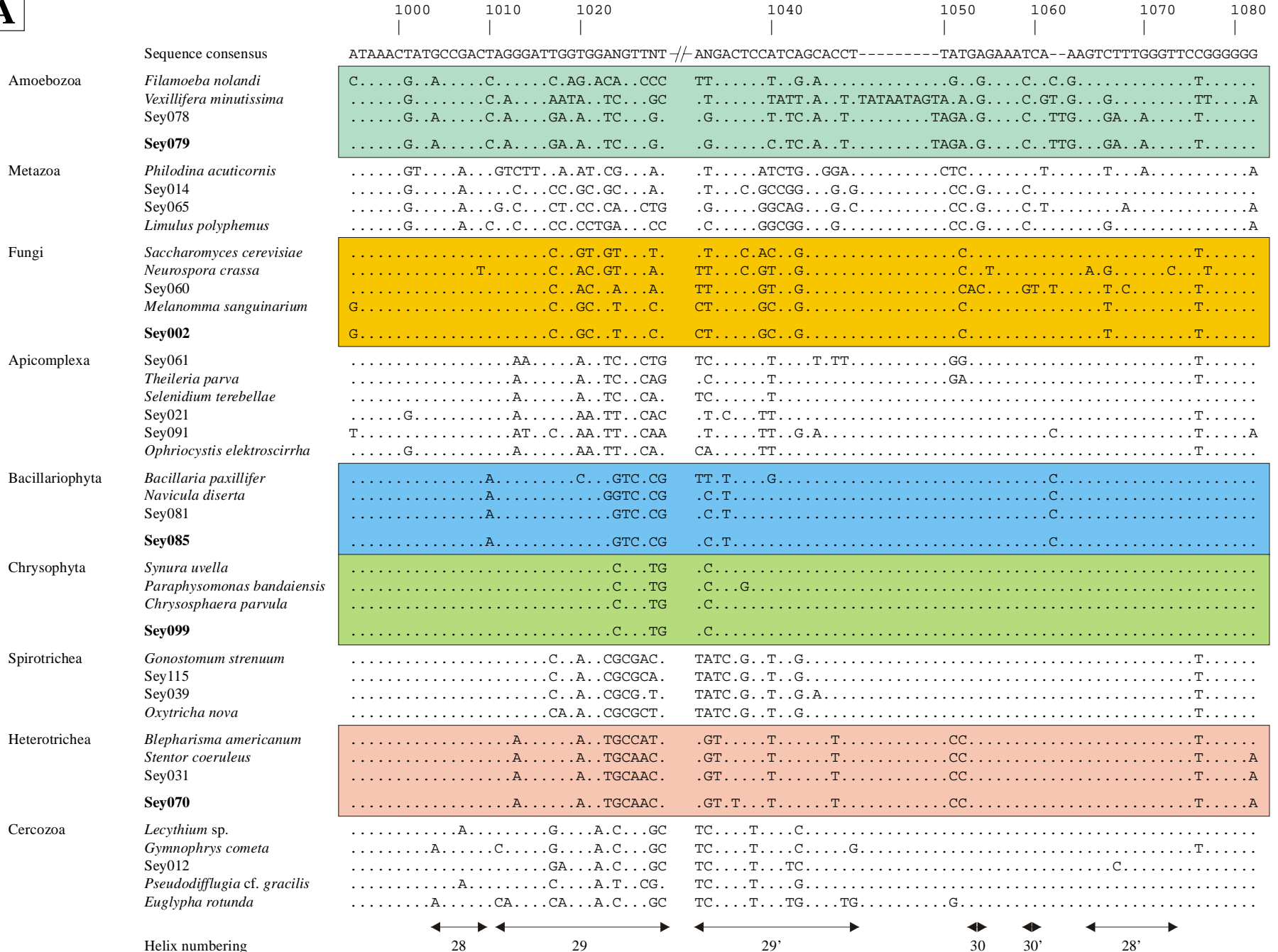**Additional File 1 : Supplementary Figure 1.**

Illustration of the methods we used for the detection of chimeric sequences.

Visual screening of partial alignments of the V5 region (**A**) and the V9 region (**B**) of the SSU rRNA gene, including 17 sequences from our EES of the river Seymaz, strongly suggests the presence among them of 5 chimeric sequences (indicated in bold), because different regions of the same sequence contain rare substitutions and/or indels that are specific for different lineages of eukaryotes. Helices are numbered according to the secondary structure model proposed by Wuyts et al. [45] and the numbers at the top of the alignment refer to the sequence of the red alga *Palmaria palmata* (GenBank accession number X53500). The different colored boxes highlight the taxonomic lineage to which each part of the chimera belongs. The V5 region of sequence Sey079 is almost identical to that of sequence Sey078 (Amoebozoa), while its V9 region is identical to that of the rotifer *Philodina acuticornis* (Metazoa). The V5 region of sequence Sey002 is identical to that of the ascomycete *Melanomma sanguinarium* (Fungi), while its V9 region is identical to that of sequence Sey061 (Apicomplexa). The V5 region of sequence Sey085 is identical to that of sequence Sey081 (Bacillariophyta), while its V9 region possesses all characteristic features of the chrysophytes. The V5 region of sequence Sey099 is identical to that of the chrysophyte *Chrysosphaera parvula*, while its V9 region possesses all characteristic features of the spirotrich ciliates. Finally, the V5 region of sequence Sey070 is almost identical to that of sequence Sey031 and the heterorich ciliate *Stentor coeruleus*, while its V9 region is identical to that of *Lecythium* sp. (Cercozoa). These observations are confirmed by partial treeing analysis [12], i.e. distance analyses based on different subsets of unambiguously aligned regions. For this example, analyses were based on (**C**) the first 150 sites at the 5' end of the partial alignment (helices 27 to 50) used for Figure 1, and (**D**) the last 425 sites at the 3' end of the same alignment. Colored boxes highlight the change of position of each chimeric sequence (indicated in bold), depending on the region analyzed. In both trees, all branches are drawn to scale.

A

```
                                          1000      1010      1020               1040            1050      1060      1070      1080
                                          |         |         |                 |               |         |         |         |
            Sequence consensus  ATAAACTATGCCGACTAGGGATTGGTGGANGTTNT -//- ANGACTCCATCAGCACCT---------TATGAGAAATCA--AAGTCTTTGGGTTCCGGGGGG

Amoebozoa   Filamoeba nolandi     C.....G..A.....C......C.AG.ACA..CCC    TT.....T.G.A...............G..G....C..C.G.............T.....
            Vexillifera minutissima .....G.......C.A....AATA..TC...GC    .T.....TATT.A..T.TATAATAGTA.A.G....C.GT.G...G.........TT....A
            Sey078                .....G..A.....C.A....GA.A..TC...G.    .G.....T.TC.A..T.........TAGA.G....C..TTG...GA..A....T.....
            Sey079                .....G..A.....C.A....GA.A..TC...G.    .G.....C.TC.A..T.........TAGA.G....C..TTG...GA..A....T.....

Metazoa     Philodina acuticornis ......GT....A...GTCTT..A.AT.CG...A.    .T.....ATCTG..GGA..........CTC.......T......T...A........A
            Sey014                ......G......A....C..CC.GC.GC...A.    .T..C.GCCGG...G.G.........CC.G...C.........................
            Sey065                ......G......A..G.C...CT.CC.CA..CTG   .G.....GGCAG...G.C........CC.G...C.T.......A...............A
            Limulus polyphemus    ......G......A..C..C...CC.CCTGA..CC   .C.....GGCGG...G.........CC.G...C......G..............A

Fungi       Saccharomyces cerevisiae .............C..GT.GT...T.         .T...C.AC..G.............C..................T.....
            Neurospora crassa     ...........T......C..AC.GT...A.       TT...C.GT..G.............C..T.........A.G......C..T.....
            Sey060                .............C..AC..A...A.            TT.....GT..G.............CAC....GT.T......T.C.......T.....
            Melanomma sanguinarium G.............C..GC..T...C.          CT.....GC..G.............C..................T.......T.....
            Sey002                G.............C..GC..T...C.           CT.....GC..G.............C..................T.......T.....

Apicomplexa Sey061                ................AA.....A..TC..CTG     TC.....T....T.TT.........GG................T.....
            Theileria parva       ................A.....A..TC..CAG      .C.....T................GA................T.....
            Selenidium terebellae ................A.....A..TC..CA.      TC.....T...................................T.....
            Sey021                .....G..........A.....AA.TT..CAC       .T.C...TT.................................T.....
            Sey091                T...............AT..C..AA.TT..CAA     .T.....TT..G.A..........C.............T...A
            Ophriocystis elektroscirrha ......G..........A.....AA.TT..CA. CA.....TT.................................T.....

Bacillariophyta Bacillaria paxillifer .............A.....C...GTC.CG      TT.T....G.................C...................
            Navicula diserta      .............A.....GGTC.CG           .C.T.....................C...................
            Sey081                .............A.....GTC.CG            .C.T.....................C...................
            Sey085                .............A.....GTC.CG            .C.T.....................C...................

Chrysophyta Synura uvella         .....................C...TG          .C........................................
            Paraphysomonas bandaiensis ...............C...TG            .C...G....................................
            Chrysosphaera parvula .....................C...TG          .C........................................
            Sey099                .....................C...TG          .C........................................

Spirotrichea Gonostomum strenuum  ..................C..A..CGCGAC.      TATC.G..T..G...........................T.....
            Sey115                ..................C..A..CGCGCA.      TATC.G..T..G...........................T.....
            Sey039                ..................C..A..CGCG.T.      TATC.G..T..G.A.........................T.....
            Oxytricha nova         ..................CA.A..CGCGCT.     TATC.G..T..G...........................T.....

Heterotrichea Blepharisma americanum ..............A......A..TGCCAT.    .GT....T......T..........CC................T.....
            Stentor coeruleus     ..............A......A..TGCAAC.      .GT....T......T..........CC................T....A
            Sey031                ..............A......A..TGCAAC.      .GT....T......T..........CC................T....A
            Sey070                ..............A......A..TGCAAC.      .GT.T...T......T..........CC................T....A

Cercozoa    Lecythium sp.          .............A.......G...A.C...GC    TC...T....C.................................
            Gymnophrys cometa      ..........A......C.....G...A.C...GC  TC...T....C....G...........................T.....
            Sey012                 ..................GA...A.C...GC      TC....T...TC.....................C..............
            Pseudodifflugia cf. gracilis .........A.......C....A.T..CG.  TC...T..G.................................
            Euglypha rotunda       ..........A......CA....CA...A.C...GC TC...T...TG....TG......G....................

            Helix numbering        <-->  <------------->  <------------------->    <->  <->  <------->
                                     28         29              29'                30   30'    28'
```

B

```
                                              1610        1620        1630        1640        1650              1690        1700        1710        1720        1730
                                               |           |           |           |           |                |           |           |           |           |
Sequence consensus          CCGTCGCTCCTACCGATT--GAATGGTCCGGTGAAATCTTCGGANTGNNN--//--TNNNGNGAAGTTGATTAAACCTTATCATTTAGAGGAAGGAGAAGTCG
```

Group	Taxon	Sequence
Amoebozoa	*Filamoeba nolandi*	`....................C....................A....TATTGG    .CGATA.........G.........CTG....................`
	Vexillifera minutissima	`........T........-.......A......A...AA..G....T.ATAA    .TGTAAA..C..AT.........G.........................`
	Sey078	`.................-.......AT....A....C.A..G...ACTGTC    GATT.CC..C.CT.G....T.....T......................`
Metazoa	**Sey079**	`.......A...................T.TTA....G.........CT..GTT    .ATC.AA...A..C.C....TGG.................T.A......`
	Philodina acuticornis	`.......A...................T.TTA....G.........CT..GTT    .ATC.AA...A..C.C....TGG.................T.A......`
	Sey014	`.......A..........G.....TTA...GG..C....TC.GCC    CGCC.A.....AC....C....T.G.CT..C.........T.A......`
	Sey065	`.......A.............TTA.C..G..TC.....T..GGC    GTCT.A.....AAAC.C..G.T.G.................T.A......`
	Limulus polyphemus	`.......A................A.TTA....GG.........C..GCT    .GCC.GA...A...CC....T.G.................T.A......`
Fungi	*Saccharomyces cerevisiae*	`.......AG................CTTA...GGC..CA...TCTGCT    AGCG.A...T...GAC...T.GG...............CT.A......`
	Neurospora crassa	`.......A...............CT.A...GGCT.C....C..GCC    GGCC.GA...C.ATCC...TCGG.................T.A......`
	Sey060	`.......A...............CT.A...GGCT.C....C..GCC    GGCC.GA...C..ATCC...TCGG.................T.A......A`
	Melanomma sanguinarium	`.......A...............CT.A...GGC.....C..GCT    AGCC.GA.....CG.C..TCGG.................T.A......`
Apicomplexa	**Sey002**	`...................GG..A.........T.AC.....C.TGTG    ATCA.G..G...TTG.G.............C.................`
	Sey061	`...................GG..A.........T.AC.....C.TGTG    ATCA.G..G...TTG.G.............C.................`
	Theileria parva	`.............C....G..A.........T.A.....CC.TGA    .CTA.G......TTG.G.............C...A.............`
	Selenidium terebellae	`...................GG..A.TA.....T.A.....CCACAC    .CGT.G.....CTTG.G.....C...G.C...................`
	Sey021	`.....CT.A.T...C....G.C.A.......TGAC.....C..GAA    .GCT.GA.....TTG.G....AC...G.C.GA..A.T.AGA......`
	Sey091	`.....AT.A.T......G...A.T.......TGA.....T...ATT    AATT.A......TTG......CA...C..C.GT..TCT.ATC......`
	Ophriocystis elektroscirrha	`.....CT.A.T...C....G..A.......T.A.....CC.ACT    AGAC.GA.....TTA..GA.......C.GA..A.T.AGA......C`
Bacillariophyta	*Bacillaria paxillifer*	`.......A.......................GC..CG...T..TGG    .CGC.A...C...TC.......................T......`
	Navicula diserta	`.......A.......................GC..CG...T..CGA    .TGT.A..C...TC.......................T......`
	Sey081	`.......A.......................GC...G...T..TGA    .TGT.A..C...TC.......................T......`
Chrysophyta	**Sey085**	`.......A..........C..........T........AT...A..CCTAGG    CCAG.GA.....AT.......C...............T......`
	Synura uvella	`.......A..................A.T......AT.CT..C..TGG    CTAT.G......AT.......C...............T......`
	Paraphysomonas bandaiensis	`.......A..................T.......AT.....CC.CGG    CTGT.GA.....T.......C...............T......`
	Chrysosphaera parvula	`.......A..................A.T.....CTC.....CC.ACG    CATT.G......AT.......A...............T......`
Spirotrichea	**Sey099**	`.................TC..G..........CCT..T...CC.TAC    GTGT.G...A.CA.G.....A...C.................`
	Gonostomum strenuum	`.................TC..G..T........CCT......CC.CGC    GTGT.G.....CA.G.....A..A..C.................`
	Sey115	`.................TC..G...........CCT..T...C..TGC    GCGT.GA..A.CA.G.....A....C.................`
	Sey039	`.................TC..G..A........CCT..T...C..CGT    GTGC.GA..A.CA.G.....A....C.................`
	Oxytricha nova	`.................TC..G..A........CCA..T...CC.CGG    CTGT.GA..A.CT.G.....A....C.................`
Heterotrichea	*Blepharisma americanum*	`.................TC..G..A.GA.....TC..C....C..CAC    GTGT.G.........G............C.............`
	Stentor coeruleus	`.................TC..G..A.GA.....CC..C....C..TGC    CGTT.G.........G............C.............`
	Sey031	`.................TC..G..A.GA.....CC..C....C..TGC    CGTT.G.........G............C.............`
Cercozoa	**Sey070**	`.......A...................CTTA....GC...CT..C..TTG    AAAT.G....GA...C.....T.G.............T.A......`
	Lecythium sp.	`.......A...................CTTA....GC...CT..C..TTG    AAAT.G....GA...C.....T.G.............T.A......`
	Gymnophrys cometa	`.......A...............AC.TA....GT.TCA....T..TTG    CAGT.A....GA..C...T.G.............T.A......`
	Sey012	`.......A...............ATTA....GC.TCA....T..TTG    CAAC.A....GA..C...T.GC.............T.A......`
	Pseudodifflugia cf. *gracilis*	`.......A...............CTTA....GC...A....C..CGT    ATGC.G....A...C...T.G.............T.A......`
	Euglypha rotunda	`.......A...............G.....TTA...GG.TCA....C..TTG    ATACTG.....GACCC...T.G....C.......T.A......`

```
Helix numbering            <---------------------  49  --------------------->  <---------------------  49'  --------------------->
```

C

Spirotrichea (Ciliophora)
- *Oxytricha nova*
- Sey115
- *Gonostomum strenuum*
- Sey039

Heterotrichea (Ciliophora)
- **Sey070**
- *Stentor coeruleus*
- Sey031
- *Blepharisma americanum*

Apicomplexa
- Sey021
- *Ophriocystis elektroscirrha*
- Sey091
- Sey061
- *Theileria parva*
- *Selenidium terebellae*

Bacillariophyta (Stramenopiles)
- **Sey085**
- Sey081
- *Navicula diserta*
- *Bacillaria paxillifer*

Chrysophyta (Stramenopiles)
- **Sey099**
- *Chrysosphaera parvula*
- *Synura uvella*
- *Paraphysomonas bandaiensis*

Cercozoa
- *Euglypha rotunda*
- *Gymnophrys cometa*
- Sey012
- *Lecythium* sp.
- *Pseudodifflugia* cf. *gracilis*

Amoebozoa
- **Sey079**
- Sey078
- *Vexillifera minutissima*
- *Filamoeba nolandi*

Metazoa
- Sey065
- *Limulus polyphemus*
- Sey014
- *Philodina acuticornis*

Ascomycota (Fungi)
- *Melanomma sanguinarium*
- **Sey002**
- *Neurospora crassa*
- Sey060
- *Saccharomyces cerevisiae*

0.049

D

Spirotrichea (Ciliophora)
- *Oxytricha nova*
- Sey115
- *Gonostomum strenuum*
- **Sey099**
- Sey039

Heterotrichea (Ciliophora)
- *Stentor coeruleus*
- Sey031
- *Blepharisma americanum*

Apicomplexa
- Sey021
- *Ophriocystis elektroscirrha*
- Sey091
- *Selenidium terebellae*
- Sey061
- **Sey002**
- *Theileria parva*

Amoebozoa
- *Vexillifera minutissima*
- Sey078
- *Filamoeba nolandi*

Bacillariophyta (Stramenopiles)
- Sey081
- *Navicula diserta*
- *Bacillaria paxillifer*

Chrysophyta (Stramenopiles)
- **Sey085**
- *Synura uvella*
- *Chrysosphaera parvula*
- *Paraphysomonas bandaiensis*

Cercozoa
- *Lecythium* sp.
- **Sey070**
- *Pseudodifflugia* cf. *gracilis*
- *Euglypha rotunda*
- Sey012
- *Gymnophrys cometa*

Metazoa
- *Philodina acuticornis*
- **Sey079**
- Sey014
- *Limulus polyphemus*
- Sey065

Ascomycota (Fungi)
- Sey060
- *Neurospora crassa*
- *Melanomma sanguinarium*
- *Saccharomyces cerevisiae*

0.040