is shown in Figure S1.

8 Detailed fatty acid profiles for all viable isolates of the 39 collected are show in Figure S2.

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## 10 References

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15 for polyunsaturated fatty acids production by *Thraustochytrium kinney* VAL-B1. *Int. J. Eng. Res. Afr.* **2017**,  
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- 17 3. Yokoyama, R.; Salleh, B.; Honda, D. Taxonomic rearrangement of the genus *Ulkenia* sensu lato based  
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19 Labyrinthulomycetes): emendation for *Ulkenia* and erection of *Botryochytrium*, *Parietichytrium*, and  
20 *Sicyoidochytrium* gen. nov. *Mycoscience* **2007**, *48*, 329–341. doi:10.1007/s10267-007-0377-1.

**Supplementary Table S1.** Taxa and accession numbers represented in this study and for which analyses corresponding sequences were used.

Taxon <sup>a</sup>	Accession number <sup>b</sup>	Node number <sup>c</sup>	
		E	L
Stramenopiles (heterokonts)			
Labyrinthulomycetes			
Thraustochytriaceae			
<i>Aplanochytrium kerguelense</i>	AB022103	35	52
<i>Aplanochytrium stocchini</i>	AJ519935	34	50
<i>Aurantiochytrium limacinum</i>	AB022107	17	25
<i>Aurantiochytrium mangrovei</i>	DQ367049	18	26
<i>Aurantiochytrium</i> sp. SEK 218	AB290573	20	27
<i>Botryochytrium radiatum</i>	AB022115	11	18
<i>Japonochytrium</i> sp. ATCC 28207	AB022104	15	23
labyrinthulid quahog parasite QPX	AY052644	28	46
<i>Labyrinthuloides minuta</i>	L27634	33	51
<i>Oblongichytrium</i> sp. SEK 347	AB290575	31	48
<i>Parietichytrium sarkarianum</i>	AB355411	10	20
<i>Schizochytrium aggregatum</i>	AB022106	7	15
<i>Schizochytrium minutum</i>	AB022108	30	47
<i>Sicyoidochytrium minutum</i>	AB355412	24	38
<i>Sicyoidochytrium</i> sp. SEK 675	AB973513		30
<i>Sicyoidochytrium</i> sp. SEK 676	AB973514		34
Thraustochytriidae sp. #32	DQ367052	21	29
Thraustochytriidae sp. Fng1	AY870336		37
Thraustochytriidae sp. H1-14	AB073305	9	19
Thraustochytriidae sp. MBIC11060	AB183653		32
Thraustochytriidae sp. MBIC11063	AB183654		31
Thraustochytriidae sp. MBIC11071	AB290585		35
Thraustochytriidae sp. MBIC11077	AB183659		40
Thraustochytriidae sp. MBIC11078	AB290582		36
Thraustochytriidae sp. N1-27	AB073308	19	28
Thraustochytriidae sp. NK40	KM233917		33
Thraustochytriidae sp. strain M12-X1	DQ459552	1	5
<i>Thraustochytrium</i> aff. <i>kinnei</i> BAFCCult 3485	HQ228962		11
<i>Thraustochytrium</i> aff. <i>kinnei</i> BAFCCult 3489	HQ228963		10
<i>Thraustochytrium</i> aff. <i>kinnei</i> BAFCCult 3490	HQ228964		12
<i>Thraustochytrium</i> aff. <i>kinnei</i> BAFCCult 3495	HQ228966		6
<i>Thraustochytrium</i> aff. <i>kinnei</i> BAFCCult 3497	HQ228967		7
<i>Thraustochytrium aggregatum</i>	AB022109	27	44
<i>Thraustochytrium aureum</i>	AB022110	8	16
<i>Thraustochytrium gaertnerium</i>	AY705753	6	14
<i>Thraustochytrium kinnei</i>	DQ367053	3	4
<i>Thraustochytrium kinnei</i>	KF460462		2

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Supplementary Table S1 *cont.*

Taxon <sup>a</sup>	Accession number <sup>b</sup>	Node number <sup>c</sup>	
		E	L
Stramenopiles (heterokonts)			
Labyrinthulomycetes			
Thraustochytriaceae			
<i>Thraustochytrium kinnei</i>	KF460466		1
<i>Thraustochytrium kinnei</i>	KF709393	4	9
<i>Thraustochytrium kinnei</i>	L34668		13
<i>Thraustochytrium multirudimentale</i>	AB022111	32	49
<i>Thraustochytrium pachydermum</i>	AB022113	29	45
<i>Thraustochytrium striatum</i>	AB022112	13	21
<i>Ulkenia profunda</i>	AB022114	12	17
<i>Ulkenia profunda</i>	L34054	14	22
<i>Ulkenia visurgensis</i>	AB022116	16	24
Labyrinthulaceae			
<i>Labyrinthula</i> sp. AN-1565	AB022105	38	54
<i>Labyrinthula</i> sp. f Sap 16-1	AF348522	36	53
<i>Labyrinthula</i> sp. L59	AB095092	37	55
Bacillariophyta (diatoms)			
<i>Bacillaria paxillifer</i>	M87325	40	58
<i>Phaeodactylum tricornutum</i>	GQ452861	41	57
<i>Thalassiosira pseudonana</i>	HM991698	39	56
Viridiplantae (plants)			
<i>Arabidopsis thaliana</i>	GQ380689	45	
<i>Chlamydomonas reinhardtii</i>	JX888472	42	
<i>Ostreococcus tauri</i>	GQ426346	43	
<i>Physcomitrella patens</i>	AF223015	44	
Rhodophyta (red algae)			
<i>Cyanidioschyzon merolae</i>	AF441376	46	
Fungi			
<i>Eremothecium gossypii</i>	AY046265	48	
<i>Neurospora crassa</i>	AY046271	47	
<i>Schizosaccharomyces pombe</i>	EU011742	49	
Metazoa (animals)			
<i>Mus musculus</i>	X00686	51	
<i>Placopecten magellanicus</i>	X53899	50	
<i>Xenopus laevis</i>	X04025	52	
Amoebozoa			
<i>Dictyostelium discoideum</i>	KJ394480	53	59

<sup>a</sup>Names of taxa are presented as they appear in GenBank

<sup>b</sup>GenBank accession numbers of 18S rRNA gene

<sup>c</sup>Leaf number of sequences used to reconstruct phylogenetic trees of E, Eukaryotes; L, Labyrinthulomycetes.

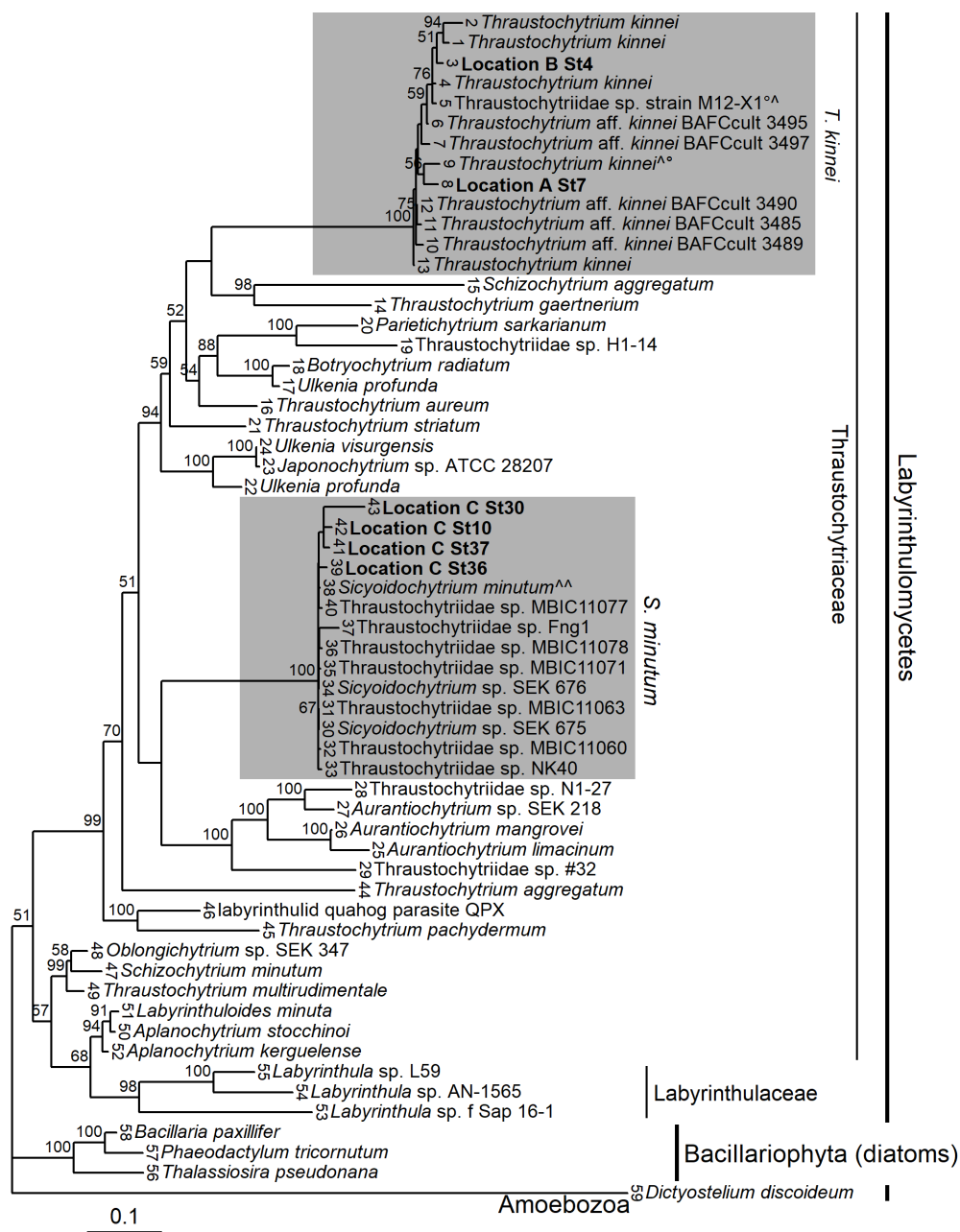
**Supplementary Table S2.** Locations (degrees decimal minutes) and materials sampled for the isolation of thraustochytrids in 2009 and 2010.

Location (symbol)	Lat	Lon	Material <sup>a</sup>	Isolate
Spákonufellshöfði, Skagaströnd (A)	65° 50.073' N	20° 18.954' W	SWD and SW	St1, St6, St7
Hveravík south of Drangsnæs (B)	65° 42.041' N	21° 33.804' W	SW	St2 – St5, St8, St9
Hverastrytur, Eyjafjörður (C)	65° 52.315' N	18° 13.579' W	Stones and SWD	St10 – St39 <sup>b</sup>

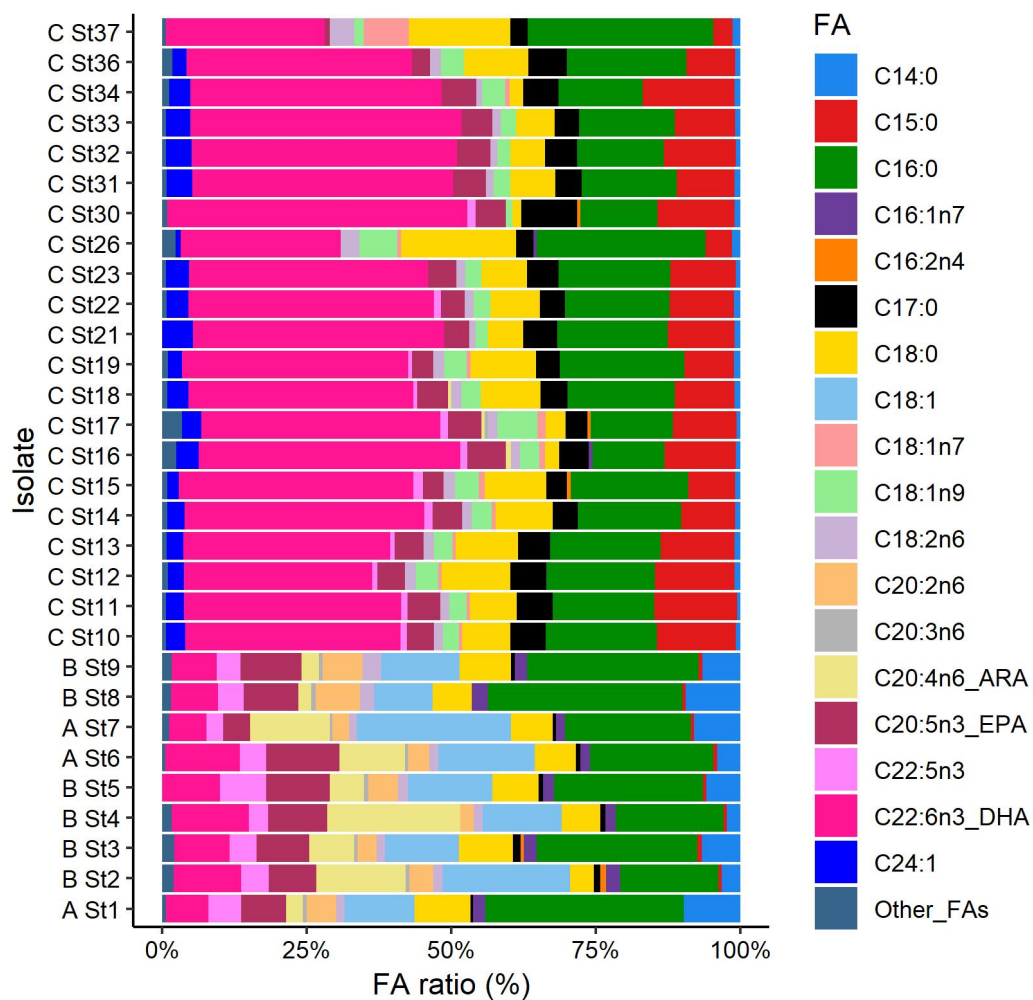
<sup>a</sup>SW, seawater; SWD, seaweed

<sup>b</sup>Isolates St20, St24, St25, St27 - St29, St35, St38, and St39 were not viable in culture subsequent to isolation

Further sampling effort was made at other locations around Iceland which did not result viable isolates. These are listed below. Skagaströnd: 65° 49.600' N, 20° 18.791' W, Sand and SW; By Hrafná Skagaströnd: 65° 49.078' N, 20° 18.636' W, SWD and SW; By Hólánæs Skagaströnd: 65° 49.342' N, 20° 18.517' W, SWD and SW; Reykjanes by Ísafjarðardjúp: 65° 55.633' N, 22° 25.300' W, SWD and SW; Grindavík: 63° 51.083' N, 22° 21.372' W, SWD and SW; Hafnir: 63° 56.395' N, 22° 37.883' W, SWD and SW; Húnaflói (3 samples): 65° 51.566' N, 20° 53.599' W, SW; Gjögur: 65° 58.902' N, 21° 20.71' W, SW; Djúpavík: 65° 57.930' N, 21° 32.92' W, SW; Sölvabakki: 65° 42.79' N, 20° 17.97' W, SW; Stapi: 65° 47.36' N, 20° 18.63' W, SW; Gjögur: 65° 58.902' N, 21° 20.71' W, SW; Djúpavík: 65° 57.93' N, 21° 32.92' W, SW; Stapi: 65° 47.36' N, 20° 18.63' W, SW; Sölvabakki: 65° 42.79' N, 20° 17.97' W, SW; By Hrafná: 65° 49.078' N, 20° 18.636' W, SW; Hallá: 65° 47.211' N, 20° 17.940' W, SW; Stapi: 65° 47.36' N, 20° 18.63' W, SW; Sölvabakki: 65° 42.79' N, 20° 17.97' W, SW; Laxárvík: 65° 43.67' N, 20° 16.323' W, SW; Hafurstaðaá: 65° 46.766' N, 20° 16.765' W, SW.



**Figure S1.** Maximum likelihood phylogenetic tree depicting relationships of Labyrinthulomycetes species (with amoeba as an outgroup) as inferred from partial 18S rRNA gene sequences. Names of taxa are presented as they appear in GenBank. Locations where newly isolated strains were collected are indicated in bold (location A, samples collected from sand and the sea off Skagastönd; B, Hveravík creek; and C, Eyjafjörður fjord). Shaded areas indicate clades where newly isolated strains cluster including related strains. The numbers at each internal branch show bootstrap values (1000 replicates); only values greater than 50% are shown. <sup>o^</sup> denotes *Thraustochytriidae* sp. strain M12-X1 [1]; <sup>^o</sup> *Thraustochytrium kinnei* strain VAL-B1 [2]; and <sup>^^</sup> *Sicyoidochytrium minutum* strain SEK 354 [3] see text for details. Scale bar shows substitutions/site.



**Figure S2.** Detailed fatty acid (FA) profile of all viable isolates of the ones originally collected off the coast of Iceland (capital letters denote location: A, Skagaströnd; B, Hveravík; and C, Eyjafjörður). Fatty acids constituting more than 1.5% of total ratio are shown. FAs are ordered according to chain length with arachidonic acid (ARA), eicosapentaenoic acid (EPA), and docosahexaenoic acid (DHA) named especially.