

New record and phylogenetic affinities of the oomycete *Olpidiopsis feldmanni* infecting *Asparagopsis* sp. (Rhodophyta)

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Supplement 1. Accession numbers used to build phylogenetic trees (Figs. 4 & 5 in the main text).

SSU rRNA

<i>Aphanomyces astaci</i>	XR_717099.1
<i>Aphanomyces invadans</i>	XR_608067.1
<i>Aquastella attenuata</i>	KF294792.1
<i>Eurychasma dicksonii</i> Eury96	AY032607.2
<i>Eurychasma dicksonii</i> Eury05	AB368176.1
<i>Eurychasma dicksonii</i> FI S63	FM202391.1
<i>Haliphthoros milfordensis</i> I	AB178868.1
<i>Haliphthoros milfordensis</i> II	AB284573.1
<i>Haliocitida</i> sp. NJM 0034	AB178865.1
<i>Haliphthoros</i> sp. NJM 0440	AB284580.1
<i>Haliphthoros</i> sp. NJM 0443	AB284579.1
<i>Halocrusticida baliensis</i>	AB284578.1
<i>Halocrusticida parasitica</i>	AB284576.1
<i>Halodaphnea panulirata</i>	AB284574.1
<i>Haptoglossa heterospora</i>	AB425199.1
<i>Haptoglossa zoospora</i> SZ02	AB425200.1
<i>Haptoglossa zoospora</i> Y11	AB425201.1
<i>Hyphochytrium catenoides</i> I	X80344.1
<i>Hyphochytrium catenoides</i> II	AF163294.1
<i>Leptolegnia caudata</i>	AJ238659.1
<i>Leptolegnia chapmanii</i>	AJ238661.1
<i>Olpidiopsis bostrychia</i>	AB363063.1
<i>Olpidiopsis feldmanni</i>	KM210530.1
<i>Olpidiopsis porphyrae</i>	AB287418.1
<i>Phytophthora cinnamomi</i>	JN635050.1
<i>Phytophthora infestans</i>	JN635251.1
<i>Phytophthora nicotianae</i>	JN635184.1
<i>Phytophthora parasitica</i>	XR_608068.1
<i>Phytophthora sojae</i>	JN635166.1
<i>Pythiopsis cymosa</i>	AJ238657.1
<i>Pythium adhaerens</i>	AY598619.2
<i>Pythium aphanidermatum</i>	AY598622.2
<i>Pythium insidiosum</i>	AY486144.1
<i>Pythium oligandrum</i>	AY598618.2
<i>Pythium porphyrae</i>	AY598673.2
<i>Rhizidiomyces apophysatus</i>	AF163295.1
<i>Saprolegnia ferax</i>	AJ238655.1
<i>Saprolegnia parasitica</i>	AB086899.1
Uncultured eukaryote clone D3P05B11	EF100276.1

Uncultured eukaryote clone D3P06D06	EF100297.1
Uncultured eukaryote clone KRL09E14	KC315837.1
Uncultured marine eukaryote clone BL010320.2	AY381206.1
Uncultured stramenopile clone H3S3Be44w <i>COII</i>	JQ781892.1
<i>Albugo candida</i>	ACJ09763.1
<i>Albugo laibachii</i>	ACS94750.1
<i>Aphanomyces euteiches</i>	AAF80234.1
<i>Apodachlya pirifera</i>	AAF80237.1
<i>Atkinsiella dubia</i>	AAK97845.1
<i>Eurychasma dicksonii</i> Eury05	BAG24489.1
<i>Eurychasma dicksonii</i> Eury96	BAG24490.1
<i>Haliphthoros milfordensis</i> ATCC 200320	AAK97838.1
<i>Haliphthoros milfordensis</i> NJM_0131	BAF47698.1
<i>Haliphthoros philippinensis</i>	AAK97840.1
<i>Haliocitida</i> sp. NJM 0034	BAF47697.1
<i>Halocrusticida okinawaensis</i>	AAK97839.1
<i>Haptoglossa heterospora</i> I	BAF57238.1
<i>Haptoglossa heterospora</i> II	BAF57239.1
<i>Haptoglossa</i> sp. NI01	BAF57243.1
<i>Haptoglossa</i> sp. SZ01	BAF57244.1
<i>Haptoglossa</i> sp. SZ03	BAH30233.1
<i>Haptoglossa</i> sp. TK01	BAF57242.1
<i>Haptoglossa</i> sp. UK	AJW72784
<i>Haptoglossa zoospora</i>	BAH30232.1
<i>Hyphochytrium catenoids</i>	AAF80243.1
<i>Lagenidium caudatum</i>	AAK97842.1
<i>Lagenidium giganteum</i>	AAF80239.1
<i>Lagenidium humanum</i>	AAK97843.1
<i>Lagenidium thermophilum</i>	AAK97837.1
<i>Leptomitus lacteus</i>	AAF80238.1
<i>Olpidiopsis bostrychiae</i>	BAH56455.1
<i>Olpidiopsis feldmanni</i>	KM210528.1
<i>Olpidiopsis porphyrae</i>	BAF95092.1
<i>Phytophthora capisci</i>	ABF06683.1
<i>Phytophthora infestans</i>	ADQ28482.1
<i>Phytophthora nicotianae</i>	AEM43827.1
<i>Phytophthora tropicalis</i>	ABR18759.1
<i>Plectospora myriandra</i>	AAF80236.1
<i>Pythium aphanidermatum</i>	AAF89386.1
<i>Pythium arrhenomanes</i>	AAF89393.1
<i>Pythium insidiosum</i>	AHG28650.1
<i>Pythium oligandrum</i>	AAF89417.1
<i>Saprolegnia ferax</i>	AJG04723.1
<i>Saprolegnia parasitica</i>	AAZ22238.1
<i>Thraustotheca clavata</i>	AAF80230.1

Supplement 2. Measurements of sporangia

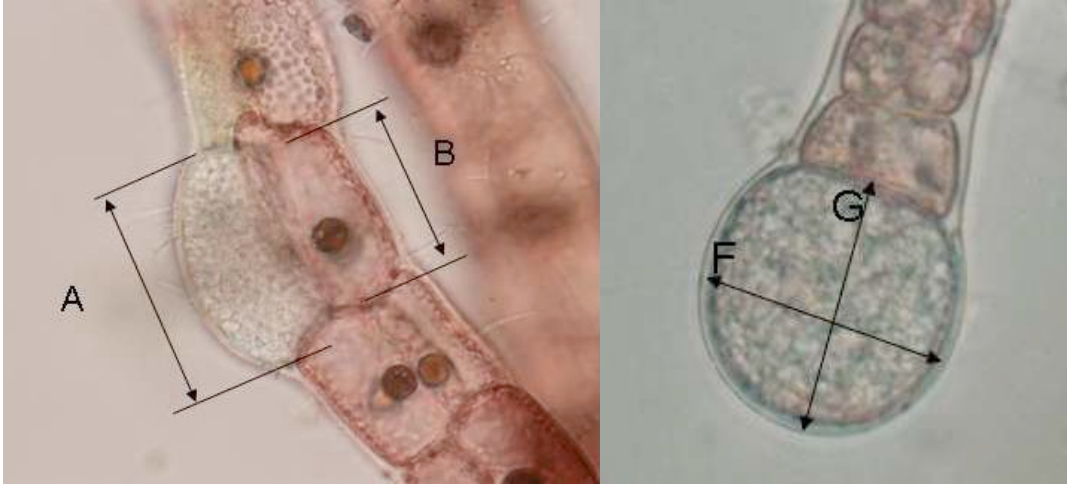


Fig. S1. Light micrographs indicating corresponding columns in Table S1.

Table S1. Measurements made from light micrographs, refer to Fig. S1 for a key to headings.

A (μm)	B (μm)	F(μm)	G(μm)
39.4283	27.7066	27.3285	28.5279
39.6197	27.5482	30.3306	28.5028
41.8221	42.9139	31.7109	34.7686
42.4674	40.2535	32.9648	34.5077
43.0331	37.7956	33.3181	36.5086
44.7179	43.8398	33.5337	36.3954
45.9806	32.0636	33.5891	37.6467
46.2730	44.6723	34.2643	33.0175
50.3064	36.1527	35.1137	37.3991
50.3329	48.3282	36.3827	35.7331
50.3407	56.1915	36.8494	35.8140
50.7618	44.0968	37.2545	39.1835
52.1961	50.3977	37.8678	36.1260
52.2855	42.5598	38.1170	45.2592
53.1464	42.0669	39.6501	38.7026
53.3850	48.3456	40.4183	38.5364
54.1361	50.4606	41.1203	45.5822
54.2667	50.4832	41.3650	41.2930
54.8532	44.1194	42.6954	39.1772
55.1295	47.5375	43.1153	47.7074
56.2313	52.4095	44.6205	44.9094
57.3410	51.4337	44.8023	40.3818
57.4459	72.7200	45.5622	59.0714
57.5769	47.5395	46.0575	42.5070
57.6773	47.6451	47.9531	44.7441
57.9813	47.1685	48.8700	47.1323
58.2811	54.1127	53.2467	53.1927
60.7836	43.5354	55.7857	62.5407
61.8524	67.5558	56.7879	50.5004
62.3996	51.8512		
62.7381	63.3076		
63.6086	63.8017		
67.7912	69.4969		
71.5368	69.7906		
75.8495	67.0620		

Pearson's correlation = $A \times B$ (width of *Olpidiopsis feldmanni* sporangia against the width of the neighbouring uninfected cell in the alga filament)

R = 0.8173

In Pearson's correlation a score > 0.75 is considered a very strong correlation

t-test *F* x *A* A test of the apical sporangia diameter from one side to the other against the length of the sporangia in an older cell. See Fig S1 and Table S1 for further details of variable.

t-Test: Two-Sample Assuming Unequal Variances

	Variable 1	Variable 2
Mean	54.38791	40.36812
Variance	73.42737	56.14881
Observations	35	29
Hypothesized Mean Difference	0	
df	62	
<i>t</i> Stat	6.980214	
<i>P</i> (<i>T</i> ≤ <i>t</i>) one-tail	1.16E-09	
<i>t</i> Critical one-tail	1.669804	
<i>P</i> (<i>T</i> ≤ <i>t</i>) two-tail	2.33E-09	
<i>t</i> Critical two-tail	1.998971	

t-test 2 *G* x *A* A test of the apical sporangia diameter from the base to top against the length of the sporangia in an older cell.

t-Test: Two-Sample Assuming Unequal Variances

	Variable 1	Variable 2
Mean	54.38791	41.21962
Variance	73.42737	64.29463
Observations	35	29
Hypothesized Mean Difference	0	
df	61	
<i>t</i> Stat	6.339284	
<i>P</i> (<i>T</i> ≤ <i>t</i>) one-tail	1.56E-08	
<i>t</i> Critical one-tail	1.670219	
<i>P</i> (<i>T</i> ≤ <i>t</i>) two-tail	3.12E-08	
<i>t</i> Critical two-tail	1.999624	

These results show that the sporangia in older parts of the plant are significantly wider than in the apical cell, concurrent with the original description (Aleem 1952)

Supplement 3. COII Alignment

>Achlya_ambisexualis
VIFVSWILARCIFFFNENTNKKAEITFVHGTVLEIVWTTITPALILIIIAIPSFSLLYAMDEVIDPVLTVKVIKS
QWYWSYEYSDAVEDS-----
IFFDSYMILDEDLKQFRLLLEVNDNRVVPTNTHVRLIVTATDVLHSAWVPSLGVKLDACPGRLNQTSIFIKR

>Albugo_candida
TIFVCWILFRIIFMFSENKNPIAETFVHGSTIEIIWTSIPALILLIIAIPSFALLYSMDEIIYPLITIKVIKS
QWYWTYEYSDFFSFENEDINESLIFDSYMLQEDDLKLGQFRLLLEVNDNRVIVPTYTHIRILITASDVLHSAWAI
SLGIKLDACPGRLNQTSMFIKR

>Albugo_laibachii
TVFVCWILFRIIFMFSENKNPIAETFVHGATIEIIWTSIPALILLIIAIPSFALLYSMDEIIYPLITIKVIKS
QWYWTYEYSDFFTFENKHTDESILIFDSYMLQEDDLKLGQFRLLLEVNDNRVVVPTYTHIRVLITASDVLHSAWAI
SLGIKLDACPGRLNQTSMFIKR

>Aphanomyces_euteiches
VVFVSWILGRCIFFYNNVNVKKAEIFVHGTVLEIVWTTITPAIILIIIAIPSFSLLYAMDEVIDPILTLKVIGN
QWYWSYEYSDAVDDS-----
IFFDSYMILEEDDLKQFRLLLEVNDNRVVVPVNTNTHVRVITATDVLHSAWVPSLGVKLDACPGRLNQTSIFIKR

>Apodachlya_pirifera
VVFVSWILARCIYFFDEDKHKIAETFVHGTVLEIVWTTITPALVLIIIAIPSFSLLYAMDEVIDPITTVKVIKS
QWYWSYEYSDSYTDTN----
ESIFFDSYMLIEDDLDIGQFRLLLEVNDNRVVPTNTHIRMIITASDVLHSAWVPSLGIKLDACPGRLNQTSMF
IKR

>Atkinsiella_dubia
VVFVWLLIRSIFFFTENKN--
PETFVHGTFFIEIIWTTITPALVLIIIAIPSFSLLYAMDEVIDPVISLKIIGSQWYWSYEYSDNFSLNN----
ESIFFDSYMLIEDDLKGNRLLLEVNDNRVVLPTNTHIRVITATDVLHSAWVPSLGVKLDACPGRLNQTSVFI
IKR

>Eurychasma_dicksonii_Eury05
VVGVCYFIARCIVLFTDK-
SEKSSNFAHGTLLEIIWTVTPAALLVIIAIPSFALLYSMDEIIDPEFTLKVVGHQWYWSYEYTDHSD-----
IDQNLNFDSYMIPTSDLEKGNLRLLEVNDNRVVLPIKTHIRVITITSADVLHSAWVPSLGVKLDACPGRLNQTSI
FLKR

>Eurychasma_dicksonii_Eury96
VVGVCYFIARCIVLFTDK-
SVKSSNFAHGTLLEIIWTTITPAALLVIIAVPSFALLYSMDEIIDPEFTLKVVGHQWYWSYEYTDHSD-----
IDQNLNFDSYMIPTSDLEKGNLRLLEVNDNRVVLPIKTHIRVITITSADVLHSAWVPSLGVKLDACPGRLNQTSI
FLKR

>Haliocitida_sp._NJM_0034
VVLVCWLVIKRCIFFFNQQKNPIAYKFVHGTVIEIIFWTTIPAIILFIIAIPSFALLYSMDEIINPSITLKVTVGH
QWYWSYEYSDDFINL----
EESLFFESYMQEEDDLVKGQFRLLLEVNDNRVVIPTNTHIRVLITASDVLHSAWAIPSLGIKLDACPGRLNQTSMF
IKR

>Haliphthoros_milfordensis_ATCC_200320
VVFVLWILTRCLFFFLVENKK--
PQKFVHGTNLEIIWTLTPALILMVIAIPSFALLYPMDEVIDPTITLKVIGHQWYWSYEYSDNLNSFE---
EESIFFESYMIQEEDLDLQFRLLLEVNDNRVVLPIINTHIRILITASDVLHSAWAIPSLGVKLDACPGRLNQTSVFI
IKR

>Haliphthoros_milfordensis_NJM_0131
VTFVLWILTRCLFFFTNNKK--
PQKFVHGTNLEIIWTLTPAFLLMIIAIPSFALLYSMDEVIDPTITLKVIGHQWYWSYEYSDNIDNIN---
EPIFFESYMIQEEDLDLQFRLLLEVNDNRVVLVNTHIRILITASDVLHSAWAIPSLGIKLDACPGRLNQTSLY
IKR

>Haliphthoros_philippinensis
VTFVLWILTRCLFFFTNNKK--
PQKFVHGTNLEIIWTLTPAFLLMIIAIPSFALLYSMDEVIDPTITLKVIGHQWYWSYEYSDNIDNIN---
EPIFFESYMIQEEDLDLQFRLLLEVNDNRVVLVNTHIRILITASDVLHSAWAIPSLGVKLDACPGRLNQTSLY
IKR

>Halocrusticida_okinawaensis
VIFVLWLLGRSIYFFNEDVKPVPERFVHGTVLEIVWTLTPALVLIVIAIPSFALLYSMDEVIDPTITLKVVGH

QWYWTYEYSDNTD-LD---
 DESVFFESYMQEEDLDKGQFRLLEVDNRVVVPIKTHIRLLITASDVLHCWAI PSLGIKLDACPGRLNQTSMY
 IKR
 >Haptoglossa_heterospora_I
 IIFVLWLLIRCIYFFSN--
 TKTINNFVHGTTIEI IWTITPALILLIIALPSFALLYSIDEIIDPALTLKVIGHQWYWSYEYTDN-----
 FNNINFDSYMIPTSDLEKQQLRLEVDNRVVLPLNTHIRLIITSSDVLHSAVPSLGIKLDACPGRLNQTTVY
 IKR
 >Haptoglossa_heterospora_II
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 FNNINFDSYMIPTSDLEKQQLRLEVDNRVVLPLNTHIRLIITSSDVLHSAVPSLGIKLDACPGRLNQTTVY
 IKR
 >Haptoglossa_sp._NI01
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 NKNPQKFVHGTFIEVWVWITPSLILIIIIAIPSFALLYSMDEIIDPVITIKI IGHQWYWSYEYTDN-----
 LNNLNFDSYMIPTEDLEKQQLRLEVDNRLVVPNTHIRLIITSSDVLHCWAVPSLGIKLDACPGRLNQTTLF
 VKR
 >Haptoglossa_sp._SZ01
 ILFVWVLLLRICIYFFNL--
 SKNPQKFIHGTLIEFIWTI IPSIILIIIIAIPSFALLYSMDEIIDPIITIKI IGHQWYWSYEYTDN-----
 LINIQFDSYMIPTLELEKQQLRLEVDNRLVLPKTHIRLIITSSDVLHCWAI PSLGIKLDACPGRLNQTTLF
 VKR
 >Haptoglossa_sp._SZ03
 IIFVLWLLLRICIFFFKS--
 SIHSQKFVHGTLIEFIWTI FPSLILIIIIAIPSFALLYSMDEIIDPIITIKI IGHQWYWSYEYTDN-----
 LLNFQFDSYMIPTSDLEKQQLRLEVDNRLVLPKTHIRLIITSSDVLHSAVPSLGIKLDACPGRLNQTTLF
 VKR
 >Haptoglossa_sp._TK01
 IIFVLWLLLRICIFFFSN--
 NKI INNFVHGTVIEIVWVWITPALILLIIALPSFALLYSIDEIIDPVLTIKVIGHQWYWSYEYTDN-----
 FKEINFDSYMIPTSELEKQQLRLEVDNRLILPSNTHIRLIITSSDVLHSAI PSLGIKLDACPGRLNQSTVY
 IKR
 >Haptoglossa_sp._UK
 IIFVLWLLFRICIYFFTN--
 NKNPQKFVHGTLIEI IWTITPSLILIIIIAIPSFALLYSMDEIIDPIITIKI IGHQWYWSYEYTDN-----
 LNNFNFDYMIPTEDLEKQQLRLEVDNRLVIPSNTHIRLIITSSDVLHCWAVPSLGIKLDACPGRLNQTTLF
 VKR
 >Haptoglossa_zoospora
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 NTSFQKFVHGTMIEI IWTITPSLILIIIIAIPSFALLYSMDEIIDPIITIKVIGHQWYWSYEYTDN-----
 LNNINFDSYMIPTEDLEKQQLRLEVDNRLVIPSNTHIRLIITSSDVLHCWAVPSLGIKLDACPGRLNQTTLF
 VKR
 >Hyphochytrium_catenoids
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 >Lagenidium_giganteum
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 QWYWTYEYSDNLEYA----
 DEPLIFDSYMIQEDDLEIGQLRLEVDNRIVVPTNTHIRVLITASDVLHSAVPSLGVKLDACPGRLNQTSMF
 IKR
 >Lagenidium_humanum
 TVFVGWMLFRVITLFDEKKNPIPATFVHGATIEI IWTITPALILLTVAVPSFALLYSMDEVIDPVITLKVIGS
 QWYWTYEYSDNLEYA----
 DEPLIFDSYMQEEDDLEIGQLRLEVDNRIVVPTNTHIRVLITASDVLHSAVPSLGVKLDACPGRLNQTSMF
 IKR
 >Lagenidium_thermophilum
 TVFVSWMLFRVITLFDEKKNPTPATFVHGATIEI IWTITPAIILLVIAIPSVALLYSMDEVIDPIITLKVIGS
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DEPLIFDSYMLQEDDLEIGQFRLLEVDNRVVVPTNTHIRVLITASDVLHSAVPSLGVKLDACPGRLNQTSMF
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 >Leptolegnia_caudata
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 IFFDSYMLEEDLDKQFRLLEVDNRVVVVPVNTNTHVRVITATDVLHSAVPSLGVKLDACPGRLNQTSIFIKR
 >Leptomitus_lacteus
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 KR
 >Olpidiopsis_bostrychiae
 VIFTSYLVSKIIISFNEKTNPIAQKFVHGTLEIEIWTITPALILLIISVPSFALLYSMDELIDPAMTIKVIGH
 QWYWNYEYSD---NT----
 DESLIFESYMIQEDDLQDQFRLLEVDNRVIVPINTHIRILITASDVLHSAIPSLGIKLDACPGRLNQTSMF
 IKR
 >Olpidiopsis_feldmanii
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 QWYWNYEYSD---NT----
 EESLIFESYMIPEQDLQDQFRLLQVHNRVVVPANTHIRLLITASDVLHSAIPSLGVKLDACPGRLNQTSMF
 IKR
 >Olpidiopsis_porphyrae
 VVFTLWIVARSVYFFNKNIHAKSLKFVHGTTEIEILWTITPALILLVIALPSFALLYSMDEIIDLTLTLKVIGH
 QWYWSYEYSDAS-IN---
 GESLAFDSYMQENDLDIGLFRLLEVDNRVVLPINTHVRILITASDVLHCWAIPSLGTKLDACPGRLNQTTVF
 IKR
 >Phytophthora_capsici
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 >Phytophthora_infestans
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 >Phytophthora_nicotianae
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 DEPLIFDSYMQEDDLAIGQFRLLEVDNRVVVPTNSHIRVLITASDVLHSAIPSLGIKLDACPGRLNQTSMF
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 >Phytophthora_tropicalis
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 >Plectospora_myriandra
 VVFWVSWILGRCIFFYNNENVNKKAETVHGTILEIVWTITPALILIIIIAIPSFSLLYAMDEVIDPVTLTLKVIGN
 QWYWSYEYSDAVDDS-----
 IFFDSYMLEEDLDKGFHRLLEVDNRVVVVPVNTNTHIRVITATDVLHSAVPSLGVKLDACPGRLNQTSMFIKR
 >Pythium_aphanidermatum
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 >Pythium_arrhenomanes
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 QWYWSYEYSDNLEFA----
 DEPLIFDSYMQENDLEIGQFRLLEVDNRVVVPTNSHIRVLITASDVLHSAIPSLGVKLDACPGRLNQTSMY
 IKR
 >Pythium_insidiosum

TVFVCWMLFRVVILFDEKKNPIPATFVHGATIEIIWTTIPALILLTVAVPSFALLYSMDEIIDPIITLKVIGS
QWYWSYEYSDNLEFA----
DEPLIFDSYMQENDLEIGQFRLLEVDNRVVVPTNSHIRVLITASDVLHSAVPSLGIKLDACPGRLNQTSMY
IKR
>Pythium_oligandrum
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QWYWSYEYSDNLEFA----
DEPLIFDSYMQDNDLEIGQFRLLEVDNRVVVPTNSHIRVLITASDVLHSAIAPSLGLKLDACPGRLNQTSMF
IKR
>Saprolegnia_ferax
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QWYWSYEYSDAMDDS-----
IFFDSYMLEEDLDKGQFRLLEVDNRVVVPTNTHIRVIITATDVLHSAVPSLGVKLDACPGRLNQTSIFIKR
>Saprolegnia_parasitica
VIFVSWILARCIFFFNENTNKAETFVHGTVLEIVWTITPALILIIIIAIPSFSLLYAMDEVIDPILTLKVIGS
QWYWSYEYSDAMDDS-----
IFFDSYMLEEDLDKGQFRLLEVDNRVVVPTNTHIRVIITATDVLHSAVPSLGVKLDACPGRLNQTSIFIKR
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Supplement 4. SSU alignment

>Aphanomyces_astaci

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>Aphanomyces_invadans

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>Aquastella_attenuata

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>Eurychasma_dicksonii

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>Eurychasma_dicksonii_Eury05
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>Haliphthoros_milfordensis_II

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>Haliphthoros_sp._NJM_0034

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>Halocrusticida_baliensis

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>Halocrusticida_parasitica

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>Halodaphnea_panulirata

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>Halophytophthora vesicula
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>Olpidiopsis_bostrychiae

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