Species delimitation and phylogeographic analyses in the Ectocarpus subgroup siliculosi (Ectocarpales, Phaeophyceae)

Alejandro E Montecinos, Lucia Couceiro, Akira F Peters, Antoine Desrut, Myriam Valero, Marie-Laure Guillemin

Journal of Phycology
AN INTERNATIONAL JOURNAL OF ALGAL RESEARCH
A PUBLICATION OF THE PHYCOLOGICAL SOCIETY OF AMERICA

SPECIES DELIMITATION AND PHYLOGEOGRAPHIC ANALYSES IN THE *ECTOCARPUS* SUBGROUP *SILICULOSI* (ECTOCARPALES, PHAEOPHYCEAE)

Journal:	*Journal of Phycology*
Manuscript ID	JPY-15-242-ART.R2
Manuscript Type:	Regular Article
Date Submitted by the Author:	02-Jun-2016
Complete List of Authors:	Montecinos, Alejandro; CNRS, Sorbonne Universités, UPMC University Paris VI, UMI 3614, Evolutionary Biology and Ecology of Algae; Universidad Austral de Chile, Instituto de Ciencias Ambientales y Evolutivas, Facultad de Ciencias Couceiro, Lucía; CNRS, Sorbonne Universités, UPMC University Paris VI, UMI 3614, Evolutionary Biology and Ecology of Algae; University of A Coruña, Dep. Animal Biology, Plant Biology and Ecology Peters, Akira; Bezhin Rosko Desrut, Antoine; CNRS, Sorbonne Universités, UPMC University Paris VI, UMI 3614, Evolutionary Biology and Ecology of Algae Valero, Myriam; CNRS, Sorbonne Universités, UPMC University Paris VI, UMI 3614, Evolutionary Biology and Ecology of Algae Guillemin, Marie-Laure; Universidad Austral de Chile, Instituto de Ciencias Ambientales y Evolutivas, Facultad de Ciencias; CNRS, Sorbonne Universités, UPMC University Paris VI, UMI 3614, Evolutionary Biology and Ecology of Algae
Keywords:	barcode, brown alga, COI-5P, cryptic species, <i>Ectocarpus</i>, hybridization, introgression, ITS1, species delimitation

SPECIES DELIMITATION AND PHYLOGEOGRAPHIC ANALYSES IN THE *ECTOCARPUS* SUBGROUP *SILICULOSI* (ECTOCARPALES, PHAEOPHYCEAE) [(1)]

Alejandro E. Montecinos [1,2]
[1]CNRS, Sorbonne Universités, UPMC University Paris VI, PUC, UACH, UMI 3614, Evolutionary Biology and Ecology of Algae, Station Biologique de Roscoff, CS 90074, Place G. Teissier, 29680 Roscoff, France
[2]Instituto de Ciencias Ambientales y Evolutivas, Facultad de Ciencias, Universidad Austral de Chile, Casilla 567 Valdivia, Chile
Lucia Couceiro[1,3]
[1]CNRS, Sorbonne Universités, UPMC University Paris VI, PUC, UACH, UMI 3614, Evolutionary Biology and Ecology of Algae, Station Biologique de Roscoff, CS 90074, Place G. Teissier, 29680 Roscoff, France
[3]current address: Dep. Animal Biology, Plant Biology and Ecology; University of A Coruña; A Coruña; Spain
Akira F. Peters[4]
[4]Bezhin Rosko, 40 rue des pêcheurs, 29250 Santec, France
Antoine Desrut[1]
[1]CNRS, Sorbonne Universités, UPMC University Paris VI, PUC, UACH, UMI 3614, Evolutionary Biology and Ecology of Algae, Station Biologique de Roscoff, CS 90074, Place G. Teissier, 29680 Roscoff, France
Myriam Valero[1]
[1]CNRS, Sorbonne Universités, UPMC University Paris VI, PUC, UACH, UMI 3614, Evolutionary Biology and Ecology of Algae, Station Biologique de Roscoff, CS 90074, Place G. Teissier, 29680 Roscoff, France
Marie-Laure Guillemin[1,2 (2)]
[1]CNRS, Sorbonne Universités, UPMC University Paris VI, PUC, UACH, UMI 3614, Evolutionary Biology and Ecology of Algae, Station Biologique de Roscoff, CS 90074, Place G. Teissier, 29680 Roscoff, France
[2]Instituto de Ciencias Ambientales y Evolutivas, Facultad de Ciencias, Universidad Austral de Chile, Casilla 567 Valdivia, Chile
Email: marielaure.guillemin@gmail.com
Phone: +56 063 222 1703

Running Title: Species delimitation in the *Ectocarpus* subgroup *siliculosi*

Abstract:

The genus *Ectocarpus* (Ectocarpales, Phaeophyceae) contains filamentous algae widely distributed in marine and estuarine habitats of temperate regions in both hemispheres. While *E. siliculosus* has become a model organism for genomics and genetics of the brown macroalgae, accurate species delineation, distribution patterns and diversity for the genus *Ectocarpus* remain problematic. In this study, we used three independent species delimitation approaches to generate a robust species hypothesis for 729 *Ectocarpus* specimens collected mainly along the European and Chilean coasts. These approaches comprised phylogenetic reconstructions and two bioinformatics tools developed to objectively define species boundaries (GMYC; General Mixed Yule Coalescence Method and ABGD; Automatic Barcode Gap Discovery). Our analyses were based on DNA sequences of two loci: the mitochondrial cytochrome oxidase subunit 1 (COI-5P) and the nuclear internal transcribed spacer 1 of the ribosomal DNA (ITS1). Our analyses showed the presence of at least 15 cryptic species and suggest the existence of incomplete lineage sorting or introgression between five of them. These results suggested the possible existence of different levels of reproductive barriers within this species complex. We also detected differences among species in their phylogeographic patterns, range and depth distributions which may suggest different biogeographic histories (e.g., endemic species or recent introductions).

Keywords: barcode, brown alga, COI-5P, cryptic species, *Ectocarpus*, hybridization, introgression, ITS1, species delimitation.

List of abbreviations:

ABGD, Automatic Barcode Gap Discovery

BI, Bayesian Inference

COI-5P, 5’-partial cytochrome c oxidase sub-unit1

GMYC, General Mixed Yule Coalescent

ITS1, internal transcribed spacer 1

ML, Maximum Likelihood

mtDNA, mitochondrial DNA

NEA, North European Atlantic

NW France, North-West France

nrDNA, nuclear ribosomal DNA

SEP, South-East Pacific

Introduction

Delineating species boundaries is a longstanding methodological and conceptual challenge, especially in algal systems. Some of the problems arise from the fact that species are dynamic entities that change with time (Sites and Marshall 2003, 2004) and a plethora of species concepts has been proposed (Mayden 1997, 1999, Coyne and Orr 2004). Recently, a new line of thinking was put forth among biologists whereby species are considered as scientific hypotheses (species hypotheses) and species delineation is a process of refutation based on the acquisition of new evidence (Pante et al. 2015). DNA-based methods, such as single gene barcoding, have been proven especially useful to uncover cryptic species where classical taxonomy has been problematic in organisms characterized by simple morphology and / or by high phenotypic plasticity (e.g., in animals: Yamashita and Roads 2013; in plants: Carstens and Satler 2013; in seaweeds: Tronholm et al. 2010). However, problems are linked with this single gene approach. Indeed, single-locus data represent the history of a single gene that might not be representative of organismal history. Differences in the overall amount of differentiation between loci or in how these loci reconstruct the relationships among groups generate discordance in species boundaries delineation among markers and the importance of using multiple independent loci to generate robust species hypotheses has been repeatedly emphasized (Dupuis et al. 2012).

Distance-based approaches have classically defined species using arbitrary thresholds (universal or defined visually using a barcode gap in a particular group of species, Hebert et al. 2003). Species have also been defined based on the existence of well-supported monophyletic groups (Wiens and Penkrot 2002). However, monophyly, while a discrete criterion, is arbitrary with respect to taxonomic level (Goldstein and DeSalle 2011). Methods characterized by an increased statistical rigor and better objectivity in delimiting species, such as the General Mixed Yule Coalescent (GMYC) (Pons et al. 2006, Monaghan et al. 2009) and the Automatic Barcode Gap Detection (ABGD) (Puillandre et al. 2012a), were recently developed to detect discontinuities in DNA sequence variation associated with species boundaries. GMYC uses a pre-existing phylogenetic tree to determine the transition signal from speciation to coalescent branching patterns. While, ABGD detects the breaks in the distribution of genetic pairwise distances, referred to as the 'barcode gap', relying exclusively on genetic distance between DNA sequences. GMYC and ABGD analyses combined with searches for well-supported monophyletic groups in phylogenetic reconstructions have been used to detect the existence of cryptic species in many taxa (e.g. snails: Prevot et al. 2013; fish: Alò et al. 2013; copepods: Cornils and Held 2014; red algae: Payo et al. 2012 and Pardo et al. 2014 or brown algae: Vieira et al. 2014).

The genus *Ectocarpus* Lyngbye (Ectocarpales, Phaeophyceae) is widely distributed in marine and estuarine habitats of temperate regions in both hemispheres (Stache 1990). *Ectocarpus* spp. is found as a short-lived annual and often colonizes abiotic substrata or grows as an epiphyte on macrophytes; the habitat of *Ectocarpus* spp. includes the subtidal up to high intertidal pools (Russell 1967a, 1967b, 1983a, 1983b). Members of *Ectocarpus* spp. complex have been described as important contributors to biofouling and are frequently encountered as epiphytes in mariculture settings (Stache-Crain et al. 1997). The genus *Ectocarpus* has a long research history, starting in the XIX century with the first taxonomic descriptions of this genus (Dillwyn 1809, Lyngbye 1819). Despite being a model organism (Peters et al. 2004, Cock et al. 2010), basic knowledge concerning species delineation, distribution patterns, diversity and differentiation remains elusive (Peters et al. 2010a).

Initial morphology-based descriptions of species diversity have a long and controversial history. For example, Hamel (1931-1939) recognized five species along the European Atlantic coast, which he classified into two major groups based on branching pattern and sporangium shape: the section "*siliculosi*" and the section "*fasciculati*". Later, Cardinal (1964), using field material from the French Channel, proposed another classification and distinguished four species with seven varieties in the *Ectocarpus* subgroup *siliculosi* and three varieties in the *Ectocarpus* subgroup *fasciculati*. Conversely, Russell (1966, 1967a) using isolates from around the British Isles, demonstrated that sporangium morphology was not an informative species character. His proposal to reduce the number of European species to two (*E. fasciculatus* and *E. siliculosus*) was later supported by crossing and chemical studies (Müller and Eichenberger 1995) and was the most widely accepted classification system until recently (but see Peters et al. 2010a). Nonetheless, within *E. siliculosus*, reproductive barriers have been reported between isolates from different geographical areas (reviewed in Stache-Crain et al. 1967). Prezygotic barriers have been described for populations from NE America (Müller 1976); likewise, reduced development or normal sporophyte development with inhibition of meiosis (post-zygotic barriers) has been observed for strains isolated from different hemispheres (Müller 1977, 1979, 1988, Stache 1990). Despite these observations, Müller and Kawai (1991) proposed to collapse *E. siliculosus* isolates into a single species arguing that full or slightly reduced interbreeding patterns could be explained by the geographical isolation between populations in this world-wide distributed species. However, this explanation has been questioned by different studies where sequence-based analyses have identified cryptic diversity within the *Ectocarpus* genus. First, phylogenetic analyses using ITS1 (nrDNA) and the Rubisco spacer of choloroplast DNA (cpDNA) of 43 *Ectocarpus* strains isolated from all continents except Antarctica, showed several lineages within the *Ectocarpus* subgroup *siliculosi* (Stache-Crain et al. 1997). Second, using three additional markers (*cox*3 and *rps*14-*atp*8 (both from mtDNA) and ITS2 (nrDNA)) and including samples isolated from NW France, Peters et al. (2010a) suggested the existence of at least four different lineages within the *Ectocarpus* subgroup *siliculosi*; for one of the four lineages, they proposed to reinstate the name *E. crouaniorum* Thuret coined by Thuret in Le Jolis. Third, the presence of most lineages described by Stache-Crain et al. (1997) was later confirmed for strains sampled along the South-East Pacific coast (Peters et al. 2010b). Finally, using a single-locus approach (COI-5P) on samples from NW France, Mediterranean Sea and Asia, Peters et al. (2015) reported again several lineages previously described in Stache-Crain et al. (1997) as well as 14 additional lineages possibly representing different species. However, this last study also warned against problems linked to a single-gene approach, such as incomplete lineage sorting or introgression.

The molecular findings discussed above support the probable occurrence of highly divergent genetic lineages, including cryptic species, within the *Ectocarpus* section "*siliculosi*". However, none of the previous studies has employed an integrative approach to clarify the species diversity within *Ectocarpus* and evaluate introgression levels within and among natural populations. The present study uses two unlinked loci (i.e. COI-5P and ITS1 DNA-markers) and a set of methods developed to delimit species to clarify the number of cryptic species within this group using 729 specimens collected mainly along the European and Chilean coasts. The extent to which natural hybridization and introgression occur in the field was investigated by searching for incongruence between the independent nuclear and mitochondrial markers. Finally, phylogeographic patterns, range and depth distributions of the most common *Ectocarpus* species were studied.

Materials and Methods

Field collections and isolation of Ectocarpus *strains*

Seven hundred and twenty-one *Ectocarpus* samples were collected from 37 sites located along the North-East Atlantic (NEA), Mediterranean and South-East Pacific (SEP) coasts. They were complemented with 8 strains isolated from USA, South Korea, Australia and New Zealand (Table 1). Samples collected in the field were isolated and maintained as clonal cultures, as described in Couceiro et al. (2015). Position on the shore of the collected individuals was recorded using a coarse classification (high intertidal, H; mid intertidal, M; low intertidal, L; upper subtidal, US; subtidal, S; or drifting, Drift), in order to examine whether putative cryptic species occupy different tidal zones.

DNA extraction, sequencing and alignments

Total DNA was extracted from lyophilized samples using the NucleoSpinR 96 Plant Kit (Macherey-Nagel, Duren, Germany). Partial COI (COI-5P, mitochondrial) was amplified using the primers GAZF2 and GAZR2 (Lane et al. 2007) as described in Peters et al. (2015). A nuclear fragment containing the ITS1 region and 224 bp of the flanking genes 18S and 5.8S was amplified using the primers and PCR conditions described by Peters et al. (2010a). PCR amplicons for both markers were sequenced at Genoscope facilities (Evry, France) or at Eurofinis Genomics (Ebersberg, Germany). Individuals showing phylogenetic incongruences between markers were sequenced twice in order to discard contamination errors in the preparation of the samples before the sequencing. Sequences were aligned manually using MEGA v6.06 (Tamura et al. 2013) and checked by eye; only traces with high quality values and no ambiguities were retained for further analyses.

Species-delimitation procedure

First, 729 *Ectocarpus* COI-5P sequences were used to define putative species within the *Ectocarpus* section "*siliculosi*" group. Among them, 710 sequences were generated in this study and deposited in GENBANK (Table 1, S1) while 19 were published by Peters et al. (2015) and downloaded from the same public database (Table S1). To establish putative species, two species delineation methods (ABGD and GMYC) were combined with two phylogenetic inference methods (Maximum Likelihood, ML and Bayesian inference, BI). Thereafter, putative species delineated with the COI-5P were consolidated using 630 sequences of the nrDNA marker ITS1. Five hundred and eighty sequences were generated in this study (Table 1, S2) and 50 were downloaded from GENBANK (Table S2). A single alignment including all ITS1 sequences could not be generated due to the partly high sequence variability including the presence of indels (Stache-Crain et al. 1997); the ITS1 dataset was therefore divided into four subgroups (see results on species consolidation below for more information about the composition of these four subgroups). Sequence alignment, tree reconstructions and ABGD tests were carried out independently for each subgroup. Sample groups were considered as species when all (or nearly all) the methods employed to test their boundaries and the results obtained for two independent genes were concordant.

Phylogenetic Analyses of DNA Sequences

Phylogenetic analyses were conducted separately for the COI-5P and ITS1 regions using both ML and BI methods. ML analyses were performed using RAxML v8 (Stamatakis 2014). We selected the best-fit substitution model using the Akaike Information Criterion (AIC) implemented in jModelTest v2.1.8 (Darriba et al. 2012). The selected model was GTR I+G for COI-5P, GTR +G for the first, second and fourth ITS1-sub-groups and GTR I+G for the third ITS1-sub-group. Statistical support was estimated using 1,000 replicates and a rapid bootstrap heuristic (Stamatakis et al. 2008). BI analyses were conducted using MrBayes v3.2.3 (Huelsenbeck and Ronquist 2001). Two independent analyses were run using four chains each and 20 million generations. Trees and parameters were sampled every 1,000 generations and the default parameters for temperature and branch swapping were used. The first 20% of sampled trees were discarded as "burn-in" to ensure stabilization. The remaining trees were used to compute a consensus topology and posterior probability values. The split frequency (variance among the four independent runs) was below 0.003, confirming that the posterior probability distribution was accurately sampled.

Automatic Barcode Gap Discovery (ABGD)

ABGD identifies a limit between the frequency distribution of intra- and interspecific pairwise genetic distances, even if they overlap, by using several a priori thresholds of genetic distances chosen by the user (Puillandre et al. 2012a). Then, it is recursively applied to previously obtained groups to get finer partitions until there is no further partitioning. ABGD was remotely run at http://wwwabi.snv.jussieu.fr/public/abgd/abgdweb.html. We computed Kimura two-parameter (K2P) genetic distances among specimens using default settings.

General Mixed Yule Coalescent (GMYC)

GMYC identifies a threshold value for the shift in branching rate from coalescent lineage branching to interspecific diversification on an ultrametric tree and explicitly delimits "independently evolving" clusters (i.e. putative species) (Pons et al. 2006, Monaghan et al. 2009). Before the analysis, duplicated haplotypes were removed from our data set using DnaSP v5.10.1 (Librado and Rozas 2009). Branch lengths were estimated under a relaxed log-normal clock using the Bayesian analysis implemented in BEAST v1.8.2 (Drummond et al. 2012). A coalescent (constant size) prior was used and Markov Chains Monte Carlo (MCMC) were run for 20 million generations. Trees were sampled each 1,000 generations with a 10% burn-in. A visual inspection of MCMC progression using Tracer v1.6 was performed to corroborate stabilization. An ultrametric tree was constructed using TreeAnnotator v1.8.1 (Rambaut and Drummond 2010). Both the single-threshold (Pons et al. 2006) and the multiple-threshold (Monaghan et al. 2009) versions of GMYC were fitted on the ultrametric tree using the SPLITS v1.0-19 package for R (https://r-forge.r-project.org/projects/splits/).

Network reconstructions

Haplotype networks were reconstructed for the eight *Ectocarpus* species for which more than 15 sequences were available for each marker under study. The haplotype networks were reconstructed using the median-joining algorithm implemented in NETWORK v6.13 (Bandelt et al. 1999).

Genetic diversity

Genetic diversity indices were calculated for the three species, *E. siliculosus*, *E. crouaniorum* and *Ectocarpus* 6, that were sampled most frequently (i.e. >45 individuals for which both the COI-5P and ITS1 markers were sequenced). The number of haplotypes (*nH*); the number of polymorphic sites (*S*); gene diversity (*H*) and nucleotide diversity (π, Nei and Li 1979) were computed using ARLEQUIN v3.5.1.3 (Excoffier and Lischer 2010).

AMOVA analysis

For the two most widely geographically distributed species (i.e. *E. siliculosus* and *E. crouaniorum*), a nested Analysis of Molecular Variance (AMOVA, Excoffier et al. 1992) was implemented using ARLEQUIN v3.5.1.3 (Excoffier and Lischer 2010) to test for the partition of genetic variance within locations, among locations within regions and among regions. Based on the geographic clustering of the sampled localities, four regions were defined: United Kingdom, France, NW Iberian Peninsula and Chile.

Results

Ectocarpus putative species delineation based on COI-5P

The 729 COI-5P sequences (603 bp) from the *Ectocarpus* specimens included 90 unique haplotypes with 123 variable sites and a high level of haplotypic diversity (0.9093). The phylogenies inferred from these haplotypes using ML and BI (Figure 1a) gave comparable topologies and suggested the presence of 15 putative species within the group *E. siliculosi*. Eleven of these lineages were highly supported monophyletic groups (bootstrap values > 84 for ML and > 0.98 for BI, Figure 1a) while the remaining four were singletons. Genetic pairwise K2P distances ranged from 0 to 0.089 and the shape of the distribution was clearly bimodal with two conspicuous maxima at 0.0025 and 0.0550. ABGD located the barcode gap within the 0.011-0.037 distance range

(Figure S1a) and primary partitions using this threshold suggested the existence of 15 genetic groups (Figure 1a, Figure S1b). The likelihood of the GMYC model, for both the single- and the multiple-threshold models (LGMYCsingle = 720.08 and LGMYCmultiple = 723.40), was significantly higher than the likelihood of the null model (L0 = 704.01). However, the partitions obtained were not identical for the different threshold limits; 16 groups were delimited with the single-threshold method (confidence limits, 15–18) and 22 groups were delimited with the multiple-threshold method (confidence limits, 18–26). The likelihood values of the single and multiple threshold analyses were not significantly different, suggesting that application of the more complex multiple-threshold analysis did not result in a significant improvement of the results. Thus, we selected the single threshold over the multiple threshold model to delimit putative species in our data set (Figure 1a, Figure S2).

The eleven monophyletic groups recovered by tree reconstructions were supported as putative species by the ABGD results while only ten out of these eleven clades were supported as putative species by the GMYC single threshold results. This discrepancy involved the split of two haplotypes (L211 and L206) from the rest of the *E. siliculosus* clade in the GMYC (Figure 1a, Figure S2). The four singletons observed in both phylogenetic reconstructions were defined as species by both ABGD and GMYC (Figure 1a, Figure S2). Integration of all species delimitation methods yielded 15 putative species in the *siliculosi* group. Two of them corresponded to *E. siliculosus* and *E. crouaniorum*, the rest were named using numbers 1 to 13 (Figure 1a).

Ectocarpus *putative species consolidation using ITS1 sequences*

As reported by Stache-Crain et al. (1997), the alignment of all the ITS1 sequences from the *siliculosi* group was not possible because of their high degree of divergence and the presence of numerous indels. Therefore, alignments were made for four sub-groups that were established based on sequence similarity: (1) *Ectocarpus* 1, 2, 4 and *E. siliculosus* (alignment length 885bp); (2) *Ectocarpus* 5, 6 and 7 (alignment length 447bp); (3) *Ectocarpus* 8, 9, 10 and 11 (alignment length 456bp); (4) *Ectocarpus* 12, 13 and *E. crouaniorum* (alignment length 686 bp). The ITS1 sequences of *Ectocarpus* 3 did not align well with any other putative species and were not included in these analyses. The topology of the unrooted ITS1 trees built for the alignment sub-groups were congruent with the putative species defined using the COI-5P sequences (Figure 1b). The ABGD analyses conducted within these four sub-groups of alignments were also remarkably congruent with the putative species defined using the COI-5P sequences (Figure 1b, Figure S3). The only discrepancy was the merging of *Ectocarpus* 12 and *Ectocarpus* 13 in the ABGD results (Figure 1b). Since both *Ectocarpus* 12 and *Ectocarpus* 13 were non-ambiguously defined as two separated putative species with the COI-5P and were retrieved as monophyletic groups in both tree reconstructions for ITS1, we decided to retain 15 consolidated species within the *siliculosi* group (Figure 1).

Cases of incongruences between markers

Even though results were largely concordant between markers and methods in delineating 15 consolidated species within the *siliculosi* group, incongruences between the nuclear and the mitochondrial markers were observed in several individuals collected in Chile (Table 2). In particular, a total of 20 individuals collected in Pan de Azúcar (site 26) and 9 individuals collected in Quintay (site 28), were identified as *E. crouaniorum* using the mitochondrial marker COI-5P but as *Ectocarpus* 12 using the nuclear marker ITS1. Moreover, one individual sampled in Quintay (site 28), which was identified as *Ectocarpus* 10 using the COI-5P mitochondrial marker, was identified as

Ectocarpus 11 based on the nuclear ITS1 marker and one individual collected in Concepción (site 29), which was identified as *Ectocarpus* 9 using the COI-5P was also identified as *Ectocarpus* 11 based on the nuclear marker.

Geographic distribution of the 15 Ectocarpus *species*

We chose to display the delimitation of the geographic distribution of the 15 species using the results of the mitochondrial COI-5P marker alone. However, it should be noted that a few discrepancies existed between the mitochondrial and the nuclear markers used in this study (see previous paragraph). Distribution patterns varied greatly among the species (Figure 2). Concerning the 10 most commonly sampled species, one seemed to be restricted to a single biogeographic region (*Ectocarpus* 7, n=32, found only in the Peruvian Province); four species showed a distribution limited to one ocean (*Ectocarpus* 1, n=30, and *Ectocarpus* 6, n=48, both found in North and South Pacific; *Ectocarpus* 10, n=39, distributed only in the South Pacific and *Ectocarpus* 3, n=29, observed only in the North Atlantic); and five species were encountered in more than one ocean. Among these five species, *Ectocarpus* 12 (n=16) and *Ectocarpus* 13 (n=34) were distributed in both the South Pacific and the North Atlantic. In the case of *Ectocarpus* 8 (n=14), the species was present in both oceans but only one sample was found in the Atlantic. *E. siliculosus* and *E. crouaniorum* were the most common species in our data set. *E. siliculosus* (n=206) was distributed in the Mediterranean Sea, the Pacific and the North Atlantic Oceans, and *E. crouaniorum* (n=258) was distributed in the South Pacific and the North Atlantic Oceans.

Haplotype Network

Haplotype networks were created for the 8 species for which >15 sequences were available for both markers (Figure 3). A star-like network pattern, which is usually associated with a recent population expansion, was obtained for six of the eight species studied. For example, *E. siliculosus* and *E. crouaniorum* had a single, frequent and widespread haplotype together with several less frequent haplotypes generally restricted to oceanic regions (Northern Atlantic, Lusitanian region, Mediterranean Sea or Peruvian province, Figure 3); this topology was consistent for both COI-5P and ITS1. In contrast, a more reticulate and complex haplotype network was observed for both markers with *Ectocarpus* 6.

Genetic diversity of E. siliculosus*,* E. crouaniorum *and* Ectocarpus *6*

Genetic diversity estimates (nH, H, π and S) were generally much lower for the mitochondrial marker than for the nuclear marker (Table S3, S4, S5 for *E. siliculosus, E. crouaniorum* and *Ectocarpus 6*, respectively). Regardless of the gene considered, no clear pattern of genetic diversity distribution could be detected within each of the three species (Table S3, S4, S5).

COI-5P data for *E. siliculosus* (Table S3) indicated that the highest number of haplotypes was on the NW Iberian Peninsula (nH=6, even though close values, i.e. nH=5, were also found for the United Kingdom, France and Chile) whereas the highest values of genetic diversity and nucleotide diversity were in Chile (H= 0.748 +/- 0.028 and π =0.237 +/- 0.164). ITS1 data gave similar results with the highest value of genetic diversity for the NW Iberian Peninsula (H= 0.862 +/- 0.045), the highest nucleotide diversity for Chile (π =0.653 +/- 0.364) and the highest number of polymorphic sites for France (S= 19) (Table S3). On the other hand, COI-5P data for *E. crouaniorum* (Table S4) indicated that the highest number of haplotypes as well as the highest values of nucleotide diversity and polymorphic sites were in France (*nH*=10, π =0.170 +/- 0.130, *S*= 11, Table S4) while the highest values of genetic diversity were in France and in the NW Iberian Peninsula (*H*= 0.624 +/- 0.092 and 0.679 +/- 0.080 respectively). ITS1 data for this same species indicated, however, that the highest number of haplotypes was in the United Kingdom (*nH*=23) and Chile (*nH*=23) while all values of genetic diversity were close to one, whatever the region (Table S4). Within *Ectocarpus* 6, because of the distribution pattern of this species (Figure 3), estimations of genetic diversity were carried out only along the Chilean coast (Table S5). The population of Las Cruces (LAC, Table 1), the largest population of *Ectocarpus* 6 (n=28), showed the highest number of haplotypes, genetic diversity, and polymorphic sites for both markers: *nH*= 6, H= 0.791+/- 0.048 and *S*= 8 for COI-5P, and *nH*= 19, *H*= 0.934 +/- 0.0343 and *S*= 38 for ITS1 (Table S5).

AMOVA analysis of the cosmopolitan species E. siliculosus *and* E. crouaniorum

Results of the nested Analysis of Molecular Variance (AMOVA) for both markers are given in Tables 3 and 4 for *E. siliculosus* and *E. crouaniorum*, respectively. These analyses suggested that the total genetic variance was mainly explained by variance within sites: 55,81% and 65,18% in *E. siliculosus*, 59,07% and 77,39% in *E. crouaniorum*, for the COI-5P and the ITS1, respectively. The variances among regions (< 13% in *E. siliculosus* and < 11% in E. *crouaniorum*) and among sites within regions (< 32% in *E. siliculosus* and < 31% in *E. crouaniorum*), although significant, were lower than the variance within sites (Tables 3 and 4).

Tide level distribution of E. siliculosus, E. crouaniorum *and* Ectocarpus *6*

Ectocarpus species occurred from the upper subtidal up to intertidal pools (Figure 4). Along the North Atlantic coast, different tide-level distributions were observed for the two most abundant *Ectocarpus* species (see Figure 4). *E. crouaniorum* occurred from the high intertidal to the high subtidal but was most abundant within higher intertidal pools (Figure 4). *E. siliculosus*, which also occurred from the high intertidal to the high subtidal, was most abundant in the lower tidal areas (Figure 4). The distribution of *E. crouaniorum* followed the same pattern in Chile as on the North Atlantic coast. For *E. siliculosus*, no clear pattern of distribution could be inferred in Chile since most samples were collected as drifting thalli that had been washed ashore. *Ectocarpus* 6 was found from medium intertidal to subtidal levels and was more abundant in the low intertidal (Figure 4).

Discussion

In this study, we have characterized the species diversity, geographic distribution, and phylogeographic patterns within the group *siliculosi* of the genus *Ectocarpus*. The results presented are based on the most extensive sampling of this group available to date. Using a mitochondrial and a nuclear marker, two complementary species delineation techniques and two tree reconstruction methods, we propose the recognition of 15 putative species within the *siliculosi* group. *E. siliculosus* and *E. crouaniorum*, the only two named species within the *siliculosi* group (Peters et al. 2010a, 2010b, 2015, Couceiro et al. 2015), were recovered as different species belonging to the most highly divergent clades in our study. We confirmed also that the genome-sequenced species (that we referred as *Ectocarpus* 7) is different from *E. siliculosus,* as recently suggested by Peters et al. (2015). Moreover, we found individuals showing incongruences between the nuclear and mitochondrial markers suggesting introgression, hybridization or incomplete lineage sorting between some of the newly delineated closely related species. Finally, our extensive sampling along the NEA and SEP coasts revealed that the 15 *Ectocarpus* species showed different patterns of distribution varying from rare to common cosmopolitan species. Haplotype network topologies for the commonest species showed different patterns of genetic structure suggesting different evolutionary histories.

High species diversity within the siliculosi *group*

Concordance across results obtained with different methods (monophyly in tree reconstruction, ABGD and GMYC) and the use of unlinked molecular markers (COI-5P and ITS1) are now widely acknowledged methods of supporting the delimitation of previously undescribed species (Carstens et al. 2013, Modica et al. 2014). Indeed, one could expect that unlinked selectively neutral genes will attain concordant genealogical histories when taxa have undergone species-level divergence (i.e., no gene flow for a sufficient amount of time), while reticulate genealogical patterns across those unlinked loci will be observed when genetic exchange exists between taxa (Sites and Marshall 2004). Our results showed an 80% concordance between methods, a result congruent with studies undertaken in hyper-diverse taxa such as insects (Kekkonen and Hebert 2014). Previous studies have shown that GMYC can lead to an overestimation of group partitioning while ABGD is considered as a more conservative method to delimit species (Puillandre et al. 2012a, 2012b, Kekkonen and Hebert 2014), a result concordant with what was observed in the *siliculosi* group. Despite few discordances detected between our ABGD and GMYC analyses, all putative genetic groups formed highly divergent singletons or monophyletic groups for both markers. For the COI-5P marker, the barcode gap ranged from 0.011-0.037 K2P pairwise genetic distance, which included the cut-off value (0.018) proposed empirically (by eye) by Peters et al. (2015) for *Ectocarpu*s and other genera of Ectocarpales.

The phylogenetic relationships among the 15 species revealed the occurrence of a monophyletic group composed of *E. crouaniorum*, *Ectocarpus* 12, *Ectocarpus* 13 and a paraphyletic assemblage composed of the remaining 12 other species within the *siliculosi* group. This branching pattern was retrieved in all previous phylogenetic studies despite a disagreement between the tree topologies depending on the marker used (ITS1 and rubisco spacer: Stache-Crain et al. 1997; ITS1, ITS2, Rubisco spacer region, *cox*3 and *rps*14-*atp*8: Peters et al. 2010a; ITS1, ITS2, Rubisco spacer and *cox*3: Peters et al. 2010b, COI-5P: Peters et al. 2015; COI-5P and ITS1: this study). Incomplete and/or uneven taxon sampling could produce different tree topologies. Previous studies have reported that the inclusion of additional taxa in a phylogenetic analysis can increase (on average) the accuracy of the inferred topology (Lecointre et al. 1993, Hillis et al. 2003, Hedtke et al. 2006).

A problem generated by the various attempts at resolving the *Ectocarpus* phylogeny is the use of various species codes (Stache-Crain et al. 1997, Peters et al. 2010a, 2010b). In our work some clades previously described in the literature were retained as different species (clades 1a, 1c, 2a, 2b, 2c and 3; Stache-Crain et al. 1997, Peters et al. 2010a, 2010b), while other clades were split into different species (1b and 4) (Stache-Crain et al. 1997, Peters et al. 2010a, 2010b) (see Table S6 for the correspondence between previously distinguished “lineages” and the species code proposed in this study).

Our study detected high levels of cryptic species diversity in the *siliculosi* group, as suggested in previous studies (Stache-Crain et al. 1997, Peters et al. 2010a, 2010b). However, it is highly probable that more species exist within this species complex. Indeed, within our data set, two species comprised more than 62% of the samples sequenced (*E. siliculosus* and *E. crouaniorum*) while 3 species (*Ectocarpus* 2, *Ectocarpus* 4 and *Ectocarpus* 5) were rare and were represented by less than 5 individuals. It will be necessary to carry out additional population sampling including a better representation of different biogeographic regions in order to better estimate species diversity and distribution of *Ectocarpus* in a worldwide context. The temperate waters of the southern Australia and the NW Pacific require particular scrutiny since the few sequenced samples from this region (N=12, 1.5% of the samples sequenced) included two species not encountered in other regions (*Ectocarpus* 2 and *Ectocarpus* 5). The high number of cryptic species present in sympatry within the same locality, especially in Chile, raises the question of what evolutionary mechanisms could reduce interspecific competition and promote such patterns. Peters et al. (2010a), Couceiro et al. (2015) and Geoffroy et al. (2015) showed that tide level, substratum and season are important factors that have to be taken into account when studying filamentous Ectocarpales. They reported that different species could occupy different spatio-temporal ecological niches related to different tide levels and/or host specificity. For example, Peters et al. (2010a) and Couceiro et al. (2015) showed that *E. crouaniorum* was located higher on the shore than *E. siliculosus* in NW France. In our study, this difference in tide level distribution between *E. crouaniorum* and *E. siliculosus* was corroborated for additional sites in the North Atlantic. Moreover, among the Chilean coast, *Ectocarpus* 6 seemed more restricted to mid-intertidal pools. These first results provide a good opportunity to study the importance of ecological differentiation between the cryptic species of *Ectocarpus*.

Incongruence between markers

The huge variability in the level of genetic divergence between species revealed in this study will allow the correlation between reproductive incompatibility and degree of species divergence to be investigated in this genus. Cross-compatibility experiments have been carried out between laboratory strains of *E. siliculosus* and *E. crouaniorum* (Peters et al. 2010a), between *E. siliculosus* and *Ectocarpus* 7, between *Ectocarpus* 7 and *Ectocarpus* 1 (Peters et al. 2004), and between *E. siliculosus* and *Ectocarpus* 1 (Stache-Crain et al. 1997). Hybrid sporophytes from the four crosses were viable but incapable of meiosis. Müller and Kawai (1991), in contrast, crossed an *Ectocarpus* from Japan, which is closely related to the genome-sequenced strain based on its ITS sequence but for which COI-5P sequences are so far unavailable, with *E. siliculosus*, and obtained meiosis-competent hybrid sporophytes. This cross definitively needs confirmation.

The situation in the field is less well studied. Peters et al. (2010a, 2010b) revealed the presence of field hybrids between *E. siliculosus* and *E. crouaniorum* in Chile and France but nothing is known about the proportion of hybrids in natural populations. Inspection of tree topologies obtained for several loci from different compartments have been successfully applied to identify potential cases of introgression and ancient hybridization events in natural populations (Peters et al. 2007). In our data set, a low percentage of incongruence (6%) was observed between results obtained with the mitochondrial and the nuclear marker. The species involved were phylogenetically more closely related than the crosses mentioned in the last paragraph (Figure 1a, 1b). Incongruent individuals were found exclusively among Chilean samples collected at sites where the respective species were in contact. Taken together, our results suggest the existence of different levels of reproductive barriers within the *E. siliculosi* complex, leading to mtDNA introgression only between some species pairs. Incomplete reproductive isolation may have an important bearing on the evolutionary trajectories of species by decreasing divergence between species but also by allowing new favorable mutations and allelic combinations to transgress species boundaries (Allendorf et al. 2001, Mallet et al. 2005). However, both incomplete lineage sorting and hybridization lead to similar gene tree incongruence signatures and distinguishing between those two processes has proven difficult (Knowles 2004). Hybridization may be high between closely related species, unfortunately, incomplete lineage sorting is also likely to be at least partly responsible of the gene tree incongruences in species complexes of recent origin. New statistical frameworks, which allow testing for hybridization despite incomplete lineage sorting, have been developed recently (see Yu et al. 2011 and references therein). More extensive sampling, adapted genetic tools and analyses are needed to estimate the extent and importance of hybridization between the species of the *siliculosi* group in the field.

Species distribution

During our study we extensively sampled two coasts where strong biogeographic boundaries are recognized. Along the Chilean coast, two biogeographic boundaries have been described (Camus et al. 2001). The first is located at 30-33°S and separates the Peruvian Province from the Intermediate Area; the second is located at 42°S and separates the Intermediate area from the Magellanic Province. Along the European coast, the Celtic-Sea/Brittany area has been described as a biogeographical transition zone between the Northern European Sea and the Lusitanian Province while the front Almería-Oran separates the Mediterranean coasts from the Atlantic ones (Spalding et al. 2007). Several phylogeographic studies have reported a concordance between genetic discontinuities and biogeographic boundaries, attributing this pattern to the existence of historical barriers caused by oceanographic or climatic features (for Chile see the reviews Haye et al. 2014 and Guillemin et al. 2016; for Europe see see the reviews Maggs et al. 2008 and Neiva et al. 2016). Interestingly, the species for which the genome has been sequenced, *Ectocarpus* 7 (n=32), is apparently restricted to the Peruvian Province; Peters et al. (2010b) previously found similar results using a smaller sampling scheme. The Peruvian Province is characterized by continuous upwelling of cool water (16–20°C at the sea surface) and is also affected by recurrent El Niño events, causing several weeks of higher sea surface temperatures (more than 10°C of amplitude) as a result of the southward incursion of warm waters (Peters and Breeman 1993). The distribution range of *Ectocarpus* 7 may reflect an adaptation of individuals to this specific oceanographic environment. Apart for *Ectocarpus* 7, our results did not support the existence of extensive biogeographic or phylogeographic breaks for other *Ectocarpus* species. This lack of phylogeographic structure has been reported for species that have high dispersal capacities and/or for invasive species (Cárdenas et al. 2009, Haye et al. 2014, Guillemin et al. 2014). Short dispersal distances of spores, gametes or zygotes coupled with rare events of long distance colonization seem to be the rule for the Phaeophyceae (Reed 1990, Raimondi et al. 2004, Neiva et al. 2012, Robuchon et al. 2014). However, *Ectocarpus* is described as an important contributor to biofouling and long-distance dispersal might be associated with human transport (Stache-Crain et al. 1997). Indeed, we detected two truly cosmopolitan species (*E. siliculosus* and *E. crouaniorum*) showing a star-like haplotype network and shared haplotypes between continents, a pattern characteristic of a recent expansion that may be facilitated by human activities. *Ectocarpus* 1 and *Ectocarpus* 6 occur in both the northern and the southern Pacific Ocean. Despite the large distances separating the sampled populations of these two species, no genetic structure was detected in their haplotype networks, a pattern suggestive of recent dispersal events between the North and South Pacific coasts. Similarly, no phylogeographic structure was observed for three South Pacific species (*Ectocarpus* 9, *Ectocarpus* 10 and *Ectocarpus* 11) nor for one North Atlantic species (*Ectocarpus* 3). It has been suggested that recent colonization events can eliminate genetic structure linked to historical barriers (Smith et al. 2011, DiBattista et al. 2012), thus the introductions of *Ectocarpus* species through shipping activities could explain the lack of phylogeographic structure in our study. Stache-Crain et al. (1997) have indeed reported that strains belonging to *E. siliculosus sensu stricto* (referred as lineage 1a) sampled from different continents show a maximum of 5 substitutions for the ITS marker; these authors suggest that recent dispersal events could have shaped the genetic diversity in this species. Both natural dispersal after the Pleistocene and transport via shipping have been proposed for this species (Stache-Crain et al. 1997). In our study, the distribution of *Ectocarpus* 8 seems related to dispersal associated with human transport. This species was present in the South Pacific and a single sample was found in the North Atlantic. This sample corresponds to an individual collected in the Kingsbridge Estuary (Devon, England). This could suggest a recent arrival of this species in the English Channel in ballast water or attached to a ship hull. Even if the dispersal capacity of *Ectocarpus* might be favored by shipping, when the number of samples was sufficient to perform within-species genetic differentiation analyses, we always found a slight but significant hierarchical pattern of genetic differentiation (i.e. see Table 3 and 4; results of the nested AMOVA). Consequently, the pattern of genetic differentiation may be more complex than what we found in this study and sampling effort needs to be improved for all species in order to get a comprehensive idea of species distribution, species phylogeography and population connectivity.

Conclusion

Using DNA sequence data and species delimitation methods we have observed the presence of at least fifteen species within the *Ectocarpus siliculosi* group. Species showed different patterns of distribution and suggested different evolutionary histories. Further scrutiny of individuals cultivated in controlled laboratory conditions may reveal consistent morphological differences between species. However, future research on speciation in these filamentous brown algae will have to take into account that in the field, it is impossible to distinguish between species within the *E. siliculosi* group. This contrasts clearly with the significant morphological differences observed between recently diverging species in other Phaeophyceae, such as *Fucus* (Coyer et al. 2011, Cánovas et al. 2011). In any case, the complex pattern of phylogenetic relationships among the 15 species revealed in this study, opens a very interesting field of research deciphering the process of evolution and diversification in this group using the tools available from the model organism for genomics and genetics of the brown macroalgae.

Acknowledgments

We are particularly grateful to C. Destombe, S. Faugeron, A. Mann, D.G. Müller, P. Murúa, D. Patiño, D. Schroeder, J. West and R. Westermeier, who helped by collecting samples. The authors thank Biogenouest Core Facility for technical assistance and the members of Grupo BioCost of Coruña University for advice and logistic support during sampling in Galicia and North Portugal. We also thank to S. Mauger for assistance in the molecular laboratory and L. Dartevelle and J. Coudret for help in maintaining strains in the Station Biologique de Roscoff. We particularly appreciated insightful and constructive comments from C. Destombe and J. M. Cock. Principal funding came from a doctoral grant to A. E. Montecinos (Becas-Chile, CONICYT, advanced human resources program), additional support from the projects IDEALG (France: ANR-10-BTBR-04), “Bibliothèque du vivant” (France: INRA-MNHN-INEE-CNRS) and Bi-Cycle (France: ANR10-BLAN-1727), the EU FP7 “capacities” specific program ASSEMBLE (grant no. 227799), the EU Interreg program France (Channel)—England (project Marinexus), the TOTAL Foundation (Project “Brown algal biodiversity and ecology in the Eastern Mediterranean Sea”), and a Ray-Lankester Fellowship (UK: Marine Biological Association, Plymouth) to A. F. Peters. The work was carried out within the context of the international research network "Diversity, Evolution and Biotechnology of Marine Algae" (GDRI N° 0803). The authors have declared that no competing interests exist.

References

Allendorf, F. W., Leary, R. F., Spruell, P. & Wenburg, J. K. 2001. The problems with hybrids: setting conservation guidelines. *Trends Ecol. Evol.* 16:613–22.

Alò, D., Correa, C., Arias, C. & Cárdenas, L. 2013. Diversity of *Aplochiton* fishes (Galaxiidea) and the taxonomic resurrection of *A. marinus*. *PLoS One* 8:e71577.

Bandelt, H. J., Forster, P. & Röhl, A. 1999. Median-joining networks for inferring intraspecific phylogenies. *Mol. Biol. Evol.* 16:37–48.

Camus, P. 2001. Biogeografía marina de Chile continental**.** *Rev. Chil. Hist. Nat.* 74**:**587–617.

Cánovas, F. G., Mota, C. F., Serrao, E. A. & Pearson, G. A. 2011. Driving south: a multi-gene phylogeny of the brown algal family Fucaceae reveals relationships and recent drivers of a marine radiation. *BMC Evol. Biol.* 11:371–96.

Cárdenas, L., Castilla, J. C. & Viard, F. 2009. A phylogeographical analysis across three biogeographical provinces of the south-eastern Pacific: the case of the marine gastropod *Concholepas concholepas. J. Biogeogr.* 36: 969–81.

Cardinal, A. 1964. *Étude sur les Ectocarpacées de la Manche*. Cramer, J., Weinheim, 86 pp.

Carstens, B. C. & Satler, J. D. 2013. The carnivorous plant described as *Sarracenia alata* contains two cryptic species. *Biol. J. Linn. Soc.* 109:737–46.

Carstens, B. C., Pelletier, T. A., Reid, N. M. & Satler, J. D. 2013. How to fail at species delimitation. *Mol. Ecol.* 22:4369–83.

Cock, J. M., Sterck, L., Rouze, P., Scornet, D., Allen, A. E., Amoutzias, G., Anthouard, V., Artiguenave, F., Aury, J. M., Badger, J. H., Beszteri, B., Billiau, K., Bonnet, E., Bothwell, J. H., Bowler, C., Boyen, C., Brownlee, C., Carrano, C. J., Charrier, B., Cho, G. Y., Coelho, S. M., Collen, J., Corre, E., Da Silva, C., Delage, L., Delaroque, N., Dittami, S. M., Doulbeau, S., Elias, M., Farnham, G., Gachon, C. M., Gschloessl, B., Heesch, S., Jabbari, K., Jubin, C., Kawai, H., Kimura, K., Kloareg, B., Kupper, F. C., Lang, D., Le Bail, A., Leblanc, C., Lerouge, P., Lohr, M., Lopez, P. J., Martens, C., Maumus, F., Michel, G., Miranda-Saavedra, D., Morales, J., Moreau, H., Motomura, T., Nagasato, C., Napoli, C. A., Nelson, D. R., Nyvall-Collen, P., Peters, A. F., Pommier, C., Potin, P., Poulain, J., Quesneville, H., Read, B., Rensing, S. A., Ritter, A., Rousvoal, S., Samanta, M., Samson, G., Schroeder, D. C., Segurens, B., Strittmatter, M., Tonon, T., Tregear, J. W., Valentin, K., von Dassow, P., Yamagishi, T., Van de Peer, Y. & Wincker, P. 2010. The *Ectocarpus* genome and the independent evolution of multicellularity in brown algae. *Nature* 465:617–21.

Cornils, A. & Held, C. 2014. Evidence of cryptic and pseudocryptic speciation in the *Paracalanus parvus* species complex (Crustacea, Copepoda, Calanoida). *Front. Zool.* 11:19.

Couceiro, L., Le Gac, M., Hunsperger, H. M., Mauger, S., Destombe, C., Cock, J. M., Ahmed, S., Coelho, S. M., Valero, M. & Peters, A. F. 2015. Evolution and maintenance of haploid-diploid life cycles in natural populations: the case of the marine brown alga *Ectocarpus*. *Evolution* 69:1808–22.

Coyer, J., Hoarau, G., Costa, J., Hogerdijk, B., Serrão, E. A., Billard, E., Valero, M., Pearson, G. A. & Olsen, J. L. 2011. Evolution and diversification within the intertidal brown macroalgae *Fucus spiralis*/*F. vesiculosus* species complex in the North Atlantic. *Mol. Phylogenet. Evol.* 58: 283–96.

Coyne, J. A. & Orr, H. A. 2004. *Speciation*. Sinauer Associates, Sunderland, Massachusetts, 545 pp.

Darriba, D., Taboada, G. L., Doallo, R. & Posada, D. 2012. jModelTest 2: more models, new heuristics and parallel computing. *Nat. Methods* 9:772.

DiBattista, J. D., Rocha, L. A., Craig, M. T., Feldheim, K. A. & Bowen, B. W. 2012. Phylogeography of two closely related Indo-Pacific butterflyfishes reveals divergent evolutionary histories and discordant results from mtDNA and microsatellites. *J. Hered.* 103:617–29.

Dillwyn, L. W. 1809. *British Confervae; or colored figures and descriptions of the British plants referred by botanists to the genus Conferva.* Phillips, W., Tard, G. & Street, L. London, 1–87, 1–6 (Index and Errata), Plates 69, 100–109, A–G (with text).

Drummond, A. J., Suchard, M. A., Xie, D. & Rambaut, A. 2012. Bayesian phylogenetics with BEAUti and the BEAST 1.7. *Mol. Biol. Evol.* 29:1969–73.

Dupuis, J. R., Roe, A. D. & Sperling, F. A. 2012. Multi-locus species delimitation in closely related animals and fungi: one marker is not enough. *Mol. Ecol.* 21: 4422–36.

Excoffier, L., Smouse, P. E. & Quattro, J. M. 1992. Analysis of molecular variance inferred from metric distances among DNA haplotypes: application to human mitochondrial DNA restriction data. *Genetics* 131:479–91.

Excoffier, L. & Lischer, H. E. L. 2010. Arlequin suite ver 3.5: a new series of programs to perform population genetics analyses under Linux and Windows. *Mol. Ecol. Resour.* 10:564–7.

Geoffroy, A., Mauger, S., De Jode, A., Le Gall, L. & Destombe, C. 2015. Molecular evidence for the coexistence of two sibling species in *Pylaiella littoralis* (Ectocarpales, Phaeophyceae) along the Brittany coast. *J. Phycol*. 51:480–9.

Goldstein, P. Z. & DeSalle, R. 2011. Integrating DNA barcode data and taxonomic practice: determination, discovery, and description. *Bioessays* 33:135–47.

Guillemin, M. L., Valero, M., Faugeron, S., Nelson, W. & Destombe, C. 2014. Tracing the trans-Pacific evolutionary history of a domesticated seaweed (*Gracilaria chilensis*) with archaeological and genetic data. *PLoS One* 9:e114039.

Guillemin, M. L., Valero, M., Tellier, F., Macaya, E. C., Destombe, C. & Faugeron, S. 2016. *Phylogeography of seaweeds in the South East Pacific: complex evolutionary processes along a latitudinal gradient. In:* Hu, Z. M & Fraser, C. I. [Eds.] *Seaweed Phylogeography*. Springer, Berlin, Germany, pp. 251–77.

Hamel, G. 1931–1939. *Phéophycées de France*. Wolf, Paris, XLVII + 431 pp., 9 plates.

Haye, P. A., Segovia, N. I., Muñoz-Herrera, N. C., Galvez, F. E., Martínez, A., Meynard, A., Pardo-Gandarillas, M. C., Poulin, E. & Faugeron, S. 2014. Phylogeographic structure in benthic marine invertebrates of the southeast Pacific coast of Chile with differing dispersal potential. *PLoS One* 9:e88613.

Hebert, P. D. N., Cywinska, A., Ball, S. L. & deWaard, J. R. 2003. Biological identifications through DNA barcodes. *P. Roy. Soc. B-Biol. Sci.* 270:313–21.

Hedtke, S. M., Townsend, T. M. & Hillis, D. M. 2006. Resolution of phylogenetic conflict in large data sets by increased taxon sampling. *Syst. Biol.* 55:522–9.

Hillis, D. M., Pollock, D. D., McGuire, J. A. & Zwickl, D. J. 2003. Is sparse taxon sampling a problem for phylogenetic inference? *Syst. Biol.* 52:124–6.

Huelsenbeck, J. P. & Ronquist, F. 2001. MRBAYES: Bayesian inference of phylogeny. *Bioinformatics* 8:754–5.

Kekkonen, M. & Hebert, P. D. N. 2014. DNA barcode-based delineation of putative species: efficient start for taxonomic workflows. *Mol. Ecol. Resour.* 14:706–15.

Knowles, L. 2004. The burgeoning field of statistical phylogeography. *J. Evol. Biol.* 17: 1–10.

Lane, C. E., Lindstrom, S. C. & Saunders, G. W. 2007. A molecular assessment of northeast Pacific *Alaria* species (Laminariales, Phaeophyceae) with reference to the utility of DNA barcoding. *Mol. Phylogenet. Evol.* 44:634–48.

Lecointre, G., Philippe, H., Vân Lê, H. L. & Le Guyader, H. 1993. Species sampling has a major impact on phylogenetic inference. *Mol. Phylogenet. Evol.* 2:205–24.

Librado, P. & Rozas, J. 2009. DnaSP v5: a software for comprehensive analysis of DNA polymorphism data. *Bioinformatics* 25:1451–2.

Lyngbye, H. C. 1819. *Tentamen hydrophytologiae danicae; continens omnia hydrophyta cryptogama Daniae, Holsatiae, Faeroae, Islandiae, Groenlandiae hucusqve cognita, systematice disposita, descripta et iconibus illustrata, adjectis simul speciebus norvegicis. Opus, praemio ab Universitate regia hafniensi ornatum, et sumtu regio editum*. Hafniae, typis Schultzianis, in commissis Librariae Gyldendaliae, Copenhagen, 440 pp.

Maggs, C., Castilho R., Foltz D., Hensler, C., Jolly, M. T., Kelly, J., Olsen, J. L., Perez, E., Stam., W. T., Vainola, R., Viard, F. & Wares, J. P. 2008. Evaluating signatures of glacial refugia for North Alantic benthic marine taxa. *Ecology* 89:108–22.

Mallet, J. 2005. Hybridization as an invasion of the genome. *Trends Ecol. Evol.* 20:229–37.

Mayden, R. L. 1997. A hierarchy of species concepts: the denouement in the saga of the species problem. *In*: Claridge, M. F., Dawah, H. A. & Wilson, M. R. [Eds.] *Species: The units of diversity.* Chapman and Hall, London, UK, pp. 381–423.

Mayden, R. L. 1999. Consilience and a hierarchy of species concepts: advances toward closure on the species puzzle. *J. Nematol.* 31:95–116.

Modica, M. V., Puillandre, N., Castelin, M., Zhang, Y. & Holford, M. 2014. A good compromise: rapid and robust species proxies for inventorying biodiversity hotspots using the Terebridae (Gastropoda: Conoidea). *PLoS One* 9:e102160.

Müller, D. G. 1976. Sexual isolation between Europe and an American population of *Ectocarpus siliculosus* (Phaeophyta). *J. Phycol.* 12:252–54.

Müller, D. G. 1977. Sexual reproduction in British *Ectocarpus siliculosus* (Phaeophyta). *Brit. Phycol. J.* 12:131–36.

Müller, D. G. 1979. Genetic affinity of *Ectocarpus siliculosus* (Dillw.) Lyngb. from the Mediterranean, North Atlantic and Australia. *Phycologia* 18:312–18.

Müller, D. G. 1988. Studies on sexual compatibility between *Ectocarpus siliculosus* (Phaeophyceae) from Chile and the Mediterranean Sea. *Helgoländer Meeresun.* 42:469–76.

Müller, D. G. & Kawai, H. 1991. Sexual reproduction of *Ectocarpus siliculosus* (Ectocarpales, Phaebphyceae) in Japan. *Jpn. J. of Phycol*. 39: 151–56.

Müller, D. G. & Eichenberger, W. 1995. Crossing experiments, lipid composition, and the species concept in *Ectocarpus siliculosus* and *E. fasciculatus* (Phaeophyceae, Ectocarpales). *J. Phycol.* 31:173–76.

Monaghan, M. T., Wild, R., Elliot, M., Fujisawa, T., Balke, M., Inward, D. J. G., Lees, D. C., Ranaivosolo, R., Eggleton, P., Barraclough, T. G. & Vogler, A. P. 2009. Accelerated species inventory on Madagascar using coalescent-based models of species delineation. *Syst. Biol.* 58:298–311.

Nei, M. & Li, W. H. 1979. Mathematical model for studying genetic variation in terms of restriction endonucleases**.** *P. Natl. Acad. Sci. USA* 76:5269–73.

Neiva, J., Pearson, G. A., Valero, M. & Serrão, E. A. 2012. Fine-scale genetic breaks driven by historical range dynamics and ongoing density-barrier effects in the estuarine seaweed *Fucus ceranoides* L.. *BMC Evol. Biol.* 12:78.

Neiva, J., Serrão, E. A., Assis, J., Pearson, G. A., Coyer, J. A., Olsen, J. L., Hoarau, G. & Valero, M. 2016. Climate oscillations, range shifts and phylogeographic patterns of North Atlantic Fucaceae. *In:* Hu, Z. M & Fraser, C. I. [Eds.] *Seaweed Phylogeography*. Springer, Berlin, Germany, pp. 279–308.

Pante, E., Puillandre, N., Viricel, A., Arnaud-Haond, S., Aurelle, D., Castelin, M., Chenuil, A., Destombe, C., Forcioli, D., Valero, M., Viard, F. & Samadi, S. 2015. Species are hypotheses: avoid connectivity assessments based on pillars of sand. *Mol. Ecol.* 24:525–44.

Pardo, C., Lopez, L., Peña, V., Hernández-Kantún, J., Le Gall, L., Bárbara, I. & Barreiro, R. 2014. A multilocus species delimitation reveals a striking number of species of coralline algae forming maerl in the OSPAR maritime area. *PLoS One* 9:e104073.

Payo, D. A., Leliaert, F., Verbruggen, H., D'Hondt, S., Calumpong, H. P. & De Clerck, O. 2012. Extensive cryptic species diversity and fine-scale endemism in the marine red alga *Portieria* in the Philippines. *P. Roy. Soc. B-Biol. Sci.* 280:20122660.

Peters, A. F. & Breeman, A. M. 1993. Temperature tolerance and latitudinal range of brown algae from temperate Pacific South America. *Mar. Biol.* 115:143–50.

Peters, A. F., Marie, D., Scornet, D., Kloareg, B. & Cock, J. M. 2004. Proposal of *Ectocarpus siliculosus* (Ectocarpales, Phaeophyceae) as a model organism for brown algal genetics and genomics. *J. Phycol.* 40:1079–88.

Peters, J. L., Zhuravlev, Y., Fefelov, I., Logie, A., & Omland, K. E. 2007. Nuclear loci and coalescent methods support ancient hybridization as cause of mitochondrial paraphyly between gadwall and falcated duck (*Anas* spp.). *Evolution*. 61:1992–2006.

Peters, A. F., Van Wijk, S. J., Cho, G. Y., Scornet, D., Hanyuda, T., Kawai, H., Schroeder, D. C., Cock, J. M. & Boo, S. M. 2010a. Reinstatement of *Ectocarpus crouaniorum* Thuret in Le Jolis as a third common species of *Ectocarpus* (Ectocarpales, Phaeophyceae) in Western Europe, and its phenology at Roscoff, Brittany. *Phycol. Res.* 58:157–70.

Peters, A. F., Mann, A. D., Cordova, C. A., Brodie, J., Correa, J. A., Schroeder, D. C. & Cock, J. M. 2010b. Genetic diversity of *Ectocarpus* (Ectocarpales, Phaeophyceae) in Peru and northern Chile, the area of origin of the genome-sequenced strain. *New Phytol.* 188:30–41.

Peters, A. F., Couceiro, L., Tsiamis, K., Küpper, F. C. & Valero, M. 2015. Barcoding of cryptic stages of marine brown algae isolated from incubated substratum reveals high diversity in Acinetosporaceae (Ectocarpales, Phaeophyceae). *Cryptogamie Algol.* 36:3–29.

Pons, J., Barraclough, T. G., Gomez-Zurita, J., Cardoso, A., Duran, D. P., Hazell, S., Kamoun, S., Sumlin, W. D. & Vogler, A. P. 2006. Sequence-based species delimitation for the DNA taxonomy of undescribed insects. *Syst. Biol.* 55:595–609.

Prevot, V., Jordaens, K., Sonet, G. & Backeljau, T. 2013. Exploring species level taxonomy and species delimitation methods in the facultatively self-fertilizing land snail genus *Rumina* (Gastropoda: Pulmonata). *PLoS One* 8:e60736.

Puillandre, N., Lambert, A., Brouillet, S. & Achaz, G. 2012a. ABGD, Automatic Barcode Gap Discovery for primary species delimitation. *Mol. Ecol.* 21:1864–77.

Puillandre, N., Modica, M. V., Zhang, Y., Sirovich, L., Boisselier, M. C., Cruaud, C., Holford, M. & Samadi, S. 2012b. Large-scale species delimitation method for hyperdiverse groups. *Mol. Ecol.* 21:2671–91.

Raimondi, T., Reed, D. C., Gaylord, B. & Washburn, L. 2004. Effects of self-fertilization in the giant kelp, *Macrocystis pyrifera*. *Ecology* 85: 3267–76.

Rambaut, A. & Drummond, A. J. 2010. TreeAnnotator version 1.6.1. Available at: http://beast.bio.ed.ac.uk/treeannotator (last accessed 05 January 2015).

Reed, D. C. 1990. The effects of variable settlement and early competition on patterns of kelp recruitment. *Ecology* 71: 776–87.

Robuchon, M., Le Gall, L., Mauger, S. & Valero, M. 2014. Contrasting genetic diversity patterns in two sister kelp species co-distributed along the coast of Brittany. *Mol. Ecol.* 23:2669–85.

Russell, G. 1966. The genus *Ectocarpus* in Britain. I. The attached forms. *J. Mar. Biol. Assoc. UK.* 46:267–94.

Russell, G. 1967a. The genus *Ectocarpus* in Britain II. The free-living forms. *J. Mar. Biol. Assoc. UK.* 47:233–50.

Russell, G. 1967b. The ecology of some free-living Ectocarpaceae. *Helg. Wiss. Meer.* 15:155–62.

Russell, G. 1983a. Formation of an ectocarpoid epiflora on blades of *Laminaria digitata*. *Mar. Ecol.-Prog. Series* 11:181–87.

Russell, G. 1983b. Parallel growth patterns in algal epiphytes and *Laminaria* blades. *Mar. Ecol.-Prog. Series* 13:303–4.

Sites, J. W. & Marshall, J. C. 2003. Delimiting species: a renaissance issue in systematic biology. *Trends Ecol. Evol.* 18:462–70.

Sites, J. W. & Marshall, J. C. 2004. Operational criteria for delimiting species. *Annu. Rev. Ecol. Evol. S.* 35:199–227.

Smith, B. T., Escalante, P., Hernández Baños, B. E., Navarro-Sigüenza, A. G., Rohwer, S. & Klicka, J. 2011. The role of historical and contemporary processes on phylogeographic structure and genetic diversity in the Northern Cardinal, *Cardinalis cardinalis*. *BMC Evol. Biol.* 11:136.

Spalding, M. D., Fox, H. E., Allen, G. R., Davidson, N., Ferdaña, Z. A., Finlayson, M., Halpern, B. S., Jorge, M. A., Lombana, A., Lourie, S. A, Martin, K. D., McManus, E., Molnar, J., Recchia, C. A. & Robertson, J. 2007. Marine ecoregions of the world: a bioregionalization of coastal and shelf areas. *Bioscience* 57:573–83.

Stache, B. 1990. Sexual compatability and species concept in *Ectocarpus siliculosus* (Ectocarpales, Phaeophyceae) from Italy, North Carolina, Chile, and New Zealand. *In* Garbary, D. J. & South, G. R. [Eds.] *Evolutionary Biogeography of the Marine Algae of the North Atlantic*. Springer Verlag, Berlin, Germany: pp. 173–86.

Stache-Crain, B., Müller, D. G. & Goff, L. J. 1997. Molecular systematics of *Ectocarpus* and *Kuckuckia* (Ectocarpales, Phaeophyceae) inferred from phylogenetic analyses of nuclear and plastid-encoded DNA sequences. *J. Phycol.* 33:152–68.

Stamatakis, A., Hoover, P. & Rougemont, J. 2008. A fast bootstrapping algorithm for the RAxML web-servers". *Syst. Biol.* 57: 758–71.

Stamatakis, A. 2014. RAxML version 8: a tool for phylogenetic analysis and post-analysis of large phylogenies. *Bioinformatics* 30: 1312–3.

Tamura, K., Stecher, G., Peterson, D., Filipski, A. & Kumar, S. 2013. MEGA6: Molecular Evolutionary Genetics Analysis version 6.0. *Mol. Biol. Evol.* 30:2725–9.

Tronholm, A., Steen, F., Tyberghein, L., Leliaert, F., Verbruggen, H., Ribera Siguan, M. A. & De Clerck, O. 2010. Species delimitation, taxonomy, and biogeography of *Dictyota* in Europe (Dictyotales, Phaeophyceae). *J. Phycol.* 46:1301–21.

Vieira, C., D'hondt, S., De Clerck, O. & Payri, C. E. 2014. Toward an inordinate fondness for stars, beetles and *Lobophora*? Species diversity of the genus *Lobophora* (Dictyotales, Phaeophyceae) in New Caledonia. *J. Phycol.* 50:1101–19.

Wiens, J. J. & Penkrot, T. A. 2002. Delimiting species limits in spiny lizards (*Sceloporus*). *Syst. Biol.* 51:69–91.

Yamashita, T. & Rhoads, D. D. 2013. Species delimitation and morphological divergence in the scorpion *Centruroides vittatus* (Say, 1821): insights from phylogeography. *PLoS One* 7:e68282.

Yu, Y., Than, C., Degnan, J. H. & Nakhleh, L. 2011. Coalescent histories on phylogenetic networks and detection of hybridization despite incomplete lineage sorting. *Syst. Biol.* 60:138–49.

Tables

Table 1. Sites and samples sequenced in the present study. The number of site, the continent, country, name of site, code, year of sampling and the number of sequences for both markers (COI-5P and ITS1) are indicated.

N° of site	Continent	Country	Site	CODE	YEAR	COI-5P	ITS1
1	Europe	UK	Wick	WIC	2008	10	10
2	Europe	UK	Rattray Head	RAT	2008	1	0
3	Europe	UK	Dunstaffnage	DUN	2008	7	8
4	Europe	UK	Berwick	BER	2008	12	12
5	Europe	UK	Mull of Galloway	MUL	2008	14	14
6	Europe	UK	Pett level	PET	2008	11	13
7	Europe	UK	Gosport Marina	GOS	2008	1	3
8	Europe	UK	Plymouth	PLY	2010-2011	38	37
9	Europe	UK	Restronguet	RES	2010	13	12
10	Europe	France	Cherbourg	CHE	2006	2	0
11	Europe	France	Roscoff	ROS	2010-2012	48	31
12	Europe	France	Saint Malo	STM	2010	23	0
13	Europe	France	Traezh Hir	THZ	2010	28	24
14	Europe	France	Concarneau	CON	2010	1	0
15	Europe	France	Quiberon	QUI	2010-2012	30	27
16	Europe	Spain	Ribadeo	RIB	2013	27	25
17	Europe	Spain	Coruña	COR	2013	26	19
18	Europe	Spain	Ría de Arousa	RIA	2013	8	8
19	Europe	Portugal	Viana	VIA	2013	11	8
20	Europe	Italy	Naples	NAP	2012	42	27

21	Europe	Greece	Korinthos	KOR	2011	10	5
22	Europe	Greece	Lesbos	LES	2009	9	6
23	South America	Peru	Bahía Mendieta	BHM	2006	0	3
24	South America	Peru	San Juan	SJN	1988/2006	2	0
25	South America	Chile	Pisagua	PSG	2006	2	1
26	South America	Chile	Pan de Azúcar	PAN	2004-5/2013	46	39
27	South America	Chile	Caldera	CAL	2013	67	62
28	South America	Chile	Quintay	QUI	2013	84	59
29	South America	Chile	Concepción	CON	2013	45	37
30	South America	Chile	Valdivia	VAL	2013	39	32
31	South America	Chile	Estaquilla	EST	2013	42	38
32	South America	Chile	Achao	ACH	2013	22	20
33	North America	USA	Oregon	ORE	2009	2	0
34	North America	USA	Massachusetts	MAS	2009	1	1
35	Asia	Korea	Kimnyung/Hanrim	KIM	2006	3	1
36	Oceania	New Zealand	Kaikoura	KAI	1988	1	0
37	Oceania	Australia	Victoria	VIC	1988	1	0
					TOTAL	**729**	**582**

Table 2. Association between mitochondria (COI-5P) and nrDNA (ITS1) sequences in the *Ectocarpus* specimens in which both markers were sequenced. Individuals showing incongruence among markers are indicated in bold. *Esil* = *E. siliculosus*, *Ecro* = *E. crouaniorum*, *Ec* 1 – 12 = *Ectocarpus* 1 – 12.

		COI-5P														
		Esil	*Ecro*	*Ec* 1	*Ec* 2	*Ec* 3	*Ec* 4	*Ec* 5	*Ec* 6	*Ec* 7	*Ec* 8	*Ec* 9	*Ec* 10	*Ec* 11	*Ec* 12	*Ec* 13
ITS1	*Esil*	178														
	Ecro		152													
	Ec 1			1												
	Ec 2				1											
	Ec 3					3										
	Ec 4						1									
	Ec 5							1								
	Ec 6								46							
	Ec 7									31						
	Ec 8										13					
	Ec 9											10				
	Ec 10												31			
	Ec 11											**1**	**1**	3		
	Ec 12		**29**												11	
	Ec 13															17

Table 3. Analysis of molecular variance (AMOVA) of *E. siliculosus* for each molecular marker (COI-5P and ITS1). Regions, not including the Mediterranean for which only a single site was sampled, as in Supplementary Table 3. d.f.: degree of freedom. SS: sum of squares.

Source of variation	d.f.	SS	Variance components	% Variation	p-value
COI-5P					
Among regions	3	18.982	0.07307	12.54	<0.0001
Among sites within regions	10	22.304	0.18446	31.65	<0.0001
Within site	154	50.095	0.32529	55.81	0.0351
TOTAL	**167**	**91.381**	**0.58283**		
ITS1					
Among regions	3	51.486	0.15194	7.14	<0.0001
Among sites within regions	10	74.673	0.58877	27.68	<0.0001
Within site	154	213.502	1.38638	65.18	0.1476
TOTAL	**167**	**339.661**	**2.12709**		

Table 4. Analysis of molecular variance (AMOVA) of *E. crouaniorum* for each molecular marker (COI-5P and ITS1). Regions as in Supplementary Table 4. d.f.: degree of freedom. SS: sum of squares.

Source of variation	**d.f.**	**SS**	**Variance components**	**% Variation**	**p-value**
COI-5P					
Among regions	3	11.404	0.05270	10.74	<0.0001
Among sites within regions	12	19.118	0.14818	30.19	<0.0001
Within site	134	38.851	0.28993	59.07	0.0088
TOTAL	**149**	**69.373**	**0.49082**		
ITS1					
Among regions	3	37.469	0.08576	2.67	<0.0001
Among sites within regions	12	97.254	0.63927	19.93	<0.0001
Within site	134	332.610	2.48217	77.39	0.37634
TOTAL	**149**	**69.373**	**0.49082**		

Figures

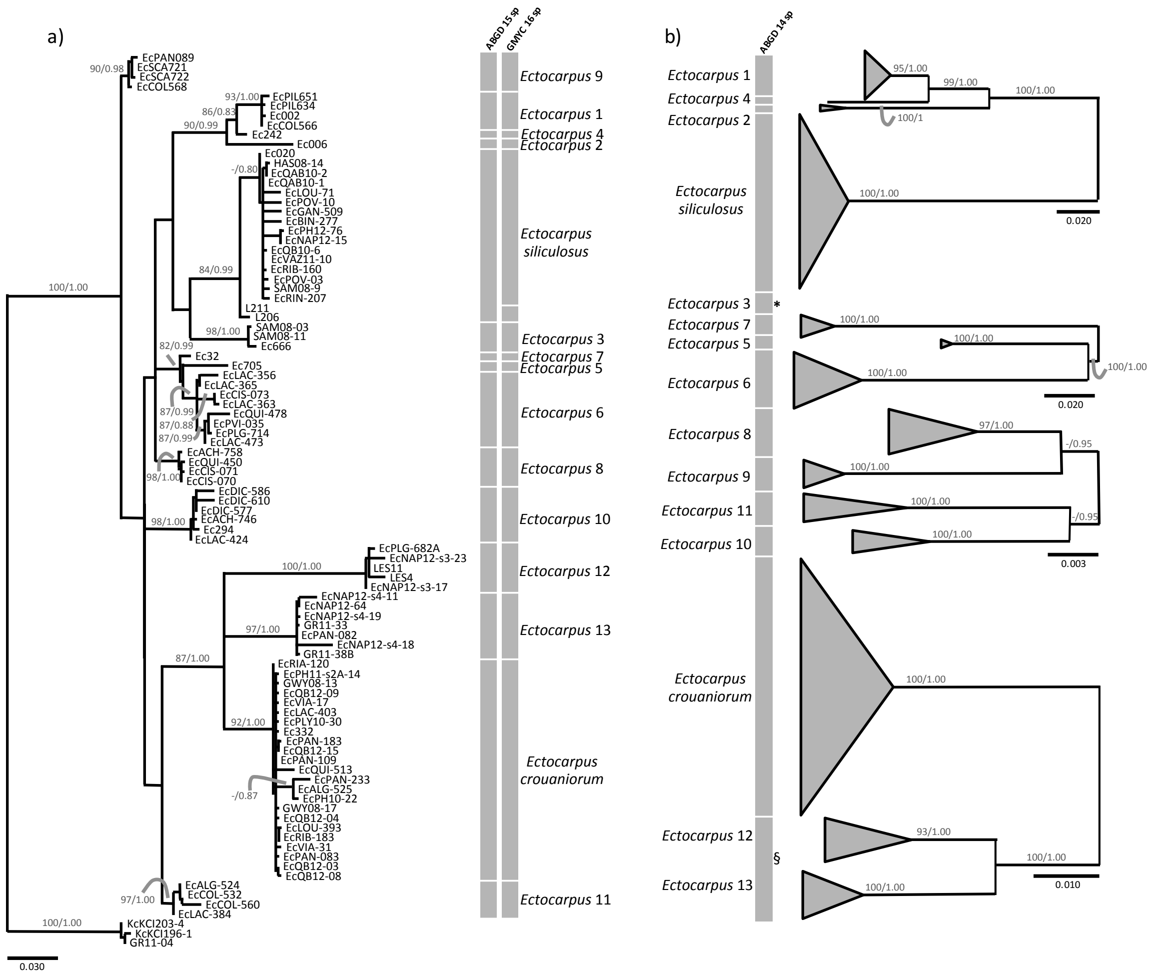
Figure 1. Proposed species in the *Ectocarpus siliculosi* group using COI-5P (a) and their consolidation using ITS1 (b). Statistical support values > 75 and posterior probabilities > .80 are shown on branches. The asterisk in Figure 2b indicates the sequences of *Ectocarpus* 3 that were un-alignable with any other of the four alignment subgroups, and § indicates the two consolidated species that were merged using ABGD. The outgroup for the COI-5P analyses were 3 sequences of *Kuckuckia spinosa*.

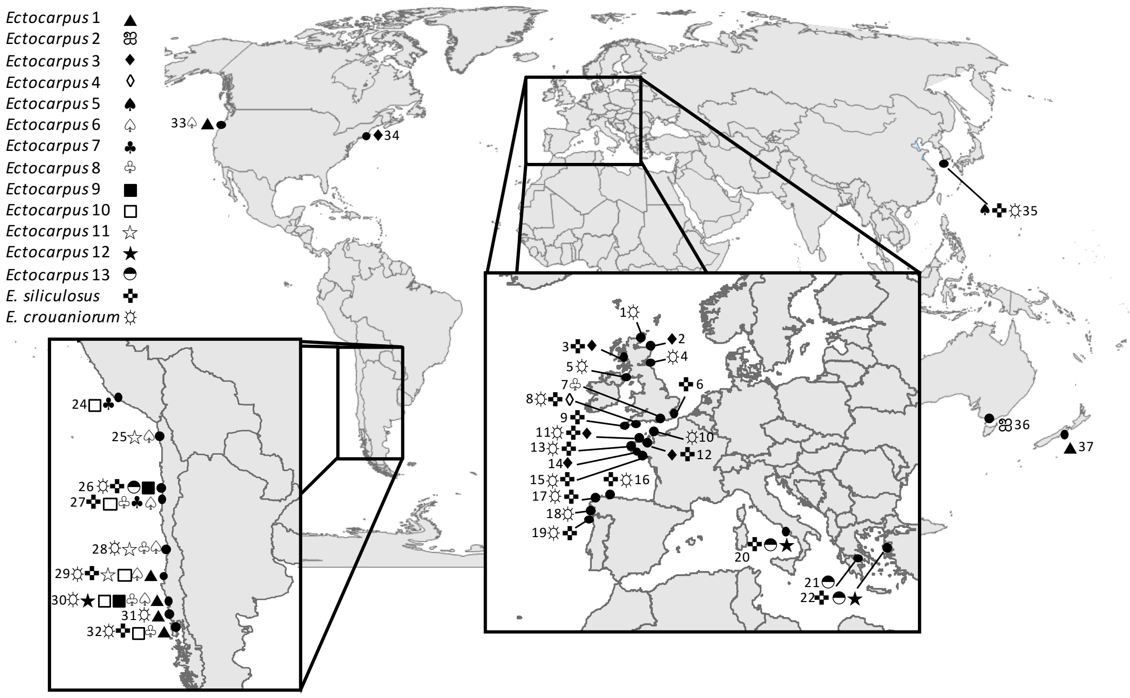
Figure 2. Distribution of the 15 species of the *Ectocarpus* subgroup *siliculosi* as defined according to the mitochondrial marker COI-5P. Sites are numbered as in Table 1.

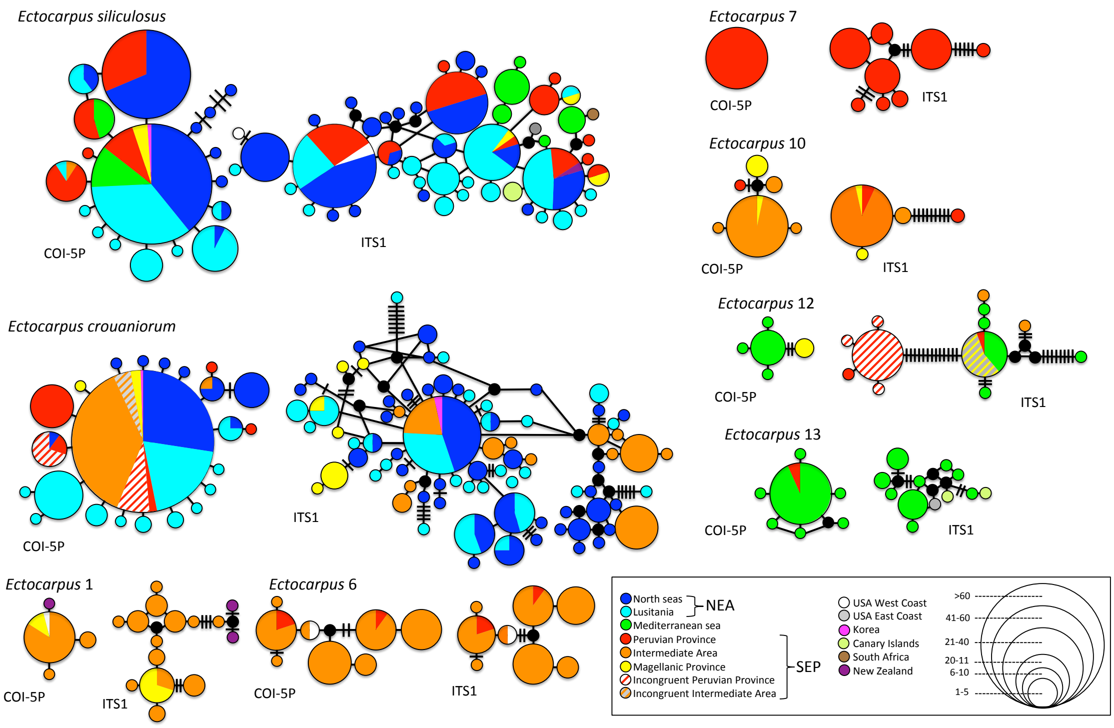
Figure 3. Haplotype networks of for COI-5P and ITS1 for eight *Ectocarpus* spp.. Biogeographical region of origin (within the South East Pacific (SEP) as defined by Camus (2001) and within the North East Atlantic (NEA) as defined by Spalding et al. (2007)) of the samples are represented as different colors identified in the box. The individuals of *E. crouaniorum* and *Ectocarpus* 12, for which incongruent results were obtained for the two sequenced markers, are indicated by stripes. In the networks, each circle represents a haplotype and its size is proportional to its frequency (correspondence between circle sizes and numbers of individuals is indicated in the box). Black circles represent hypothetical un-sampled haplotypes. For haplotypes separated by more than one mutational step, black bars indicate the number of mutational steps (i.e. substitutions and/or gaps).

Figure 4. Distribution on the shore of the commonest *Ectocarpus* species in the North Atlantic-European and Chilean coasts. The numbers of samples and the zones where the

samples were collected are indicated (H= high intertidal, M= mid intertidal, L=low intertidal, US= Upper subtidal, S =Subtidal, Drift= drifting).


a)
b)
ABGD 15 sp
GMYC 16 sp
ABGD 14 sp
Ectocarpus 9
Ectocarpus 1
Ectocarpus 4
Ectocarpus 2
Ectocarpus siliculosus
Ectocarpus 3
Ectocarpus 7
Ectocarpus 5
Ectocarpus 6
Ectocarpus 8
Ectocarpus 10
Ectocarpus 11
Ectocarpus 12
Ectocarpus 13
Ectocarpus crouaniorum
0.030
0.020
0.003
0.010


Ectocarpus 1
Ectocarpus 2
Ectocarpus 3
Ectocarpus 4
Ectocarpus 5
Ectocarpus 6
Ectocarpus 7
Ectocarpus 8
Ectocarpus 9
Ectocarpus 10
Ectocarpus 11
Ectocarpus 12
Ectocarpus 13
E. siliculosus
E. crouaniorum



Ectocarpus siliculosus
COI-5P
ITS1
Ectocarpus 7
COI-5P
ITS1
Ectocarpus 10
COI-5P
ITS1
Ectocarpus 12
COI-5P
ITS1
Ectocarpus crouaniorum
COI-5P
ITS1
Ectocarpus 13
COI-5P
ITS1
Ectocarpus 1
COI-5P
ITS1
Ectocarpus 6
COI-5P
ITS1
North seas
Lusitania
NEA
Mediterranean sea
Peruvian Province
Intermediate Area
Magellanic Province
Incongruent Peruvian Province
Incongruent Intermediate Area
SEP
USA West Coast
USA East Coast
Korea
Canary Islands
South Africa
New Zealand
>60
41-60
21-40
20-11
6-10
1-5

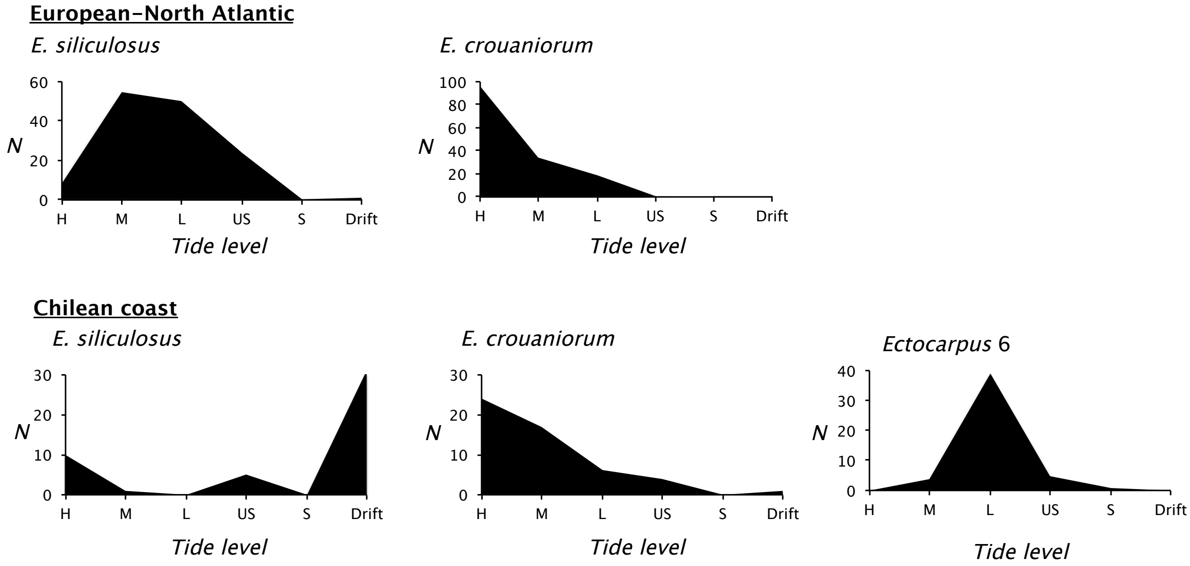

European-North Atlantic
E. siliculosus
60
40
20
0
N
H M L US S Drift
Tide level
E. crouaniorum
100
80
60
40
20
0
N
H M L US S Drift
Tide level
Chilean coast
E. siliculosus
30
20
10
0
N
H M L US S Drift
Tide level
E. crouaniorum
30
20
10
0
N
H M L US S Drift
Tide level
Ectocarpus 6
40
30
20
10
0
N
H M L US S Drift
Tide level

Table S1. COI-5P sequences used in the present study. Details of the date, geographic origin, Genbank accession number and reference of each COI-5P sequences used in the present study.

N°	Name of sample	Date	Country	Locality	Genbank Accession	Reference
1	SAM08-3	2008	United Kingdom	Dunstaffnage	LM995017	Peters et al. 2015
2	GOS08-02	2008	United Kingdom	Gosport Marina	LM995009	Peters et al. 2015
3	Ec318	2006	France	Cherbourg	LM995014	Peters et al. 2015
4	BLZ11-27	2011	France	Roscoff	LM995041	Peters et al. 2015
5	BLZ11-78	2011	France	Roscoff	LM995086	Peters et al. 2015
6	BLZ11-47	2011	France	Roscoff	LM995058	Peters et al. 2015
7	EcVAZ11-10	2011	France	Roscoff	LM995005	Peters et al. 2015
8	EcNAP12-64	2012	Italy	Naples	LM995012	Peters et al. 2015
9	GR11-33	2011	Greece	Athens, Kavouri	LM995375	Peters et al. 2015
10	GR11-38B	2011	Greece	Athens, Kavouri	LM995379	Peters et al. 2015
11	GR11-12A	2011	Greece	Athens, Agios Kosmas	LM995368	Peters et al. 2015
12	Ec294	2006	Peru	San Juan de Marcona	LM995008	Peters et al. 2015
13	Ec32(genome strain)	---	Peru	San Juan de Marcona	FP885846	Peters et al. 2015
14	Ec156	2006	Chile	Pisagua	LM995007	Peters et al. 2015
15	Ec157	2006	Chile	Pisagua	LM995010	Peters et al. 2015
16	Ec666	2009	USA	Falmouth, Massachusetts	LM995016	Peters et al. 2015
17	Ec705	2006	Korea	Jejudo, Kimnjung	LM995011	Peters et al. 2015
18	Ec002	1988	New Zeland	Kaikoura	LM995018	Peters et al. 2015
19	Ec006	1988	Australia	Victoria	LM995019	Peters et al. 2015
20	WIC08-01	2008	United Kingdom	Wick	KT983131	This paper
21	WIC08-02	2008	United Kingdom	Wick	KT983132	This paper
22	WIC08-03	2008	United Kingdom	Wick	KT983133	This paper

23	WIC08-04	2008	United Kingdom	Wick	KT983134	This paper
24	WIC08-05	2008	United Kingdom	Wick	KT983135	This paper
25	WIC08-07	2008	United Kingdom	Wick	KT983136	This paper
26	WIC08-08	2008	United Kingdom	Wick	KT983137	This paper
27	WIC08-17	2008	United Kingdom	Wick	KT983138	This paper
28	WIC08-18	2008	United Kingdom	Wick	KT983139	This paper
29	WIC08-19	2008	United Kingdom	Wick	KT983140	This paper
30	RAT08-6	2008	United Kingdom	Rattray Head	KT983384	This paper
31	BUT08-05	2008	United Kingdom	Berwick	KT983155	This paper
32	BUT08-11	2008	United Kingdom	Berwick	KT983156	This paper
33	BUT08-13	2008	United Kingdom	Berwick	KT983157	This paper
34	BUT08-24	2008	United Kingdom	Berwick	KT983158	This paper
35	BUT08-25	2008	United Kingdom	Berwick	KT983159	This paper
36	BUT08-26	2008	United Kingdom	Berwick	KT983160	This paper
37	BUT08-27	2008	United Kingdom	Berwick	KT983161	This paper
38	BUT08-30	2008	United Kingdom	Berwick	KT983162	This paper
39	BUT08-31	2008	United Kingdom	Berwick	KT983163	This paper
40	BUT08-35	2008	United Kingdom	Berwick	KT983164	This paper
41	BUT08-40	2008	United Kingdom	Berwick	KT983165	This paper
42	BUT08-41	2008	United Kingdom	Berwick	KT983166	This paper
43	OBA07-108	2007	United Kingdom	Dunstaffnage	KT982922	This paper
44	OBA07-15	2007	United Kingdom	Dunstaffnage	KT982923	This paper
45	SAM08-04	2008	United Kingdom	Dunstaffnage	KT982924	This paper
46	SAM08-05	2008	United Kingdom	Dunstaffnage	KT982925	This paper
47	SAM08-09	2008	United Kingdom	Dunstaffnage	KT982926	This paper
48	SAM08-11	2008	United Kingdom	Dunstaffnage	KT983383	This paper

49	GWY08-05	2008	United Kingdom	Mull of Galloway	KT983141	This paper
50	GWY08-07	2008	United Kingdom	Mull of Galloway	KT983142	This paper
51	GWY08-08	2008	United Kingdom	Mull of Galloway	KT983143	This paper
52	GWY08-09	2008	United Kingdom	Mull of Galloway	KT983144	This paper
53	GWY08-13	2008	United Kingdom	Mull of Galloway	KT983145	This paper
54	GWY08-14	2008	United Kingdom	Mull of Galloway	KT983146	This paper
55	GWY08-15	2008	United Kingdom	Mull of Galloway	KT983147	This paper
56	GWY08-16	2008	United Kingdom	Mull of Galloway	KT983148	This paper
57	GWY08-17	2008	United Kingdom	Mull of Galloway	KT983149	This paper
58	GWY08-21	2008	United Kingdom	Mull of Galloway	KT983150	This paper
59	GWY08-22	2008	United Kingdom	Mull of Galloway	KT983151	This paper
60	GWY08-23	2008	United Kingdom	Mull of Galloway	KT983152	This paper
61	GWY08-24	2008	United Kingdom	Mull of Galloway	KT983153	This paper
62	GWY08-26	2008	United Kingdom	Mull of Galloway	KT983154	This paper
63	HAS08-06	2008	United Kingdom	Pett level	KT982927	This paper
64	HAS08-07	2008	United Kingdom	Pett level	KT982928	This paper
65	HAS08-09	2008	United Kingdom	Pett level	KT982929	This paper
66	HAS08-12	2008	United Kingdom	Pett level	KT982930	This paper
67	HAS08-13	2008	United Kingdom	Pett level	KT982931	This paper
68	HAS08-14	2008	United Kingdom	Pett level	KT982932	This paper
69	HAS08-16	2008	United Kingdom	Pett level	KT982933	This paper
70	HAS08-17	2008	United Kingdom	Pett level	KT982934	This paper
71	HAS08-18	2008	United Kingdom	Pett level	KT982935	This paper
72	HAS08-19	2008	United Kingdom	Pett level	KT982936	This paper
73	HAS08-20	2008	United Kingdom	Pett level	KT982937	This paper
74	EcQAB10-001	2010	United Kingdom	Plymouth	KT982764	This paper

75	EcQAB10-02	2010	United Kingdom	Plymouth	KT982765	This paper
76	EcQAB10-03	2010	United Kingdom	Plymouth	KT982766	This paper
77	EcQAB10-04	2010	United Kingdom	Plymouth	KT982767	This paper
78	EcQAB10-05	2010	United Kingdom	Plymouth	KT982768	This paper
79	EcQAB10-06	2010	United Kingdom	Plymouth	KT982769	This paper
80	EcQAB10-07	2010	United Kingdom	Plymouth	KT982770	This paper
81	EcQAB10-09	2010	United Kingdom	Plymouth	KT982771	This paper
82	EcQAB10-11	2010	United Kingdom	Plymouth	KT982772	This paper
83	EcQAB10-12	2010	United Kingdom	Plymouth	KT982773	This paper
84	EcQAB10-13	2010	United Kingdom	Plymouth	KT982774	This paper
85	EcQAB10-14	2010	United Kingdom	Plymouth	KT982775	This paper
86	EcQAB10-15	2010	United Kingdom	Plymouth	KT982776	This paper
87	EcQAB10-16	2010	United Kingdom	Plymouth	KT982777	This paper
88	EcQAB10-17	2010	United Kingdom	Plymouth	KT982778	This paper
89	EcQAB10-18	2010	United Kingdom	Plymouth	KT982779	This paper
90	EcQAB10-19	2010	United Kingdom	Plymouth	KT982780	This paper
91	EcQAB10-20	2010	United Kingdom	Plymouth	KT982781	This paper
92	EcQAB10-21	2010	United Kingdom	Plymouth	KT982782	This paper
93	EcQAB10-22	2010	United Kingdom	Plymouth	KT982783	This paper
94	EcQAB10-23	2010	United Kingdom	Plymouth	KT982784	This paper
95	EcQAB10-24	2010	United Kingdom	Plymouth	KT982785	This paper
96	EcQAB10-10	2010	United Kingdom	Plymouth	KT982786	This paper
97	EcPLY10-19	2010	United Kingdom	Plymouth	KT983091	This paper
98	EcPLY10-20	2010	United Kingdom	Plymouth	KT983092	This paper
99	EcPLY10-21	2010	United Kingdom	Plymouth	KT983093	This paper
100	EcPLY10-22	2010	United Kingdom	Plymouth	KT983094	This paper

101	EcPLY10-23	2010	United Kingdom	Plymouth	KT983095	This paper
102	EcPLY10-25	2010	United Kingdom	Plymouth	KT983096	This paper
103	EcPLY10-26	2010	United Kingdom	Plymouth	KT983097	This paper
104	EcPLY10-27	2010	United Kingdom	Plymouth	KT983098	This paper
105	EcPLY10-28	2010	United Kingdom	Plymouth	KT983099	This paper
106	EcPLY10-29	2010	United Kingdom	Plymouth	KT983100	This paper
107	EcPLY10-30	2010	United Kingdom	Plymouth	KT983101	This paper
108	EcPLY10-31	2010	United Kingdom	Plymouth	KT983102	This paper
109	EcPLY10-32	2010	United Kingdom	Plymouth	KT983103	This paper
110	EcPLY10-34	2010	United Kingdom	Plymouth	KT983104	This paper
111	Ec242	2011	United Kingdom	Plymouth	KT983410	This paper
112	EcREP10-38	2010	United Kingdom	Restronguest	KT982938	This paper
113	EcREP10-39	2010	United Kingdom	Restronguest	KT982939	This paper
114	EcREP10-42	2010	United Kingdom	Restronguest	KT982940	This paper
115	EcREP10-43	2010	United Kingdom	Restronguest	KT982941	This paper
116	EcREP10-44	2010	United Kingdom	Restronguest	KT982942	This paper
117	EcREP10-45	2010	United Kingdom	Restronguest	KT982943	This paper
118	EcREP10-46	2010	United Kingdom	Restronguest	KT982944	This paper
119	EcREP10-48	2010	United Kingdom	Restronguest	KT982945	This paper
120	EcREP10-49	2010	United Kingdom	Restronguest	KT982946	This paper
121	EcREP10-50	2010	United Kingdom	Restronguest	KT982947	This paper
122	EcREP10-51	2010	United Kingdom	Restronguest	KT982948	This paper
123	EcREP10-52	2010	United Kingdom	Restronguest	KT982949	This paper
124	EcREP10-54	2010	United Kingdom	Restronguest	KT982950	This paper
125	Esil.Ros.h	1970	France	Roscoff	KT982830	This paper
126	Ec393	2003	France	Roscoff	KT982817	This paper

127	Ec332	2006	France	Cherbourg	KT983057	This paper
128	Ec334	2007	France	Roscoff	KT983081	This paper
129	EcPH10-17	2010	France	Roscoff	KT982832	This paper
130	EcPH10-10	2010	France	Roscoff	KT983385	This paper
131	EcPH10-136	2010	France	Roscoff	KT983386	This paper
132	EcPH10-72	2010	France	Roscoff	KT983076	This paper
133	EcPH10-7	2010	France	Roscoff	KT983387	This paper
134	L230	2010	France	Roscoff	KT983393	This paper
135	L231	2010	France	Roscoff	KT983394	This paper
136	L162	2010	France	Roscoff	KT983407	This paper
137	L163	2010	France	Roscoff	KT983408	This paper
138	EcPH10-22	2010	France	Roscoff	KT983082	This paper
139	EcPH10-38	2010	France	Roscoff	KT983083	This paper
140	EcPH11-s5-13	2011	France	Roscoff	KT982816	This paper
141	EcPH11-s5-14	2011	France	Roscoff	KT982818	This paper
142	EcPH11-s5-15	2011	France	Roscoff	KT982819	This paper
143	EcPH11-s5-17	2011	France	Roscoff	KT982820	This paper
144	EcPH11-s5-18	2011	France	Roscoff	KT982821	This paper
145	EcPH11-s5-19	2011	France	Roscoff	KT982822	This paper
146	EcPH11-s5-20	2011	France	Roscoff	KT982823	This paper
147	EcPH11-s2B-41	2011	France	Roscoff	KT982824	This paper
148	EcPH11-s2B-43	2011	France	Roscoff	KT982825	This paper
149	EcPH11-s2B-45	2011	France	Roscoff	KT982826	This paper
150	EcPH11-s-2A-06	2011	France	Roscoff	KT982827	This paper
151	EcPH11-s-2A-04	2011	France	Roscoff	KT982828	This paper
152	BLZ11-229	2011	France	Roscoff	KT982829	This paper

153	BLZ11-51	2011	France	Roscoff	KT982831	This paper
154	EcPH11-s-2A-09	2011	France	Roscoff	KT982833	This paper
155	EcPH11-s-2A-16	2011	France	Roscoff	KT982834	This paper
156	EcPH11-s2A-01	2011	France	Roscoff	KT983074	This paper
157	EcPH11-s2A-14	2011	France	Roscoff	KT983075	This paper
158	EcPH11-21	2011	France	Roscoff	KT983077	This paper
159	EcPH11-16	2011	France	Roscoff	KT983078	This paper
160	EcPH11-09	2011	France	Roscoff	KT983079	This paper
161	BLZ11-44	2011	France	Roscoff	KT983080	This paper
162	EcPH11-s5-38	2011	France	Roscoff	KT983084	This paper
163	EcPH11-s5-07	2011	France	Roscoff	KT983085	This paper
164	EcPH11-38	2011	France	Roscoff	KT983086	This paper
165	EcPH11-33	2011	France	Roscoff	KT983087	This paper
166	EcPH11-28	2011	France	Roscoff	KT983088	This paper
167	EcPH11-27	2011	France	Roscoff	KT983089	This paper
168	EcPH11-47	2011	France	Roscoff	KT983090	This paper
169	EcPH12-76	2012	France	Roscoff	KT982815	This paper
170	L212	2010	France	Saint Malo	KT982916	This paper
171	L206	2010	France	Saint Malo	KT982917	This paper
172	L211	2010	France	Saint Malo	KT982918	This paper
173	L214	2010	France	Saint Malo	KT982919	This paper
174	L218	2010	France	Saint Malo	KT983388	This paper
175	L219	2010	France	Saint Malo	KT983389	This paper
176	L220	2010	France	Saint Malo	KT983390	This paper
177	L222	2010	France	Saint Malo	KT983391	This paper
178	L224	2010	France	Saint Malo	KT983392	This paper

179	L213	2010	France	Saint Malo	KT983396	This paper
180	L215	2010	France	Saint Malo	KT983397	This paper
181	L209	2010	France	Saint Malo	KT983398	This paper
182	L210	2010	France	Saint Malo	KT983399	This paper
183	L195	2010	France	Saint Malo	KT983400	This paper
184	L197	2010	France	Saint Malo	KT983401	This paper
185	L198	2010	France	Saint Malo	KT983402	This paper
186	L205	2010	France	Saint Malo	KT983403	This paper
187	L190	2010	France	Saint Malo	KT983404	This paper
188	L183	2010	France	Saint Malo	KT983405	This paper
189	L170	2010	France	Saint Malo	KT983406	This paper
190	L216	2010	France	Saint Malo	KT983409	This paper
191	L168	2010	France	Saint Malo	KT982920	This paper
192	L196	2010	France	Saint Malo	KT982921	This paper
193	EcTH10-04	2010	France	Traezh Hir	KT982951	This paper
194	EcTH10-05	2010	France	Traezh Hir	KT982952	This paper
195	EcTH10-06	2010	France	Traezh Hir	KT982953	This paper
196	EcTH10-07	2010	France	Traezh Hir	KT982954	This paper
197	EcTH10-08	2010	France	Traezh Hir	KT982955	This paper
198	EcTH10-09	2010	France	Traezh Hir	KT982956	This paper
199	EcTH10-10	2010	France	Traezh Hir	KT982957	This paper
200	EcTH10-12	2010	France	Traezh Hir	KT982958	This paper
201	EcTH10-13	2010	France	Traezh Hir	KT982959	This paper
202	EcTH10-14	2010	France	Traezh Hir	KT982960	This paper
203	EcTH10-15	2010	France	Traezh Hir	KT982961	This paper
204	EcTH10-16	2010	France	Traezh Hir	KT982962	This paper

205	EcTH10-17	2010	France	Traezh Hir	KT982963	This paper
206	EcTH10-18	2010	France	Traezh Hir	KT982964	This paper
207	EcTH10-53	2010	France	Traezh Hir	KT982965	This paper
208	EcTH10-21	2010	France	Traezh Hir	KT983167	This paper
209	EcTH10-26	2010	France	Traezh Hir	KT983168	This paper
210	EcTH10-31	2010	France	Traezh Hir	KT983169	This paper
211	EcTH10-32	2010	France	Traezh Hir	KT983170	This paper
212	EcTH10-33	2010	France	Traezh Hir	KT983171	This paper
213	EcTH10-34	2010	France	Traezh Hir	KT983172	This paper
214	EcTH10-35	2010	France	Traezh Hir	KT983173	This paper
215	EcTH10-36	2010	France	Traezh Hir	KT983174	This paper
216	EcTH10-37	2010	France	Traezh Hir	KT983175	This paper
217	EcTH10-38	2010	France	Traezh Hir	KT983176	This paper
218	EcTH10-39	2010	France	Traezh Hir	KT983177	This paper
219	EcTH10-41	2010	France	Traezh Hir	KT983178	This paper
220	EcTH10-42	2010	France	Traezh Hir	KT983179	This paper
221	L232	2010	France	Concarneau	KT983395	This paper
222	EcQB10-02	2010	France	Quiberon	KT982787	This paper
223	EcQB10-03	2010	France	Quiberon	KT982788	This paper
224	EcQB10-04	2010	France	Quiberon	KT982789	This paper
225	EcQB10-05	2010	France	Quiberon	KT982790	This paper
226	EcQB10-06	2010	France	Quiberon	KT982791	This paper
227	EcQB10-19	2010	France	Quiberon	KT982792	This paper
228	EcQB10-20	2010	France	Quiberon	KT982793	This paper
229	EcQB10-22	2010	France	Quiberon	KT982794	This paper
230	EcQB10-23	2010	France	Quiberon	KT982795	This paper

231	EcQB10-24	2010	France	Quiberon	KT982796	This paper
232	EcQB10-09	2010	France	Quiberon	KT982797	This paper
233	EcQB10-10	2010	France	Quiberon	KT982798	This paper
234	EcQB10-11	2010	France	Quiberon	KT982799	This paper
235	EcQB10-12	2010	France	Quiberon	KT982800	This paper
236	EcQB12-05	2012	France	Quiberon	KT983058	This paper
237	EcQB12-06	2012	France	Quiberon	KT983059	This paper
238	EcQB12-07	2012	France	Quiberon	KT983060	This paper
239	EcQB12-04	2012	France	Quiberon	KT983061	This paper
240	EcQB12-14	2012	France	Quiberon	KT983062	This paper
241	EcQB12-03	2012	France	Quiberon	KT983063	This paper
242	EcQB12-13	2012	France	Quiberon	KT983064	This paper
243	EcQB12-12	2012	France	Quiberon	KT983065	This paper
244	EcQB12-09	2012	France	Quiberon	KT983066	This paper
245	EcQB12-08	2012	France	Quiberon	KT983067	This paper
246	EcQB12-02	2012	France	Quiberon	KT983068	This paper
247	EcQB12-15	2012	France	Quiberon	KT983069	This paper
248	EcQB12-16	2012	France	Quiberon	KT983070	This paper
249	EcQB12-17	2012	France	Quiberon	KT983071	This paper
250	EcQB12-18	2012	France	Quiberon	KT983072	This paper
251	EcQB12-19	2012	France	Quiberon	KT983073	This paper
252	EcRIB-160	2013	Spain	Ribadeo	KT982854	This paper
253	EcRIB-161	2013	Spain	Ribadeo	KT982855	This paper
254	EcRIB-162	2013	Spain	Ribadeo	KT982856	This paper
255	EcRIB-179	2013	Spain	Ribadeo	KT982857	This paper
256	EcRIB-186	2013	Spain	Ribadeo	KT982858	This paper

257	EcRIB-195	2013	Spain	Ribadeo	KT982859	This paper
258	EcRIB-203	2013	Spain	Ribadeo	KT982860	This paper
259	EcRIB-204	2013	Spain	Ribadeo	KT982861	This paper
260	EcRIB-207	2013	Spain	Ribadeo	KT982862	This paper
261	EcRIB-208	2013	Spain	Ribadeo	KT982863	This paper
262	EcRIB-231	2013	Spain	Ribadeo	KT982864	This paper
263	EcRIB-234	2013	Spain	Ribadeo	KT982865	This paper
264	EcRIB-236	2013	Spain	Ribadeo	KT982866	This paper
265	EcRIB-148	2013	Spain	Ribadeo	KT983105	This paper
266	EcRIB-157	2013	Spain	Ribadeo	KT983106	This paper
267	EcRIB-158	2013	Spain	Ribadeo	KT983107	This paper
268	EcRIB-183	2013	Spain	Ribadeo	KT983108	This paper
269	EcRIB-185	2013	Spain	Ribadeo	KT983109	This paper
270	EcRIB-187	2013	Spain	Ribadeo	KT983110	This paper
271	EcRIB-190	2013	Spain	Ribadeo	KT983111	This paper
272	EcRIB-191	2013	Spain	Ribadeo	KT983112	This paper
273	EcRIB-194	2013	Spain	Ribadeo	KT983113	This paper
274	EcRIB-209	2013	Spain	Ribadeo	KT983114	This paper
275	EcRIB-213	2013	Spain	Ribadeo	KT983115	This paper
276	EcRIB-214	2013	Spain	Ribadeo	KT983116	This paper
277	EcRIB-215	2013	Spain	Ribadeo	KT983117	This paper
278	EcRIB-129	2013	Spain	Ribadeo	KT983118	This paper
279	EcGAN-509	2013	Spain	Coruña	KT982843	This paper
280	EcGAN-512	2013	Spain	Coruña	KT982844	This paper
281	EcGAN-528	2013	Spain	Coruña	KT982845	This paper
282	EcGAN-529	2013	Spain	Coruña	KT982846	This paper

283	EcGAN-532	2013	Spain	Coruña	KT982847	This paper
284	EcGAN-535	2013	Spain	Coruña	KT982848	This paper
285	EcGAN-537	2013	Spain	Coruña	KT982849	This paper
286	EcGAN-540	2013	Spain	Coruña	KT982850	This paper
287	EcGAN-544	2013	Spain	Coruña	KT982851	This paper
288	EcGAN-545	2013	Spain	Coruña	KT982852	This paper
289	EcGAN-552	2013	Spain	Coruña	KT982853	This paper
290	EcGAN-515	2013	Spain	Coruña	KT983127	This paper
291	EcGAN-516	2013	Spain	Coruña	KT983128	This paper
292	EcGAN-525	2013	Spain	Coruña	KT983129	This paper
293	EcLOU-57	2013	Spain	Coruña	KT982840	This paper
294	EcLOU-71	2013	Spain	Coruña	KT982841	This paper
295	EcLOU-98	2013	Spain	Coruña	KT982842	This paper
296	EcLOU-102	2013	Spain	Coruña	KT983119	This paper
297	EcLOU-371	2013	Spain	Coruña	KT983120	This paper
298	EcLOU-391	2013	Spain	Coruña	KT983121	This paper
299	EcLOU-393	2013	Spain	Coruña	KT983122	This paper
300	EcLOU-394	2013	Spain	Coruña	KT983123	This paper
301	EcLOU-412	2013	Spain	Coruña	KT983124	This paper
302	EcLOU-413	2013	Spain	Coruña	KT983125	This paper
303	EcLOU-418	2013	Spain	Coruña	KT983126	This paper
304	EcLOU-454	2013	Spain	Coruña	KT983130	This paper
305	EcRIA-119	2013	Spain	Ría de Arosa	KT983180	This paper
306	EcRIA-120	2013	Spain	Ría de Arosa	KT983181	This paper
307	EcRIA-121	2013	Spain	Ría de Arosa	KT983182	This paper
308	EcRIA-279	2013	Spain	Ría de Arosa	KT983183	This paper

309	EcRIA-297	2013	Spain	Ría de Arosa	KT983184	This paper
310	EcRIA-298	2013	Spain	Ría de Arosa	KT983185	This paper
311	EcRIA-307	2013	Spain	Ría de Arosa	KT983186	This paper
312	EcRIA-308	2013	Spain	Ría de Arosa	KT983187	This paper
313	EcPOV-03	2013	Portugal	Viana do Castelo	KT982835	This paper
314	EcPOV-10	2013	Portugal	Viana do Castelo	KT982836	This paper
315	EcPOV-11	2013	Portugal	Viana do Castelo	KT982837	This paper
316	EcPOV-554	2013	Portugal	Viana do Castelo	KT982839	This paper
317	EcPOV-16	2013	Portugal	Viana do Castelo	KT983193	This paper
318	EcVIA-39	2013	Portugal	Viana do Castelo	KT982838	This paper
319	EcVIA-26	2013	Portugal	Viana do Castelo	KT983188	This paper
320	EcVIA-31	2013	Portugal	Viana do Castelo	KT983189	This paper
321	EcVIA-45	2013	Portugal	Viana do Castelo	KT983190	This paper
322	EcVIA-17	2013	Portugal	Viana do Castelo	KT983191	This paper
323	EcVIA-48	2013	Portugal	Viana do Castelo	KT983192	This paper
324	EcNAP12-109	2012	Italy	Naples	KT982801	This paper
325	EcNAP12-110	2012	Italy	Naples	KT982802	This paper
326	EcNAP12-111	2012	Italy	Naples	KT982803	This paper
327	EcNAP12-112	2012	Italy	Naples	KT982804	This paper
328	EcNAP12-113	2012	Italy	Naples	KT982805	This paper
329	EcNAP12-114	2012	Italy	Naples	KT982806	This paper
330	EcNAP12-115	2012	Italy	Naples	KT982807	This paper
331	EcNAP12-116	2012	Italy	Naples	KT982808	This paper
332	EcNAP12-117	2012	Italy	Naples	KT982809	This paper
333	EcNAP12-118	2012	Italy	Naples	KT982810	This paper
334	EcNAP12-119	2012	Italy	Naples	KT982811	This paper

335	EcNAP12-120	2012	Italy	Naples	KT982812	This paper
336	EcNAP12-210	2012	Italy	Naples	KT982813	This paper
337	EcNAP12-s3-34	2012	Italy	Naples	KT982814	This paper
338	EcNAP12-15	2012	Italy	Naples	KU134118	This paper
339	EcNAP12-17	2012	Italy	Naples	KU134119	This paper
340	EcNAP12-14	2012	Italy	Naples	KU134120	This paper
341	EcNAP12-12	2012	Italy	Naples	KU134121	This paper
342	EcNAP12-94	2012	Italy	Naples	KU134122	This paper
343	EcNAP12-s3-17	2012	Italy	Naples	KU134123	This paper
344	EcNAP12-s3-11	2012	Italy	Naples	KU134124	This paper
345	EcNAP12-s3-13	2012	Italy	Naples	KU134125	This paper
346	EcNAP12-s3-19	2012	Italy	Naples	KU134126	This paper
347	EcNAP12-s3-22	2012	Italy	Naples	KU134127	This paper
348	EcNAP12-s3-23	2012	Italy	Naples	KU134128	This paper
349	EcNAP12-s4-16	2012	Italy	Naples	KU134141	This paper
350	EcNAP12-s4-18	2012	Italy	Naples	KU134142	This paper
351	EcNAP12-s4-11	2012	Italy	Naples	KU134143	This paper
352	EcNAP12-s3-21	2012	Italy	Naples	KU134144	This paper
353	EcNAP12-s3-01	2012	Italy	Naples	KU134145	This paper
354	EcNAP12-92	2012	Italy	Naples	KU134146	This paper
355	EcNAP12-45	2012	Italy	Naples	KU134147	This paper
356	EcNAP12-s3-51	2012	Italy	Naples	KU134148	This paper
357	EcNAP12-s4-10	2012	Italy	Naples	KU134149	This paper
358	EcNAP12-s3-35	2012	Italy	Naples	KU134150	This paper
359	EcNAP12-s3-08	2012	Italy	Naples	KU134151	This paper
360	EcNAP12-s3-03	2012	Italy	Naples	KU134152	This paper

361	EcNAP12-s3-50	2012	Italy	Naples	KU134153	This paper
362	EcNAP12-s4-19	2012	Italy	Naples	KU134154	This paper
363	EcNAP12-s4-09	2012	Italy	Naples	KU134155	This paper
364	EcNAP12-82	2012	Italy	Naples	KU134156	This paper
365	GR11-28	2011	Greece	Korinthos	KU134129	This paper
366	GR11-36	2011	Greece	Korinthos	KU134130	This paper
367	GR11-38A	2011	Greece	Korinthos	KU134131	This paper
368	GR11-40	2011	Greece	Korinthos	KU134132	This paper
369	GR11-45	2011	Greece	Korinthos	KU134133	This paper
370	GR11-46	2011	Greece	Korinthos	KU134134	This paper
371	GR11-48	2011	Greece	Korinthos	KU134135	This paper
372	LES08	2009	Greece	Lesbos	KT982913	This paper
373	LES15	2009	Greece	Lesbos	KT982914	This paper
374	LES11	2009	Greece	Lesbos	KU134116	This paper
375	LES4	2009	Greece	Lesbos	KU134117	This paper
376	LES1	2009	Greece	Lesbos	KU134136	This paper
377	LES2	2009	Greece	Lesbos	KU134137	This paper
378	LES3	2009	Greece	Lesbos	KU134138	This paper
379	LES7	2009	Greece	Lesbos	KU134139	This paper
380	LES10	2009	Greece	Lesbos	KU134140	This paper
381	EcPAN-84	2013	Spain	Pan de Azúcar	KT982867	This paper
382	EcPAN-90	2013	Spain	Pan de Azúcar	KT982868	This paper
383	EcPAN-95	2013	Spain	Pan de Azúcar	KT982869	This paper
384	EcPAN-128	2013	Spain	Pan de Azúcar	KT982870	This paper
385	EcPAN-138	2013	Spain	Pan de Azúcar	KT982871	This paper
386	EcPAN-140	2013	Spain	Pan de Azúcar	KT982872	This paper

387	EcPAN-174	2013	Spain	Pan de Azúcar	KT982873	This paper
388	EcPAN-175	2013	Spain	Pan de Azúcar	KT982874	This paper
389	EcPAN-192	2013	Spain	Pan de Azúcar	KT982875	This paper
390	EcPAN-197	2013	Spain	Pan de Azúcar	KT982876	This paper
391	EcPAN-161A	2013	Chile	Pan de Azúcar	KT982966	This paper
392	EcPAN-117	2013	Chile	Pan de Azúcar	KT982967	This paper
393	EcPAN-119	2013	Chile	Pan de Azúcar	KT982968	This paper
394	EcPAN-177	2013	Chile	Pan de Azúcar	KT982969	This paper
395	EcPAN-183	2013	Chile	Pan de Azúcar	KT982970	This paper
396	EcPAN-185	2013	Chile	Pan de Azúcar	KT982971	This paper
397	EcPAN-233	2013	Chile	Pan de Azúcar	KT982972	This paper
398	EcPAN-083	2013	Chile	Pan de Azúcar	KT983194	This paper
399	EcPAN-087A	2013	Chile	Pan de Azúcar	KT983195	This paper
400	EcPAN-091A	2013	Chile	Pan de Azúcar	KT983196	This paper
401	EcPAN-097A	2013	Chile	Pan de Azúcar	KT983197	This paper
402	EcPAN-085	2013	Chile	Pan de Azúcar	KT983198	This paper
403	EcPAN-086	2013	Chile	Pan de Azúcar	KT983199	This paper
404	EcPAN-087	2013	Chile	Pan de Azúcar	KT983200	This paper
405	EcPAN-114A	2013	Chile	Pan de Azúcar	KT983201	This paper
406	EcPAN-139A	2013	Chile	Pan de Azúcar	KT983202	This paper
407	EcPAN-139B	2013	Chile	Pan de Azúcar	KT983203	This paper
408	EcPAN-144A	2013	Chile	Pan de Azúcar	KT983204	This paper
409	EcPAN-174A	2013	Chile	Pan de Azúcar	KT983205	This paper
410	EcPAN-109	2013	Chile	Pan de Azúcar	KT983206	This paper
411	EcPAN-110	2013	Chile	Pan de Azúcar	KT983207	This paper
412	EcPAN-113	2013	Chile	Pan de Azúcar	KT983208	This paper

413	EcPAN-114	2013	Chile	Pan de Azúcar	KT983209	This paper
414	EcPAN-122	2013	Chile	Pan de Azúcar	KT983210	This paper
415	EcPAN-160	2013	Chile	Pan de Azúcar	KT983211	This paper
416	EcPAN-181	2013	Chile	Pan de Azúcar	KT983212	This paper
417	EcPAN-182	2013	Chile	Pan de Azúcar	KT983213	This paper
418	EcPAN-089	2013	Chile	Pan de Azúcar	KU134058	This paper
419	EcPAN-104	2013	Chile	Pan de Azúcar	KU134059	This paper
420	EcPAN-148	2013	Chile	Pan de Azúcar	KU134060	This paper
421	EcPAN-161	2013	Chile	Pan de Azúcar	KU134061	This paper
422	EcPAN-163	2013	Chile	Pan de Azúcar	KU134062	This paper
423	EcPAN-143A	2013	Chile	Pan de Azúcar	KU134066	This paper
424	EcPAN-149A	2013	Chile	Pan de Azúcar	KU134067	This paper
425	EcPAN-79	2013	Chile	Pan de Azúcar	KU134157	This paper
426	EcPAN-82	2013	Chile	Pan de Azúcar	KU134158	This paper
427	EcBIN-272	2013	Chile	Bahía Inglesa, Caldera	KT982877	This paper
428	EcBIN-273	2013	Chile	Bahía Inglesa, Caldera	KT982878	This paper
429	EcBIN-277	2013	Chile	Bahía Inglesa, Caldera	KT982879	This paper
430	EcBIN-279	2013	Chile	Bahía Inglesa, Caldera	KT982880	This paper
431	EcBIN-282	2013	Chile	Bahía Inglesa, Caldera	KT982881	This paper
432	EcBIN-283	2013	Chile	Bahía Inglesa, Caldera	KT982882	This paper
433	EcBIN-285	2013	Chile	Bahía Inglesa, Caldera	KT982883	This paper
434	EcBIN-284	2013	Chile	Bahía Inglesa, Caldera	KT982884	This paper
435	EcBIN-288	2013	Chile	Bahía Inglesa, Caldera	KT982885	This paper
436	EcBIN-291	2013	Chile	Bahía Inglesa, Caldera	KT982886	This paper
437	EcBIN-292	2013	Chile	Bahía Inglesa, Caldera	KT982887	This paper
438	EcBIN-293	2013	Chile	Bahía Inglesa, Caldera	KT982888	This paper

439	EcBIN-294	2013	Chile	Bahía Inglesa, Caldera	KT982889	This paper
440	EcBIN-295	2013	Chile	Bahía Inglesa, Caldera	KT982890	This paper
441	EcBIN-306	2013	Chile	Bahía Inglesa, Caldera	KT982891	This paper
442	EcBIN-307	2013	Chile	Bahía Inglesa, Caldera	KT982892	This paper
443	EcBIN-308	2013	Chile	Bahía Inglesa, Caldera	KT982893	This paper
444	EcBIN-309	2013	Chile	Bahía Inglesa, Caldera	KT982894	This paper
445	EcBIN-315	2013	Chile	Bahía Inglesa, Caldera	KT982895	This paper
446	EcBIN-320	2013	Chile	Bahía Inglesa, Caldera	KT982896	This paper
447	EcBIN-323	2013	Chile	Bahía Inglesa, Caldera	KT982897	This paper
448	EcBIN-330	2013	Chile	Bahía Inglesa, Caldera	KT982898	This paper
449	EcBIN-331	2013	Chile	Bahía Inglesa, Caldera	KT982899	This paper
450	EcBIN-332	2013	Chile	Bahía Inglesa, Caldera	KT982900	This paper
451	EcBIN-333	2013	Chile	Bahía Inglesa, Caldera	KT982901	This paper
452	EcBIN-337	2013	Chile	Bahía Inglesa, Caldera	KT982902	This paper
453	EcBIN-338	2013	Chile	Bahía Inglesa, Caldera	KT982903	This paper
454	EcBIN-339	2013	Chile	Bahía Inglesa, Caldera	KT982904	This paper
455	EcBIN-341	2013	Chile	Bahía Inglesa, Caldera	KT982905	This paper
456	EcBIN-343	2013	Chile	Bahía Inglesa, Caldera	KT982906	This paper
457	EcBIN-227	2013	Chile	Bahía Inglesa, Caldera	KU134013	This paper
458	EcBIN-01	2013	Chile	Bahía Inglesa, Caldera	KU134014	This paper
459	EcBIN-02	2013	Chile	Bahía Inglesa, Caldera	KU134015	This paper
460	EcBIN-04	2013	Chile	Bahía Inglesa, Caldera	KU134016	This paper
461	EcBIN-05	2013	Chile	Bahía Inglesa, Caldera	KU134017	This paper
462	EcBIN-06	2013	Chile	Bahía Inglesa, Caldera	KU134018	This paper
463	EcBIN-07	2013	Chile	Bahía Inglesa, Caldera	KU134019	This paper
464	EcBIN-08	2013	Chile	Bahía Inglesa, Caldera	KU134020	This paper

465	EcBIN-09	2013	Chile	Bahía Inglesa, Caldera	KU134021	This paper
466	EcBIN-10	2013	Chile	Bahía Inglesa, Caldera	KU134022	This paper
467	EcBIN-220	2013	Chile	Bahía Inglesa, Caldera	KU134024	This paper
468	EcBIN-221	2013	Chile	Bahía Inglesa, Caldera	KU134025	This paper
469	EcBIN-224	2013	Chile	Bahía Inglesa, Caldera	KU134026	This paper
470	EcBIN-226	2013	Chile	Bahía Inglesa, Caldera	KU134027	This paper
471	EcBIN-243	2013	Chile	Bahía Inglesa, Caldera	KU134028	This paper
472	EcBIN-246	2013	Chile	Bahía Inglesa, Caldera	KU134029	This paper
473	EcBIN-247	2013	Chile	Bahía Inglesa, Caldera	KU134030	This paper
474	EcBIN-276	2013	Chile	Bahía Inglesa, Caldera	KU134032	This paper
475	EcBIN-346	2013	Chile	Bahía Inglesa, Caldera	KU134037	This paper
476	EcBIN-348	2013	Chile	Bahía Inglesa, Caldera	KU134038	This paper
477	EcBIN-350	2013	Chile	Bahía Inglesa, Caldera	KU134039	This paper
478	EcBIN-351	2013	Chile	Bahía Inglesa, Caldera	KU134040	This paper
479	EcBAS-252A	2013	Chile	Bahía Salada, Caldera	KT982907	This paper
480	EcBAS-264	2013	Chile	Bahía Salada, Caldera	KU134031	This paper
481	EcBAS-298	2013	Chile	Bahía Salada, Caldera	KU134033	This paper
482	EcBAS-303	2013	Chile	Bahía Salada, Caldera	KU134034	This paper
483	EcBAS-304	2013	Chile	Bahía Salada, Caldera	KU134035	This paper
484	EcBAS-305	2013	Chile	Bahía Salada, Caldera	KU134036	This paper
485	EcBAS-255A	2013	Chile	Bahía Salada, Caldera	KU134041	This paper
486	EcBAS-255D	2013	Chile	Bahía Salada, Caldera	KU134042	This paper
487	EcBAS-302A	2013	Chile	Bahía Salada, Caldera	KU134043	This paper
488	EcBAS-305B	2013	Chile	Bahía Salada, Caldera	KU134044	This paper
489	EcCIS-071	2013	Chile	Caleta Cisne, Caldera	KU134051	This paper
490	EcCIS-70	2013	Chile	Caleta Cisne, Caldera	KU134053	This paper

491	EcCIS-073	2013	Chile	Caleta Cisne, Caldera	KT987931	This paper
492	EcPVI-36	2013	Chile	Puerto Viejo, Caldera	KU134023	This paper
493	EcPVI-035	2013	Chile	Puerto Viejo, Caldera	KT987930	This paper
494	Ec454	---	Chile	Caldera	KU134105	This paper
495	EcALG-520	2013	Chile	Algarrobo	KT982995	This paper
496	EcALG-521	2013	Chile	Algarrobo	KT982996	This paper
497	EcALG-522	2013	Chile	Algarrobo	KT982997	This paper
498	EcALG-523	2013	Chile	Algarrobo	KT982998	This paper
499	EcALG-525	2013	Chile	Algarrobo	KT982999	This paper
500	EcALG-527	2013	Chile	Algarrobo	KT983000	This paper
501	EcALG-521A	2013	Chile	Algarrobo	KT983001	This paper
502	EcALG-524	2013	Chile	Algarrobo	KU134108	This paper
503	EcQUI-482	2013	Chile	Quintay	KT982974	This paper
504	EcQUI-483	2013	Chile	Quintay	KT982975	This paper
505	EcQUI-485	2013	Chile	Quintay	KT982976	This paper
506	EcQUI-486	2013	Chile	Quintay	KT982977	This paper
507	EcQUI-489	2013	Chile	Quintay	KT982978	This paper
508	EcQUI-491	2013	Chile	Quintay	KT982979	This paper
509	EcQUI-493	2013	Chile	Quintay	KT982980	This paper
510	EcQUI-494	2013	Chile	Quintay	KT982981	This paper
511	EcQUI-497	2013	Chile	Quintay	KT982982	This paper
512	EcQUI-498	2013	Chile	Quintay	KT982983	This paper
513	EcQUI-503	2013	Chile	Quintay	KT982984	This paper
514	EcQUI-505	2013	Chile	Quintay	KT982985	This paper
515	EcQUI-507	2013	Chile	Quintay	KT982986	This paper
516	EcQUI-508	2013	Chile	Quintay	KT982987	This paper

517	EcQUI-509	2013	Chile	Quintay	KT982988	This paper
518	EcQUI-510	2013	Chile	Quintay	KT982989	This paper
519	EcQUI-511	2013	Chile	Quintay	KT982990	This paper
520	EcQUI-515	2013	Chile	Quintay	KT982991	This paper
521	EcQUI-516	2013	Chile	Quintay	KT982992	This paper
522	EcQUI-517	2013	Chile	Quintay	KT982993	This paper
523	EcQUI-518	2013	Chile	Quintay	KT982994	This paper
524	EcQUI-455	2013	Chile	Quintay	KT987960	This paper
525	EcQUI-456	2013	Chile	Quintay	KT987961	This paper
526	EcQUI-457	2013	Chile	Quintay	KT987962	This paper
527	EcQUI-467	2013	Chile	Quintay	KT987963	This paper
528	EcQUI-469	2013	Chile	Quintay	KT987964	This paper
529	EcQUI-476	2013	Chile	Quintay	KT987965	This paper
530	EcQUI-477	2013	Chile	Quintay	KT987966	This paper
531	EcQUI-478	2013	Chile	Quintay	KT987967	This paper
532	EcQUI-480	2013	Chile	Quintay	KT987968	This paper
533	EcQUI-484	2013	Chile	Quintay	KT983214	This paper
534	EcQUI-490	2013	Chile	Quintay	KT983215	This paper
535	EcQUI-499	2013	Chile	Quintay	KT983216	This paper
536	EcQUI-500	2013	Chile	Quintay	KT983217	This paper
537	EcQUI-501	2013	Chile	Quintay	KT983218	This paper
538	EcQUI-504	2013	Chile	Quintay	KT983219	This paper
539	EcQUI-506	2013	Chile	Quintay	KT983220	This paper
540	EcQUI-519	2013	Chile	Quintay	KT983221	This paper
541	EcQUI-513	2013	Chile	Quintay	KT983222	This paper
542	EcQUI-450	2013	Chile	Quintay	KU134052	This paper

543	EcLAC-403	2013	Chile	Las Cruces	KT982973	This paper
544	EcLAC-397	2013	Chile	Las Cruces	KU134054	This paper
545	EcLAC-412	2013	Chile	Las Cruces	KU134055	This paper
546	EcLAC-398	2013	Chile	Las Cruces	KU134056	This paper
547	EcLAC-424	2013	Chile	Las Cruces	KU134106	This paper
548	EcLAC-384	2013	Chile	Las Cruces	KU134107	This paper
549	EcLAC-354	2013	Chile	Las Cruces	KT987932	This paper
550	EcLAC-355	2013	Chile	Las Cruces	KT987933	This paper
551	EcLAC-356	2013	Chile	Las Cruces	KT987934	This paper
552	EcLAC-357	2013	Chile	Las Cruces	KT987935	This paper
553	EcLAC-363	2013	Chile	Las Cruces	KT987936	This paper
554	EcLAC-365	2013	Chile	Las Cruces	KT987937	This paper
555	EcLAC-366	2013	Chile	Las Cruces	KT987938	This paper
556	EcLAC-369	2013	Chile	Las Cruces	KT987939	This paper
557	EcLAC-371	2013	Chile	Las Cruces	KT987940	This paper
558	EcLAC-373	2013	Chile	Las Cruces	KT987941	This paper
559	EcLAC-374	2013	Chile	Las Cruces	KT987942	This paper
560	EcLAC-386	2013	Chile	Las Cruces	KT987943	This paper
561	EcLAC-387	2013	Chile	Las Cruces	KT987944	This paper
562	EcLAC-388	2013	Chile	Las Cruces	KT987945	This paper
563	EcLAC-389	2013	Chile	Las Cruces	KT987946	This paper
564	EcLAC-390	2013	Chile	Las Cruces	KT987947	This paper
565	EcLAC-392	2013	Chile	Las Cruces	KT987948	This paper
566	EcLAC-394	2013	Chile	Las Cruces	KT987949	This paper
567	EcLAC-407	2013	Chile	Las Cruces	KT987950	This paper
568	EcLAC-411	2013	Chile	Las Cruces	KT987951	This paper

569	EcLAC-415	2013	Chile	Las Cruces	KT987952	This paper
570	EcLAC-425	2013	Chile	Las Cruces	KT987953	This paper
571	EcLAC-430	2013	Chile	Las Cruces	KT987954	This paper
572	EcLAC-433	2013	Chile	Las Cruces	KT987955	This paper
573	EcLAC-435	2013	Chile	Las Cruces	KT987956	This paper
574	EcLAC-443	2013	Chile	Las Cruces	KT987957	This paper
575	EcLAC-444	2013	Chile	Las Cruces	KT987958	This paper
576	EcLAC-445	2013	Chile	Las Cruces	KT987959	This paper
577	EcLAC-402A	2013	Chile	Las Cruces	KT987974	This paper
578	EcLAC-379	2013	Chile	Las Cruces	KT987977	This paper
579	EcDIC-605	2013	Chile	Dichato	KT983009	This paper
580	EcDIC-577	2013	Chile	Dichato	KU134069	This paper
581	EcDIC-578	2013	Chile	Dichato	KU134070	This paper
582	EcDIC-579	2013	Chile	Dichato	KU134071	This paper
583	EcDIC-581	2013	Chile	Dichato	KU134072	This paper
584	EcDIC-583	2013	Chile	Dichato	KU134073	This paper
585	EcDIC-584	2013	Chile	Dichato	KU134074	This paper
586	EcDIC-586	2013	Chile	Dichato	KU134075	This paper
587	EcDIC-587	2013	Chile	Dichato	KU134076	This paper
588	EcDIC-594	2013	Chile	Dichato	KU134077	This paper
589	EcDIC-595	2013	Chile	Dichato	KU134078	This paper
590	EcDIC-596	2013	Chile	Dichato	KU134079	This paper
591	EcDIC-598	2013	Chile	Dichato	KU134080	This paper
592	EcDIC-600	2013	Chile	Dichato	KU134081	This paper
593	EcDIC-601	2013	Chile	Dichato	KU134082	This paper
594	EcDIC-602	2013	Chile	Dichato	KU134083	This paper

595	EcDIC-603	2013	Chile	Dichato	KU134084	This paper
596	EcDIC-604	2013	Chile	Dichato	KU134085	This paper
597	EcDIC-609	2013	Chile	Dichato	KU134086	This paper
598	EcDIC-610	2013	Chile	Dichato	KU134087	This paper
599	EcDIC-646	2013	Chile	Dichato	KU134088	This paper
600	EcDIC-647	2013	Chile	Dichato	KU134089	This paper
601	EcDIC-653	2013	Chile	Dichato	KU134091	This paper
602	EcDIC-654	2013	Chile	Dichato	KU134092	This paper
603	EcDIC-656	2013	Chile	Dichato	KU134093	This paper
604	EcDIC-657	2013	Chile	Dichato	KU134094	This paper
605	EcDIC-658	2013	Chile	Dichato	KU134095	This paper
606	EcCOL-572	2013	Chile	Cocholgüe, Tomé	KT982908	This paper
607	EcCOL-529	2013	Chile	Cocholgüe, Tomé	KT983002	This paper
608	EcCOL-530	2013	Chile	Cocholgüe, Tomé	KT983003	This paper
609	EcCOL-531	2013	Chile	Cocholgüe, Tomé	KT983004	This paper
610	EcCOL-544	2013	Chile	Cocholgüe, Tomé	KT983005	This paper
611	EcCOL-573	2013	Chile	Cocholgüe, Tomé	KT983006	This paper
612	EcCOL-574	2013	Chile	Cocholgüe, Tomé	KT983007	This paper
613	EcCOL-576	2013	Chile	Cocholgüe, Tomé	KT983008	This paper
614	EcCOL-566	2013	Chile	Cocholgüe, Tomé	KT983223	This paper
615	EcCOL_568	2013	Chile	Cocholgüe, Tomé	KU134068	This paper
616	EcCOL-558A	2013	Chile	Cocholgüe, Tomé	KU134104	This paper
617	EcCOL-532	2013	Chile	Cocholgüe, Tomé	KU134109	This paper
618	EcCOL-558	2013	Chile	Cocholgüe, Tomé	KU134110	This paper
619	EcCOL-560	2013	Chile	Cocholgüe, Tomé	KU134111	This paper
620	EcCOL-569	2013	Chile	Cocholgüe, Tomé	KU134112	This paper

621	EcCOL-559	2013	Chile	Cocholgüe, Tomé	KT987969	This paper
622	EcCOL-567	2013	Chile	Cocholgüe, Tomé	KT987970	This paper
623	EcCOL-568A	2013	Chile	Cocholgüe, Tomé	KT987975	This paper
624	EcPIL-611	2013	Chile	Pilolcura, Valdivia	KT983010	This paper
625	EcPIL-616	2013	Chile	Pilolcura, Valdivia	KT983011	This paper
626	EcPIL-618	2013	Chile	Pilolcura, Valdivia	KT983012	This paper
627	EcPIL-624	2013	Chile	Pilolcura, Valdivia	KT983013	This paper
628	EcPIL-625	2013	Chile	Pilolcura, Valdivia	KT983014	This paper
629	EcPIL-628	2013	Chile	Pilolcura, Valdivia	KT983015	This paper
630	EcPIL-650	2013	Chile	Pilolcura, Valdivia	KT983016	This paper
631	EcPIL-621	2013	Chile	Pilolcura, Valdivia	KT983224	This paper
632	EcPIL-631	2013	Chile	Pilolcura, Valdivia	KT983225	This paper
633	EcPIL-632	2013	Chile	Pilolcura, Valdivia	KT983226	This paper
634	EcPIL-633	2013	Chile	Pilolcura, Valdivia	KT983227	This paper
635	EcPIL-634	2013	Chile	Pilolcura, Valdivia	KT983228	This paper
636	EcPIL-635	2013	Chile	Pilolcura, Valdivia	KT983231	This paper
637	EcPIL-636	2013	Chile	Pilolcura, Valdivia	KT983232	This paper
638	EcPIL-651	2013	Chile	Pilolcura, Valdivia	KT983233	This paper
639	EcPIL-648	2013	Chile	Pilolcura, Valdivia	KU134090	This paper
640	EcPIL-639	2013	Chile	Pilolcura, Valdivia	KT987971	This paper
641	EcCNA-638	2013	Chile	Curiñanco, Valdivia	KT983017	This paper
642	EcCNA-640	2013	Chile	Curiñanco, Valdivia	KT983018	This paper
643	EcCNA-641	2013	Chile	Curiñanco, Valdivia	KT983019	This paper
644	EcCNA-644	2013	Chile	Curiñanco, Valdivia	KT983020	This paper
645	EcCNA-645	2013	Chile	Curiñanco, Valdivia	KT983021	This paper
646	EcCNA-660	2013	Chile	Curiñanco, Valdivia	KT983022	This paper

647	EcCNA-659	2013	Chile	Curiñanco, Valdivia	KT983023	This paper
648	EcCNA-642	2013	Chile	Curiñanco, Valdivia	KT983229	This paper
649	EcSCA-726	2013	Chile	San Carlos, Corral, Valdivia	KT983230	This paper
650	EcSCA-721	2013	Chile	San Carlos, Corral, Valdivia	KU134063	This paper
651	EcSCA-722	2013	Chile	San Carlos, Corral, Valdivia	KU134064	This paper
652	EcSCA-723	2013	Chile	San Carlos, Corral, Valdivia	KU134065	This paper
653	EcPLG-708	2013	Chile	Niebla, Valdivia	KU134057	This paper
654	EcPLG-712	2013	Chile	Niebla, Valdivia	KU134096	This paper
655	EcPLG-716	2013	Chile	Niebla, Valdivia	KU134097	This paper
656	EcPLG-717	2013	Chile	Niebla, Valdivia	KU134098	This paper
657	EcPLG-718	2013	Chile	Niebla, Valdivia	KU134099	This paper
658	EcPLG-682A	2013	Chile	Niebla, Valdivia	KU134113	This paper
659	EcPLG-686	2013	Chile	Niebla, Valdivia	KU134114	This paper
660	EcPLG-688	2013	Chile	Niebla, Valdivia	KU134115	This paper
661	EcPLG-713	2013	Chile	Niebla, Valdivia	KT987972	This paper
662	EcPLG-714	2013	Chile	Niebla, Valdivia	KT987973	This paper
663	EcEST-782	2013	Chile	Estaquilla	KT983028	This paper
664	EcEST-785	2013	Chile	Estaquilla	KT983029	This paper
665	EcEST-786	2013	Chile	Estaquilla	KT983030	This paper
666	EcEST-788	2013	Chile	Estaquilla	KT983031	This paper
667	EcEST-789	2013	Chile	Estaquilla	KT983032	This paper
668	EcEST-790	2013	Chile	Estaquilla	KT983033	This paper
669	EcEST-791	2013	Chile	Estaquilla	KT983034	This paper
670	EcEST-792	2013	Chile	Estaquilla	KT983035	This paper
671	EcEST-793	2013	Chile	Estaquilla	KT983036	This paper
672	EcEST-794	2013	Chile	Estaquilla	KT983037	This paper

673	EcEST-795	2013	Chile	Estaquilla	KT983038	This paper
674	EcEST-796	2013	Chile	Estaquilla	KT983039	This paper
675	EcEST-797	2013	Chile	Estaquilla	KT983040	This paper
676	EcEST-798	2013	Chile	Estaquilla	KT983041	This paper
677	EcEST-800	2013	Chile	Estaquilla	KT983042	This paper
678	EcEST-801	2013	Chile	Estaquilla	KT983043	This paper
679	EcEST-802	2013	Chile	Estaquilla	KT983044	This paper
680	EcEST-804	2013	Chile	Estaquilla	KT983045	This paper
681	EcEST-805	2013	Chile	Estaquilla	KT983046	This paper
682	EcEST-806	2013	Chile	Estaquilla	KT983047	This paper
683	EcEST-807	2013	Chile	Estaquilla	KT983048	This paper
684	EcEST-808	2013	Chile	Estaquilla	KT983049	This paper
685	EcEST-809	2013	Chile	Estaquilla	KT983050	This paper
686	EcEST-810	2013	Chile	Estaquilla	KT983051	This paper
687	EcEST-811	2013	Chile	Estaquilla	KT983052	This paper
688	EcEST-813	2013	Chile	Estaquilla	KT983053	This paper
689	EcEST-815	2013	Chile	Estaquilla	KT983054	This paper
690	EcEST-816	2013	Chile	Estaquilla	KT983055	This paper
691	EcEST-769	2013	Chile	Estaquilla	KT983237	This paper
692	EcEST-771	2013	Chile	Estaquilla	KT983238	This paper
693	EcEST-772	2013	Chile	Estaquilla	KT983239	This paper
694	EcEST-775	2013	Chile	Estaquilla	KT983240	This paper
695	EcEST-776	2013	Chile	Estaquilla	KT983241	This paper
696	EcEST-777	2013	Chile	Estaquilla	KT983242	This paper
697	EcEST-778	2013	Chile	Estaquilla	KT983243	This paper
698	EcEST-779	2013	Chile	Estaquilla	KT983244	This paper

699	EcEST-780	2013	Chile	Estaquilla	KT983245	This paper
700	EcEST-781	2013	Chile	Estaquilla	KT983246	This paper
701	EcEST-783	2013	Chile	Estaquilla	KT983247	This paper
702	EcEST-784	2013	Chile	Estaquilla	KT983248	This paper
703	EcEST-787	2013	Chile	Estaquilla	KT983249	This paper
704	EcEST-803	2013	Chile	Estaquilla	KT983250	This paper
705	EcACH-745	2013	Chile	Achao	KT982909	This paper
706	EcACH-748	2013	Chile	Achao	KT982910	This paper
707	EcACH-757	2013	Chile	Achao	KT982911	This paper
708	EcACH-761	2013	Chile	Achao	KT982912	This paper
709	EcACH-751	2013	Chile	Achao	KT983024	This paper
710	EcACH-752	2013	Chile	Achao	KT983025	This paper
711	EcACH-753	2013	Chile	Achao	KT983026	This paper
712	EcACH-754	2013	Chile	Achao	KT983027	This paper
713	EcACH-749	2013	Chile	Achao	KT983234	This paper
714	EcACH-755	2013	Chile	Achao	KT983235	This paper
715	EcACH-762	2013	Chile	Achao	KT983236	This paper
716	EcACH-760	2013	Chile	Achao	KU134045	This paper
717	EcACH-765	2013	Chile	Achao	KU134046	This paper
718	EcACH-758	2013	Chile	Achao	KU134047	This paper
719	EcACH-763	2013	Chile	Achao	KU134048	This paper
720	EcACH-746A	2013	Chile	Achao	KU134049	This paper
721	EcACH-759	2013	Chile	Achao	KU134050	This paper
722	EcACH-746	2013	Chile	Achao	KU134100	This paper
723	EcACH-747	2013	Chile	Achao	KU134101	This paper
724	EcACH-750	2013	Chile	Achao	KU134102	This paper

725	EcACH-756	2013	Chile	Achao	KU134103	This paper
726	Ec642	2009	USA	Oregon	KT983251	This paper
727	Ec641	2009	USA	Oregon	KT987976	This paper
728	Ec707	2006	Korea	Hanrim	KT982915	This paper
729	Ec717	2005	Korea	Hanrim	KT983056	This paper

Table S2. ITS1 sequences used in the present study. Details of the date, geographic origin, Genbank accession number and reference of each ITS1 sequences used in the present study.

N°	Name of sample	Date	Country	Locality	Genbank Accession	Reference
1	Esil.Man.f	1976	United Kingdom	Isle of Man	U38771	Stache-Crain et al. 1997
2	W009	2004	United Kingdom	Devon	FR668929	Unpublished
3	Esil.Ros.h	1970	France	Roscoff	U38760	Stache-Crain et al. 1997
4	Ec393	2003	France	Roscoff	FN564440	Peters et al. 2010a
5	Ec496	2005	France	Roscoff	FN564451	Peters et al. 2010a
6	Ec537	2005	France	Traezh Hir	FN564450	Peters et al. 2010a
7	Ec540	2005	France	Traezh Hir	FN564448	Peters et al. 2010a
8	Ec318	2006	France	Cherbourg	FN564443	Peters et al. 2010a
9	Esilnap.m	no data	Italy	Naples	U38754	Stache-Crain et al. 1997
10	EcsilNa70m	1975	Italy	Naples	FR668809	Unpublished
11	Ec_sil_Nap_EA1f	1965	Italy	Naples	FR668820	Unpublished
12	EcsilNa84f	1975	Italy	Naples	FR668810	Unpublished
13	EcNa112fNa	1975	Italy	Naples	FR668811	Unpublished
14	Esil.Nap.f	no data	Italy	Naples	U38755	Stache-Crain et al. 1997
15	EcCI200-2	1994	Spain	Canary Islands	FR668887	Unpublished
16	EcCI193-2	1994	Spain	Canary Islands	FR668885	Unpublished
17	CI146-1	no data	Spain	Canary Islands	U38775	Stache-Crain et al. 1997
18	CI171-1	1994	Spain	Canary Islands	FR668884	Unpublished
19	EcsilNFL31E3f	no data	Canada	Newfoundland	FR668807	Unpublished
20	Esil.wil.f	1978	USA	Wilmington, North Carolina	U38756	Stache-Crain et al. 1997
21	E.SB	1977	USA	Santa Barbara, California	U38759	Stache-Crain et al. 1997

22	EcSBML7-1	1977	USA	Santa Barbara, California	FR668855	Unpublished
23	E.SF	no data	USA	Santa Francisco, California	U38758	Stache-Crain et al. 1997
24	Wil1a	no data	USA	Wilmington, North Carolina	U38776	Stache-Crain et al. 1997
25	Ec286	2006	Peru	Bahía Mendieta	FN564454	Peters et al. 2010b
26	Ec298	2006	Peru	San Juan de Marcona	FN564456	Peters et al. 2010b
27	Esil.Peru.h	1988	Peru	San Juan de Marcona	AJ550048	Unpublished
28	Ec721	2006	Chile	Arica	FN564446	Peters et al. 2010b
29	Ec156	2006	Chile	Pisagua	FN564457	Peters et al. 2010b
30	Ec157	2006	Chile	Pisagua	FN564453	Peters et al. 2010b
31	Ec524	2006	Chile	Chañaral	FN564444	Peters et al. 2010b
32	Ec608	2004-2005	Chile	Chañaral	FN564459	Peters et al. 2010b
33	Ec454	no data	Chile	Caldera	FR668740	Unpublished
34	Ec456	1990	Chile	Coquimbo, Caldera	FN564455	Unpublished
35	Esil.Ch-1.f	1985	Chile	Puerto Puyuhuapi	U38767	Stache-Crain et al. 1997
36	Efas.Ch-2.f	1992	Chile	Valdivia	U38772	Stache-Crain et al. 1997
37	RC32-4	no data	Chile	Juan Fernandez	U38763	Stache-Crain et al. 1997
38	EcSAM-117	1989	Argentina	Puerto Deseado	FR668866	Unpublished
39	Esil.NZ-1.f	1988	New Zealand	Kaikoura	U38766	Stache-Crain et al. 1997
40	EcsilNZ15d2m	1988	New Zealand	Kaikoura	FR668748	Unpublished
41	EcsilchapNZ613m	no data	New Zealand	Kaikoura	FR668744	Unpublished
42	Chap615f	no data	New Zealand	Kaikoura	U38761	Stache-Crain et al. 1997
43	Esil.Vic.f	no data	Australia	Sorrento, Victoria	U38764	Stache-Crain et al. 1997
44	Ec006	1988	Australia	Sorrento, Victoria	FR668837	Unpublished
45	EcsilVic88-12-15f	1988	Australia	Sorrento, Victoria	FR668838	Unpublished
46	Esil.Saf.f	no data	South Africa	Port Elizabeth	U38757	Stache-Crain et al. 1997

47	Ec718	2005	Korea	Hupo	FN564461	Unpublished
48	Ec714	2005	Korea	Sangjokam	FN564464	Unpublished
49	Ec705	2006	Korea	Kimnyung	FN564445	Unpublished
50	EcJAP91-5	1991	Japan	Namikata, Ehime	FR668897	Unpublished
51	WIC08-1	2008	United Kingdom	Wick	KU134398	This paper
52	WIC08-2	2008	United Kingdom	Wick	KU134399	This paper
53	WIC08-3	2008	United Kingdom	Wick	KU134400	This paper
54	WIC08-4	2008	United Kingdom	Wick	KU134401	This paper
55	WIC08-5	2008	United Kingdom	Wick	KU134402	This paper
56	WIC08-7	2008	United Kingdom	Wick	KU134403	This paper
57	WIC08-8	2008	United Kingdom	Wick	KU134404	This paper
58	WIC08-9	2008	United Kingdom	Wick	KU134405	This paper
59	WIC08-16	2008	United Kingdom	Wick	KU134406	This paper
60	WIC08-18	2008	United Kingdom	Wick	KU134407	This paper
61	OBA07-4	2007	United Kingdom	Dunstaffnage	KU134162	This paper
62	OBA07-15	2007	United Kingdom	Dunstaffnage	KU134163	This paper
63	OBA07-48	2007	United Kingdom	Dunstaffnage	KU134164	This paper
64	OBA07-10	2007	United Kingdom	Dunstaffnage	KU134165	This paper
65	SAM08-4	2008	United Kingdom	Dunstaffnage	KU134166	This paper
66	SAM08-5	2008	United Kingdom	Dunstaffnage	KU134167	This paper
67	SAM08-9	2008	United Kingdom	Dunstaffnage	KU134168	This paper
68	SAM08-03	2008	United Kingdom	Dunstaffnage	KU134545	This paper
69	BUT08-30	2008	United Kingdom	Berwick	KU134417	This paper
70	BUT08-31	2008	United Kingdom	Berwick	KU134418	This paper
71	BUT08-32	2008	United Kingdom	Berwick	KU134419	This paper

72	BUT08-24	2008	United Kingdom	Berwick	KU134420	This paper
73	BUT08-35	2008	United Kingdom	Berwick	KU134421	This paper
74	BUT08-40	2008	United Kingdom	Berwick	KU134422	This paper
75	BUT08-41	2008	United Kingdom	Berwick	KU134423	This paper
76	BUT08-11	2008	United Kingdom	Berwick	KU134424	This paper
77	BUT08-13	2008	United Kingdom	Berwick	KU134425	This paper
78	BUT08-25	2008	United Kingdom	Berwick	KU134426	This paper
79	BUT08-26	2008	United Kingdom	Berwick	KU134427	This paper
80	BUT08-27	2008	United Kingdom	Berwick	KU134428	This paper
81	GWY08-16	2008	United Kingdom	Mull of Galloway	KU134429	This paper
82	GWY08-17	2008	United Kingdom	Mull of Galloway	KU134430	This paper
83	GWY08-21	2008	United Kingdom	Mull of Galloway	KU134431	This paper
84	GWY08-24	2008	United Kingdom	Mull of Galloway	KU134432	This paper
85	GWY08-23	2008	United Kingdom	Mull of Galloway	KU134433	This paper
86	GWY08-26	2008	United Kingdom	Mull of Galloway	KU134434	This paper
87	GWY08-05	2008	United Kingdom	Mull of Galloway	KU134435	This paper
88	GWY08-06	2008	United Kingdom	Mull of Galloway	KU134436	This paper
89	GWY08-07	2008	United Kingdom	Mull of Galloway	KU134437	This paper
90	GWY08-08	2008	United Kingdom	Mull of Galloway	KU134438	This paper
91	GWY08-09	2008	United Kingdom	Mull of Galloway	KU134439	This paper
92	GWY08-13	2008	United Kingdom	Mull of Galloway	KU134440	This paper
93	GWY08-14	2008	United Kingdom	Mull of Galloway	KU134441	This paper
94	GWY08-15	2008	United Kingdom	Mull of Galloway	KU134442	This paper
95	HAS08-5	2008	United Kingdom	Pett level	KU134159	This paper
96	HAS08-9	2008	United Kingdom	Pett level	KU134160	This paper

97	HAS08-18	2008	United Kingdom	Pett level	KU134161	This paper
98	HAS08-7	2008	United Kingdom	Pett level	KU134305	This paper
99	HAS08-8	2008	United Kingdom	Pett level	KU134306	This paper
100	HAS08-11	2008	United Kingdom	Pett level	KU134307	This paper
101	HAS08-12	2008	United Kingdom	Pett level	KU134308	This paper
102	HAS08-13	2008	United Kingdom	Pett level	KU134309	This paper
103	HAS08-14	2008	United Kingdom	Pett level	KU134310	This paper
104	HAS08-16	2008	United Kingdom	Pett level	KU134311	This paper
105	HAS08-17	2008	United Kingdom	Pett level	KU134312	This paper
106	HAS08-19	2008	United Kingdom	Pett level	KU134313	This paper
107	HAS08-20	2008	United Kingdom	Pett level	KU134314	This paper
108	LH14	2008	United Kingdom	Gosport marina	KU134542	This paper
109	LH7	2008	United Kingdom	Gosport marina	KU134543	This paper
110	LH13	2008	United Kingdom	Gosport marina	KU134544	This paper
111	EcQAB10-1	2010	United Kingdom	Plymouth	KU134213	This paper
112	EcQAB10-2	2010	United Kingdom	Plymouth	KU134214	This paper
113	EcQAB10-3	2010	United Kingdom	Plymouth	KU134215	This paper
114	EcQAB10-4	2010	United Kingdom	Plymouth	KU134216	This paper
115	EcQAB10-5	2010	United Kingdom	Plymouth	KU134217	This paper
116	EcQAB10-6	2010	United Kingdom	Plymouth	KU134218	This paper
117	EcQAB10-7	2010	United Kingdom	Plymouth	KU134219	This paper
118	EcQAB10-8	2010	United Kingdom	Plymouth	KU134220	This paper
119	EcQAB10-9	2010	United Kingdom	Plymouth	KU134221	This paper
120	EcQAB10-10	2010	United Kingdom	Plymouth	KU134222	This paper
121	EcQAB10-11	2010	United Kingdom	Plymouth	KU134223	This paper

122	EcQAB10-12	2010	United Kingdom	Plymouth	KU134224	This paper
123	EcQAB10-13	2010	United Kingdom	Plymouth	KU134225	This paper
124	EcQAB10-14	2010	United Kingdom	Plymouth	KU134226	This paper
125	EcQAB10-15	2010	United Kingdom	Plymouth	KU134227	This paper
126	EcQAB10-16	2010	United Kingdom	Plymouth	KU134228	This paper
127	EcQAB10-17	2010	United Kingdom	Plymouth	KU134229	This paper
128	EcQAB10-18	2010	United Kingdom	Plymouth	KU134230	This paper
129	EcQAB10-19	2010	United Kingdom	Plymouth	KU134231	This paper
130	EcQAB10-20	2010	United Kingdom	Plymouth	KU134232	This paper
131	EcQAB10-21	2010	United Kingdom	Plymouth	KU134233	This paper
132	EcQAB10-22	2010	United Kingdom	Plymouth	KU134234	This paper
133	EcQAB10-23	2010	United Kingdom	Plymouth	KU134235	This paper
134	EcQAB10-24	2010	United Kingdom	Plymouth	KU134236	This paper
135	EcPLY10-31	2010	United Kingdom	Plymouth	KU134472	This paper
136	EcPLY10-19	2010	United Kingdom	Plymouth	KU134473	This paper
137	EcPLY10-20	2010	United Kingdom	Plymouth	KU134474	This paper
138	EcPLY10-21	2010	United Kingdom	Plymouth	KU134475	This paper
139	EcPLY10-23	2010	United Kingdom	Plymouth	KU134476	This paper
140	EcPLY10-26	2010	United Kingdom	Plymouth	KU134477	This paper
141	EcPLY10-27	2010	United Kingdom	Plymouth	KU134478	This paper
142	EcPLY10-28	2010	United Kingdom	Plymouth	KU134479	This paper
143	EcPLY10-29	2010	United Kingdom	Plymouth	KU134480	This paper
144	EcPLY10-30	2010	United Kingdom	Plymouth	KU134481	This paper
145	EcPLY10-34	2010	United Kingdom	Plymouth	KU134482	This paper
146	EcPLY10-35	2010	United Kingdom	Plymouth	KU134483	This paper

147	Ec242	2011	United Kingdom	Plymouth	KU134540	This paper
148	EcREP10-38	2010	United Kingdom	Restronguet	KU134315	This paper
149	EcREP10-39	2010	United Kingdom	Restronguet	KU134316	This paper
150	EcREP10-42	2010	United Kingdom	Restronguet	KU134317	This paper
151	EcREP10-43	2010	United Kingdom	Restronguet	KU134318	This paper
152	EcREP10-44	2010	United Kingdom	Restronguet	KU134319	This paper
153	EcREP10-45	2010	United Kingdom	Restronguet	KU134320	This paper
154	EcREP10-48	2010	United Kingdom	Restronguet	KU134321	This paper
155	EcREP10-49	2010	United Kingdom	Restronguet	KU134322	This paper
156	EcREP10-50	2010	United Kingdom	Restronguet	KU134323	This paper
157	EcREP10-51	2010	United Kingdom	Restronguet	KU134324	This paper
158	EcREP10-52	2010	United Kingdom	Restronguet	KU134325	This paper
159	EcREP10-54	2010	United Kingdom	Restronguet	KU134326	This paper
160	Ec334	2007	France	Roscoff	KU134470	This paper
161	EcPH10-22	2010	France	Roscoff	KU134456	This paper
162	EcPH10-38	2010	France	Roscoff	KU134455	This paper
163	EcPH10-72	2010	France	Roscoff	KU134471	This paper
164	EcPH11-s5-15	2011	France	Roscoff	KU134261	This paper
165	EcPH11-s2B-45	2011	France	Roscoff	KU134262	This paper
166	EcPH11-s5-13	2011	France	Roscoff	KU134263	This paper
167	EcPH11-s2B-43	2011	France	Roscoff	KU134264	This paper
168	EcPH11-s5-19	2011	France	Roscoff	KU134265	This paper
169	EcPH11-s2B-41	2011	France	Roscoff	KU134266	This paper
170	EcPH11-s5-18	2011	France	Roscoff	KU134267	This paper
171	EcPH11-s5-17	2011	France	Roscoff	KU134268	This paper

172	EcPH11-s2A-04	2011	France	Roscoff	KU134269	This paper
173	EcPH11-s2A-06	2011	France	Roscoff	KU134270	This paper
174	EcPH11-s2A-09	2011	France	Roscoff	KU134271	This paper
175	EcPH11-s2A-16	2011	France	Roscoff	KU134272	This paper
176	BLZ11-27	2011	France	Roscoff	KU134273	This paper
177	BLZ11-51	2011	France	Roscoff	KU134274	This paper
178	EcPH11-28	2011	France	Roscoff	KU134457	This paper
179	EcPH11-27	2011	France	Roscoff	KU134458	This paper
180	EcPH11-21	2011	France	Roscoff	KU134459	This paper
181	EcPH11-16	2011	France	Roscoff	KU134460	This paper
182	EcPH11-9	2011	France	Roscoff	KU134461	This paper
183	EcPH11-6	2011	France	Roscoff	KU134462	This paper
184	EcPH11-47	2011	France	Roscoff	KU134463	This paper
185	EcPH11-1	2011	France	Roscoff	KU134464	This paper
186	EcPH11-38	2011	France	Roscoff	KU134465	This paper
187	EcPH11-33	2011	France	Roscoff	KU134466	This paper
188	EcPH11-2A-01	2011	France	Roscoff	KU134467	This paper
189	EcPH11-2A-14	2011	France	Roscoff	KU134468	This paper
190	EcPH11-s5-38	2011	France	Roscoff	KU134469	This paper
191	EcTH10-04	2010	France	Traezh Hir	KU134327	This paper
192	EcTH10-05	2010	France	Traezh Hir	KU134328	This paper
193	EcTH10-06	2010	France	Traezh Hir	KU134329	This paper
194	EcTH10-07	2010	France	Traezh Hir	KU134330	This paper
195	EcTH10-08	2010	France	Traezh Hir	KU134331	This paper
196	EcTH10-09	2010	France	Traezh Hir	KU134332	This paper

197	EcTH10-10	2010	France	Traezh Hir	KU134333	This paper
198	EcTH10-12	2010	France	Traezh Hir	KU134334	This paper
199	EcTH10-13	2010	France	Traezh Hir	KU134335	This paper
200	EcTH10-14	2010	France	Traezh Hir	KU134336	This paper
201	EcTH10-15	2010	France	Traezh Hir	KU134337	This paper
202	EcTH10-16	2010	France	Traezh Hir	KU134338	This paper
203	EcTH10-17	2010	France	Traezh Hir	KU134339	This paper
204	EcTH10-18	2010	France	Traezh Hir	KU134340	This paper
205	EcTH10-53	2010	France	Traezh Hir	KU134341	This paper
206	EcTH10-26	2010	France	Traezh Hir	KU134408	This paper
207	EcTH10-31	2010	France	Traezh Hir	KU134409	This paper
208	EcTH10-32	2010	France	Traezh Hir	KU134410	This paper
209	EcTH10-33	2010	France	Traezh Hir	KU134411	This paper
210	EcTH10-35	2010	France	Traezh Hir	KU134412	This paper
211	EcTH10-36	2010	France	Traezh Hir	KU134413	This paper
212	EcTH10-38	2010	France	Traezh Hir	KU134414	This paper
213	EcTH10-39	2010	France	Traezh Hir	KU134415	This paper
214	EcTH10-41	2010	France	Traezh Hir	KU134416	This paper
215	EcQB10-20	2010	France	Quiberon	KU134237	This paper
216	EcQB10-22	2010	France	Quiberon	KU134238	This paper
217	EcQB10-23	2010	France	Quiberon	KU134239	This paper
218	EcQB10-24	2010	France	Quiberon	KU134240	This paper
219	EcQB10-2	2010	France	Quiberon	KU134241	This paper
220	EcQB10-3	2010	France	Quiberon	KU134242	This paper
221	EcQB10-7	2010	France	Quiberon	KU134243	This paper

222	EcQB10-6	2010	France	Quiberon	KU134244	This paper
223	EcQB10-5	2010	France	Quiberon	KU134245	This paper
224	EcQB10-4	2010	France	Quiberon	KU134246	This paper
225	EcQB10-19	2010	France	Quiberon	KU134247	This paper
226	EcQB10-9	2010	France	Quiberon	KU134248	This paper
227	EcQB10-10	2010	France	Quiberon	KU134249	This paper
228	EcQB10-11	2010	France	Quiberon	KU134250	This paper
229	EcQB10-12	2010	France	Quiberon	KU134251	This paper
230	EcQB12-02	2012	France	Quiberon	KU134443	This paper
231	EcQB12-03	2012	France	Quiberon	KU134444	This paper
232	EcQB12-12	2012	France	Quiberon	KU134445	This paper
233	EcQB12-08	2012	France	Quiberon	KU134446	This paper
234	EcQB12-07	2012	France	Quiberon	KU134447	This paper
235	EcQB12-06	2012	France	Quiberon	KU134448	This paper
236	EcQB12-05	2012	France	Quiberon	KU134449	This paper
237	EcQB12-04	2012	France	Quiberon	KU134450	This paper
238	EcQB12-15	2012	France	Quiberon	KU134451	This paper
239	EcQB12-09	2012	France	Quiberon	KU134452	This paper
240	EcQB12-16	2012	France	Quiberon	KU134453	This paper
241	EcQB12-17	2012	France	Quiberon	KU134454	This paper
242	EcRIB-160	2013	Spain	Ribadeo	KU134288	This paper
243	EcRIB-161	2013	Spain	Ribadeo	KU134289	This paper
244	EcRIB-162	2013	Spain	Ribadeo	KU134290	This paper
245	EcRIB-179	2013	Spain	Ribadeo	KU134291	This paper
246	EcRIB-186	2013	Spain	Ribadeo	KU134292	This paper

247	EcRIB-195	2013	Spain	Ribadeo	KU134293	This paper
248	EcRIB-200	2013	Spain	Ribadeo	KU134294	This paper
249	EcRIB-203	2013	Spain	Ribadeo	KU134295	This paper
250	EcRIB-204	2013	Spain	Ribadeo	KU134296	This paper
251	EcRIB-207	2013	Spain	Ribadeo	KU134297	This paper
252	EcRIB-208	2013	Spain	Ribadeo	KU134298	This paper
253	EcRIB-231	2013	Spain	Ribadeo	KU134299	This paper
254	EcRIB-234	2013	Spain	Ribadeo	KU134300	This paper
255	EcRIB-235	2013	Spain	Ribadeo	KU134301	This paper
256	EcRIB-236	2013	Spain	Ribadeo	KU134302	This paper
257	EcRIB-159	2013	Spain	Ribadeo	KU134484	This paper
258	EcRIB-185	2013	Spain	Ribadeo	KU134485	This paper
259	EcRIB-187	2013	Spain	Ribadeo	KU134486	This paper
260	EcRIB-190	2013	Spain	Ribadeo	KU134487	This paper
261	EcRIB-191	2013	Spain	Ribadeo	KU134488	This paper
262	EcRIB-193	2013	Spain	Ribadeo	KU134489	This paper
263	EcRIB-213	2013	Spain	Ribadeo	KU134490	This paper
264	EcRIB-214	2013	Spain	Ribadeo	KU134491	This paper
265	EcRIB-215	2013	Spain	Ribadeo	KU134492	This paper
266	EcRIB-129	2013	Spain	Ribadeo	KU134493	This paper
267	EcRIB-136	2013	Spain	Ribadeo	KU134494	This paper
268	EcGAN-516	2013	Spain	Coruña	KU134497	This paper
269	EcGAN-528	2013	Spain	Coruña	KU134278	This paper
270	EcGAN-529	2013	Spain	Coruña	KU134279	This paper
271	EcGAN-537	2013	Spain	Coruña	KU134280	This paper

272	EcGAN-532	2013	Spain	Coruña	KU134281	This paper
273	EcGAN-540	2013	Spain	Coruña	KU134282	This paper
274	EcGAN-544	2013	Spain	Coruña	KU134283	This paper
275	EcGAN-545	2013	Spain	Coruña	KU134284	This paper
276	EcGAN-552	2013	Spain	Coruña	KU134285	This paper
277	EcGAN-509	2013	Spain	Coruña	KU134286	This paper
278	EcGAN-512	2013	Spain	Coruña	KU134287	This paper
279	EcLOU-57	2013	Spain	Coruña	KU134275	This paper
280	EcLOU-71	2013	Spain	Coruña	KU134276	This paper
281	EcLOU-98	2013	Spain	Coruña	KU134277	This paper
282	EcLOU-102	2013	Spain	Coruña	KU134495	This paper
283	EcLOU-393	2013	Spain	Coruña	KU134496	This paper
284	EcLOU-394	2013	Spain	Coruña	KU134498	This paper
285	EcLOU-418	2013	Spain	Coruña	KU134499	This paper
286	EcRIA-119	2013	Spain	Ría de Arousa	KU134500	This paper
287	EcRIA-120	2013	Spain	Ría de Arousa	KU134501	This paper
288	EcRIA-121	2013	Spain	Ría de Arousa	KU134502	This paper
289	EcRIA-294	2013	Spain	Ría de Arousa	KU134503	This paper
290	EcRIA-295	2013	Spain	Ría de Arousa	KU134504	This paper
291	EcRIA-297	2013	Spain	Ría de Arousa	KU134505	This paper
292	EcRIA-298	2013	Spain	Ría de Arousa	KU134506	This paper
293	EcRIA-299	2013	Spain	Ría de Arousa	KU134507	This paper
294	EcPOV-03	2013	Portugal	Viana do Castelo	KU134303	This paper
295	EcPOV-11	2013	Portugal	Viana do Castelo	KU134304	This paper
296	EcPOV13	2013	Portugal	Viana do Castelo	KU134342	This paper

297	EcVIA-39	2013	Portugal	Viana do Castelo	KU134343	This paper
298	EcPOV-554	2013	Portugal	Viana do Castelo	KU134344	This paper
299	EcVIA-31	2013	Portugal	Viana do Castelo	KU134508	This paper
300	EcVIA-33	2013	Portugal	Viana do Castelo	KU134509	This paper
301	EcVIA-45	2013	Portugal	Viana do Castelo	KU134510	This paper
302	EcNAP12-109	2012	Italy	Naples	KU134252	This paper
303	EcNAP12-110	2012	Italy	Naples	KU134253	This paper
304	EcNAP12-112	2012	Italy	Naples	KU134254	This paper
305	EcNAP12-114	2012	Italy	Naples	KU134255	This paper
306	EcNAP12-117	2012	Italy	Naples	KU134256	This paper
307	EcNAP12-118	2012	Italy	Naples	KU134257	This paper
308	EcNAP12-119	2012	Italy	Naples	KU134258	This paper
309	EcNAP12-111	2012	Italy	Naples	KU134259	This paper
310	EcNAP12-113	2012	Italy	Naples	KU134260	This paper
311	EcNAP12-s4-09	2012	Italy	Naples	KU134691	This paper
312	EcNAP12-s4-10	2012	Italy	Naples	KU134692	This paper
313	EcNAP12-s4-11	2012	Italy	Naples	KU134693	This paper
314	EcNAP12-s4-16	2012	Italy	Naples	KU134694	This paper
315	EcNAP12-s4-18	2012	Italy	Naples	KU134695	This paper
316	EcNAP12-s4-19	2012	Italy	Naples	KU134696	This paper
317	EcNAP12-s3-35	2012	Italy	Naples	KU134697	This paper
318	EcNAP12-s3-11	2012	Italy	Naples	KU134727	This paper
319	EcNAP12-15	2012	Italy	Naples	KU134729	This paper
320	EcNAP12-17	2012	Italy	Naples	KU134730	This paper
321	EcNAP12-s3-13	2012	Italy	Naples	KU134731	This paper

322	EcNAP12-s3-17	2012	Italy	Naples	KU134732	This paper
323	EcNAP12-s3-19	2012	Italy	Naples	KU134733	This paper
324	EcNAP12-s3-22	2012	Italy	Naples	KU134734	This paper
325	EcNAP12-s3-23	2012	Italy	Naples	KU134735	This paper
326	EcNAP12-s4-51	2012	Italy	Naples	KU134736	This paper
327	EcNAP12-12	2012	Italy	Naples	KU134737	This paper
328	EcNAP12-14	2012	Italy	Naples	KU134738	This paper
329	GR11-12A	2009	Greece	Korinthos	KU134682	This paper
330	GR11-28	2009	Greece	Korinthos	KU134683	This paper
331	GR11-45	2009	Greece	Korinthos	KU134684	This paper
332	GR11-46	2009	Greece	Korinthos	KU134685	This paper
333	GR11-48	2009	Greece	Korinthos	KU134686	This paper
334	LES10	2009	Greece	Lesbos	KU134681	This paper
335	LES1	2009	Greece	Lesbos	KU134687	This paper
336	LES2	2009	Greece	Lesbos	KU134688	This paper
337	LES3	2009	Greece	Lesbos	KU134689	This paper
338	LES7	2009	Greece	Lesbos	KU134690	This paper
339	Les4	2009	Greece	Lesbos	KU134728	This paper
340	Ec287	2006	Peru	Mendieta	KU134591	This paper
341	Ec279	2006	Peru	Mendieta	KU134623	This paper
342	Ec521	2004-2005	Chile	Pan de Azúcar	KU134592	This paper
343	Ec606	2005-2005	Chile	Pan de Azúcar	KU134345	This paper
344	EcPAN-084	2013	Chile	Pan de Azúcar	KU134169	This paper
345	EcPAN-090	2013	Chile	Pan de Azúcar	KU134170	This paper
346	EcPAN-095	2013	Chile	Pan de Azúcar	KU134171	This paper

347	EcPAN-128	2013	Chile	Pan de Azúcar	KU134172	This paper
348	EcPAN-138	2013	Chile	Pan de Azúcar	KU134173	This paper
349	EcPAN-140	2013	Chile	Pan de Azúcar	KU134174	This paper
350	EcPAN-174	2013	Chile	Pan de Azúcar	KU134175	This paper
351	EcPAN-175	2013	Chile	Pan de Azúcar	KU134176	This paper
352	EcPAN-192	2013	Chile	Pan de Azúcar	KU134177	This paper
353	EcPAN-197	2013	Chile	Pan de Azúcar	KU134178	This paper
354	EcPAN-104	2013	Chile	Pan de Azúcar	KU134640	This paper
355	EcPAN-089	2013	Chile	Pan de Azúcar	KU134641	This paper
356	EcPAN-148	2013	Chile	Pan de Azúcar	KU134642	This paper
357	EcPAN-161	2013	Chile	Pan de Azúcar	KU134643	This paper
358	EcPAN-163	2013	Chile	Pan de Azúcar	KU134644	This paper
359	EcPAN-143A	2013	Chile	Pan de Azúcar	KU134645	This paper
360	EcPAN-149A	2013	Chile	Pan de Azúcar	KU134646	This paper
361	EcPAN-083	2013	Chile	Pan de Azúcar	KU134698	This paper
362	EcPAN-085	2013	Chile	Pan de Azúcar	KU134699	This paper
363	EcPAN-086	2013	Chile	Pan de Azúcar	KU134700	This paper
364	EcPAN-087	2013	Chile	Pan de Azúcar	KU134701	This paper
365	EcPAN-091A	2013	Chile	Pan de Azúcar	KU134702	This paper
366	EcPAN-097A	2013	Chile	Pan de Azúcar	KU134703	This paper
367	EcPAN-109	2013	Chile	Pan de Azúcar	KU134704	This paper
368	EcPAN-110	2013	Chile	Pan de Azúcar	KU134705	This paper
369	EcPAN-113	2013	Chile	Pan de Azúcar	KU134706	This paper
370	EcPAN-114	2013	Chile	Pan de Azúcar	KU134707	This paper
371	EcPAN-122	2013	Chile	Pan de Azúcar	KU134708	This paper

372	EcPAN-160	2013	Chile	Pan de Azúcar	KU134709	This paper
373	EcPAN-087A	2013	Chile	Pan de Azúcar	KU134710	This paper
374	EcPAN-114A	2013	Chile	Pan de Azúcar	KU134711	This paper
375	EcPAN-139A	2013	Chile	Pan de Azúcar	KU134712	This paper
376	EcPAN-139B	2013	Chile	Pan de Azúcar	KU134713	This paper
377	EcPAN-144A	2013	Chile	Pan de Azúcar	KU134714	This paper
378	EcPAN-181	2013	Chile	Pan de Azúcar	KU134715	This paper
379	EcPAN-182	2013	Chile	Pan de Azúcar	KU134716	This paper
380	EcPAN-174A	2013	Chile	Pan de Azúcar	KU134717	This paper
381	EcBIN-293	2013	Chile	Bahía Inglesa, Caldera	KU134179	This paper
382	EcBIN-272	2013	Chile	Bahía Inglesa, Caldera	KU134180	This paper
383	EcBIN-273	2013	Chile	Bahía Inglesa, Caldera	KU134181	This paper
384	EcBIN-277	2013	Chile	Bahía Inglesa, Caldera	KU134182	This paper
385	EcBIN-279	2013	Chile	Bahía Inglesa, Caldera	KU134183	This paper
386	EcBIN-283	2013	Chile	Bahía Inglesa, Caldera	KU134184	This paper
387	EcBIN-284	2013	Chile	Bahía Inglesa, Caldera	KU134185	This paper
388	EcBIN-285	2013	Chile	Bahía Inglesa, Caldera	KU134186	This paper
389	EcBIN-288	2013	Chile	Bahía Inglesa, Caldera	KU134187	This paper
390	EcBIN-291	2013	Chile	Bahía Inglesa, Caldera	KU134188	This paper
391	EcBIN-292	2013	Chile	Bahía Inglesa, Caldera	KU134189	This paper
392	EcBIN-294	2013	Chile	Bahía Inglesa, Caldera	KU134190	This paper
393	EcBIN-295	2013	Chile	Bahía Inglesa, Caldera	KU134191	This paper
394	EcBIN-306	2013	Chile	Bahía Inglesa, Caldera	KU134192	This paper
395	EcBIN-307	2013	Chile	Bahía Inglesa, Caldera	KU134193	This paper
396	EcBIN-308	2013	Chile	Bahía Inglesa, Caldera	KU134194	This paper

397	EcBIN-309	2013	Chile	Bahía Inglesa, Caldera	KU134195	This paper
398	EcBIN-315	2013	Chile	Bahía Inglesa, Caldera	KU134197	This paper
399	EcBIN-320	2013	Chile	Bahía Inglesa, Caldera	KU134198	This paper
400	EcBIN-323	2013	Chile	Bahía Inglesa, Caldera	KU134199	This paper
401	EcBIN-330	2013	Chile	Bahía Inglesa, Caldera	KU134200	This paper
402	EcBIN-331	2013	Chile	Bahía Inglesa, Caldera	KU134201	This paper
403	EcBIN-332	2013	Chile	Bahía Inglesa, Caldera	KU134202	This paper
404	EcBIN-333	2013	Chile	Bahía Inglesa, Caldera	KU134203	This paper
405	EcBIN-338	2013	Chile	Bahía Inglesa, Caldera	KU134204	This paper
406	EcBIN-339	2013	Chile	Bahía Inglesa, Caldera	KU134205	This paper
407	EcBIN-341	2013	Chile	Bahía Inglesa, Caldera	KU134206	This paper
408	EcBIN-343	2013	Chile	Bahía Inglesa, Caldera	KU134207	This paper
409	EcBIN-010	2013	Chile	Bahía Inglesa, Caldera	KU134595	This paper
410	EcBIN-220	2013	Chile	Bahía Inglesa, Caldera	KU134596	This paper
411	EcBIN-221	2013	Chile	Bahía Inglesa, Caldera	KU134597	This paper
412	EcBIN-001	2013	Chile	Bahía Inglesa, Caldera	KU134605	This paper
413	EcBIN-002	2013	Chile	Bahía Inglesa, Caldera	KU134607	This paper
414	EcBIN-004	2013	Chile	Bahía Inglesa, Caldera	KU134608	This paper
415	EcBIN-005	2013	Chile	Bahía Inglesa, Caldera	KU134609	This paper
416	EcBIN-006	2013	Chile	Bahía Inglesa, Caldera	KU134610	This paper
417	EcBIN-007	2013	Chile	Bahía Inglesa, Caldera	KU134611	This paper
418	EcBIN-008	2013	Chile	Bahía Inglesa, Caldera	KU134612	This paper
419	EcBIN-276	2013	Chile	Bahía Inglesa, Caldera	KU134613	This paper
420	EcBIN-346	2013	Chile	Bahía Inglesa, Caldera	KU134614	This paper
421	EcBIN-350	2013	Chile	Bahía Inglesa, Caldera	KU134615	This paper

422	EcBIN-351	2013	Chile	Bahía Inglesa, Caldera	KU134616	This paper
423	EcBIN-224	2013	Chile	Bahía Inglesa, Caldera	KU134617	This paper
424	EcBIN-226	2013	Chile	Bahía Inglesa, Caldera	KU134618	This paper
425	EcBIN-243	2013	Chile	Bahía Inglesa, Caldera	KU134619	This paper
426	EcBIN-247	2013	Chile	Bahía Inglesa, Caldera	KU134620	This paper
427	EcBIN-246	2013	Chile	Bahía Inglesa, Caldera	KU134621	This paper
428	EcBIN-009	2013	Chile	Bahía Inglesa, Caldera	KU134622	This paper
429	EcBAS-255D	2013	Chile	Bahía Salada, Caldera	KU134593	This paper
430	EcBAS-298	2013	Chile	Bahía Salada, Caldera	KU134600	This paper
431	EcBAS-304	2013	Chile	Bahía Salada, Caldera	KU134601	This paper
432	EcBAS-302A	2013	Chile	Bahía Salada, Caldera	KU134602	This paper
433	EcBAS-303	2013	Chile	Bahía Salada, Caldera	KU134603	This paper
434	EcBAS-305	2013	Chile	Bahía Salada, Caldera	KU134604	This paper
435	EcBAS-255A	2013	Chile	Bahía Salada, Caldera	KU134598	This paper
436	EcBAS-264	2013	Chile	Bahía Salada, Caldera	KU134599	This paper
437	EcBAS-305B	2013	Chile	Bahía Salada, Caldera	KU134606	This paper
438	EcBAS252A	2013	Chile	Bahía Salada, Caldera	KU134196	This paper
439	EcCIS-073	2013	Chile	Caleta Cisne, Caldera	KU134548	This paper
440	EcCIS-070	2013	Chile	Caleta Cisne, Caldera	KU134624	This paper
441	EcCIS-071	2013	Chile	Caleta Cisne, Caldera	KU134625	This paper
442	EcPVI-035	2013	Chile	Puerto Viejo, Caldera	KU134565	This paper
443	EcPVI-036	2013	Chile	Puerto Viejo, Caldera	KU134594	This paper
444	EcALG-520	2013	Chile	Algarrobo	KU134347	This paper
445	EcALG-521	2013	Chile	Algarrobo	KU134348	This paper
446	EcALG-523	2013	Chile	Algarrobo	KU134349	This paper

447	EcALG-525	2013	Chile	Algarrobo	KU134350	This paper
448	EcALG-527	2013	Chile	Algarrobo	KU134351	This paper
449	EcALG-524	2013	Chile	Algarrobo	KU134677	This paper
450	EcQUI-478	2013	Chile	Quintay	KU134550	This paper
451	EcQUI-455	2013	Chile	Quintay	KU134554	This paper
452	EcQUI-467	2013	Chile	Quintay	KU134555	This paper
453	EcQUI-469	2013	Chile	Quintay	KU134556	This paper
454	EcQUI-480	2013	Chile	Quintay	KU134557	This paper
455	EcQUI-456	2013	Chile	Quintay	KU134563	This paper
456	EcQUI-457	2013	Chile	Quintay	KU134570	This paper
457	EcQUI-476	2013	Chile	Quintay	KU134571	This paper
458	EcQUI-477	2013	Chile	Quintay	KU134573	This paper
459	EcQUI-450	2013	Chile	Quintay	KU134629	This paper
460	EcQUI-484	2013	Chile	Quintay	KU134718	This paper
461	EcQUI-490	2013	Chile	Quintay	KU134719	This paper
462	EcQUI-499	2013	Chile	Quintay	KU134720	This paper
463	EcQUI-500	2013	Chile	Quintay	KU134721	This paper
464	EcQUI-501	2013	Chile	Quintay	KU134722	This paper
465	EcQUI-504	2013	Chile	Quintay	KU134723	This paper
466	EcQUI-506	2013	Chile	Quintay	KU134724	This paper
467	EcQUI-513	2013	Chile	Quintay	KU134725	This paper
468	EcQUI-519	2013	Chile	Quintay	KU134726	This paper
469	EcLAC-403	2013	Chile	Las Cruces	KU134346	This paper
470	EcLAC-425	2013	Chile	Las Cruces	KU134546	This paper
471	EcLAC-363	2013	Chile	Las Cruces	KU134547	This paper

472	EcLAC-369	2013	Chile	Las Cruces	KU134551	This paper
473	EcLAC-355	2013	Chile	Las Cruces	KU134552	This paper
474	EcLAC-392	2013	Chile	Las Cruces	KU134553	This paper
475	EcLAC-366	2013	Chile	Las Cruces	KU134559	This paper
476	EcLAC-402A	2013	Chile	Las Cruces	KU134560	This paper
477	EcLAC-430	2013	Chile	Las Cruces	KU134561	This paper
478	EcLAC-445	2013	Chile	Las Cruces	KU134562	This paper
479	EcLAC-354	2013	Chile	Las Cruces	KU134566	This paper
480	EcLAC-371	2013	Chile	Las Cruces	KU134567	This paper
481	EcLAC-386	2013	Chile	Las Cruces	KU134568	This paper
482	EcLAC-444	2013	Chile	Las Cruces	KU134569	This paper
483	EcLAC-357	2013	Chile	Las Cruces	KU134574	This paper
484	EcLAC-365	2013	Chile	Las Cruces	KU134575	This paper
485	EcLAC-407	2013	Chile	Las Cruces	KU134576	This paper
486	EcLAC-373	2013	Chile	Las Cruces	KU134577	This paper
487	EcLAC-374	2013	Chile	Las Cruces	KU134578	This paper
488	EcLAC-388	2013	Chile	Las Cruces	KU134579	This paper
489	EcLAC-387	2013	Chile	Las Cruces	KU134580	This paper
490	EcLAC-389	2013	Chile	Las Cruces	KU134581	This paper
491	EcLAC-390	2013	Chile	Las Cruces	KU134582	This paper
492	EcLAC-411	2013	Chile	Las Cruces	KU134583	This paper
493	EcLAC-415	2013	Chile	Las Cruces	KU134584	This paper
494	EcLAC-433	2013	Chile	Las Cruces	KU134585	This paper
495	EcLAC-435	2013	Chile	Las Cruces	KU134587	This paper
496	EcLAC-443	2013	Chile	Las Cruces	KU134588	This paper

497	EcLAC-356	2013	Chile	Las Cruces	KU134589	This paper
498	EcLAC-394	2013	Chile	Las Cruces	KU134590	This paper
499	EcLAC-397	2013	Chile	Las Cruces	KU134626	This paper
500	EcLAC-398	2013	Chile	Las Cruces	KU134627	This paper
501	EcLAC-412	2013	Chile	Las Cruces	KU134628	This paper
502	EcLAC-424	2013	Chile	Las Cruces	KU134680	This paper
503	EcDIC-605	2013	Chile	Dichato	KU134358	This paper
504	EcDIC-577	2013	Chile	Dichato	KU134651	This paper
505	EcDIC-578	2013	Chile	Dichato	KU134652	This paper
506	EcDIC-579	2013	Chile	Dichato	KU134653	This paper
507	EcDIC-583	2013	Chile	Dichato	KU134654	This paper
508	EcDIC-584	2013	Chile	Dichato	KU134655	This paper
509	EcDIC-586	2013	Chile	Dichato	KU134656	This paper
510	EcDIC-587	2013	Chile	Dichato	KU134657	This paper
511	EcDIC-594	2013	Chile	Dichato	KU134658	This paper
512	EcDIC-595	2013	Chile	Dichato	KU134659	This paper
513	EcDIC-596	2013	Chile	Dichato	KU134660	This paper
514	EcDIC-598	2013	Chile	Dichato	KU134661	This paper
515	EcDIC-600	2013	Chile	Dichato	KU134662	This paper
516	EcDIC-601	2013	Chile	Dichato	KU134663	This paper
517	EcDIC-602	2013	Chile	Dichato	KU134664	This paper
518	EcDIC-603	2013	Chile	Dichato	KU134665	This paper
519	EcDIC-604	2013	Chile	Dichato	KU134666	This paper
520	EcDIC-609	2013	Chile	Dichato	KU134667	This paper
521	EcDIC-610	2013	Chile	Dichato	KU134668	This paper

522	EcDIC-646	2013	Chile	Dichato	KU134669	This paper
523	EcDIC-647	2013	Chile	Dichato	KU134670	This paper
524	EcDIC-653	2013	Chile	Dichato	KU134671	This paper
525	EcDIC-654	2013	Chile	Dichato	KU134672	This paper
526	EcDIC-657	2013	Chile	Dichato	KU134673	This paper
527	EcDIC-658	2013	Chile	Dichato	KU134674	This paper
528	EcCOL-572	2013	Chile	Cocholgüe, Tomé	KU134208	This paper
529	EcCOL-529	2013	Chile	Cocholgüe, Tomé	KU134352	This paper
530	EcCOL-530	2013	Chile	Cocholgüe, Tomé	KU134353	This paper
531	EcCOL-531	2013	Chile	Cocholgüe, Tomé	KU134354	This paper
532	EcCOL-573	2013	Chile	Cocholgüe, Tomé	KU134355	This paper
533	EcCOL-574	2013	Chile	Cocholgüe, Tomé	KU134356	This paper
534	EcCOL-576	2013	Chile	Cocholgüe, Tomé	KU134357	This paper
535	EcCOL-566	2013	Chile	Cocholgüe, Tomé	KU134513	This paper
536	EcCOL-568A	2013	Chile	Cocholgüe, Tomé	KU134549	This paper
537	EcCOL-559	2013	Chile	Cocholgüe, Tomé	KU134564	This paper
538	EcCOL-569	2013	Chile	Cocholgüe, Tomé	KU134678	This paper
539	EcCOL-568	2013	Chile	Cocholgüe, Tomé	KU134679	This paper
540	EcPLG-713	2013	Chile	Nieba, Valdivia	KU134572	This paper
541	EcPLG-708	2013	Chile	Nieba, Valdivia	KU134630	This paper
542	EcPLG-714	2013	Chile	Nieba, Valdivia	KU134586	This paper
543	EcPLG-712	2013	Chile	Nieba, Valdivia	KU134648	This paper
544	EcPLG-716	2013	Chile	Nieba, Valdivia	KU134675	This paper
545	EcPLG-717	2013	Chile	Nieba, Valdivia	KU134676	This paper
546	EcPIL-616	2013	Chile	Pilolcura, Valdivia	KU134359	This paper

547	EcPIL-618	2013	Chile	Pilolcura, Valdivia	KU134360	This paper
548	EcPIL-624	2013	Chile	Pilolcura, Valdivia	KU134361	This paper
549	EcPIL-625	2013	Chile	Pilolcura, Valdivia	KU134362	This paper
550	EcPIL-628	2013	Chile	Pilolcura, Valdivia	KU134363	This paper
551	EcPIL-650	2013	Chile	Pilolcura, Valdivia	KU134367	This paper
552	EcPIL-621	2013	Chile	Pilolcura, Valdivia	KU134514	This paper
553	EcPIL-631	2013	Chile	Pilolcura, Valdivia	KU134515	This paper
554	EcPIL-632	2013	Chile	Pilolcura, Valdivia	KU134516	This paper
555	EcPIL-633	2013	Chile	Pilolcura, Valdivia	KU134517	This paper
556	EcPIL-635	2013	Chile	Pilolcura, Valdivia	KU134518	This paper
557	EcPIL-651	2013	Chile	Pilolcura, Valdivia	KU134535	This paper
558	EcPIL-634	2013	Chile	Pilolcura, Valdivia	KU134538	This paper
559	EcPIL-636	2013	Chile	Pilolcura, Valdivia	KU134539	This paper
560	EcPIL-639	2013	Chile	Pilolcura, Valdivia	KU134558	This paper
561	EcPIL-648	2013	Chile	Pilolcura, Valdivia	KU134647	This paper
562	EcCNA-659	2013	Chile	Curiñanco, Valdivia	KU134368	This paper
563	EcCNA-660	2013	Chile	Curiñanco, Valdivia	KU134369	This paper
564	EcCNA-642	2013	Chile	Curiñanco, Valdivia	KU134519	This paper
565	EcCNA-640	2013	Chile	Curiñanco, Valdivia	KU134364	This paper
566	EcCNA-641	2013	Chile	Curiñanco, Valdivia	KU134365	This paper
567	EcCNA-645	2013	Chile	Curiñanco, Valdivia	KU134366	This paper
568	EcSCA-726	2013	Chile	San Carlos, Corral, Valdivia	KU134536	This paper
569	EcSCA-722	2013	Chile	San Carlos, Corral, Valdivia	KU134637	This paper
570	EcSCA-723	2013	Chile	San Carlos, Corral, Valdivia	KU134638	This paper
571	EcSCA-721	2013	Chile	San Carlos, Corral, Valdivia	KU134639	This paper

572	EcEST-786	2013	Chile	Estaquilla	KU134374	This paper
573	EcEST-788	2013	Chile	Estaquilla	KU134375	This paper
574	EcEST-789	2013	Chile	Estaquilla	KU134376	This paper
575	EcEST-790	2013	Chile	Estaquilla	KU134377	This paper
576	EcEST-791	2013	Chile	Estaquilla	KU134378	This paper
577	EcEST-792	2013	Chile	Estaquilla	KU134379	This paper
578	EcEST-793	2013	Chile	Estaquilla	KU134380	This paper
579	EcEST-794	2013	Chile	Estaquilla	KU134381	This paper
580	EcEST-795	2013	Chile	Estaquilla	KU134382	This paper
581	EcEST-796	2013	Chile	Estaquilla	KU134383	This paper
582	EcEST-797	2013	Chile	Estaquilla	KU134384	This paper
583	EcEST-798	2013	Chile	Estaquilla	KU134385	This paper
584	EcEST-800	2013	Chile	Estaquilla	KU134386	This paper
585	EcEST-801	2013	Chile	Estaquilla	KU134387	This paper
586	EcEST-802	2013	Chile	Estaquilla	KU134388	This paper
587	EcEST-804	2013	Chile	Estaquilla	KU134389	This paper
588	EcEST-805	2013	Chile	Estaquilla	KU134390	This paper
589	EcEST-808	2013	Chile	Estaquilla	KU134391	This paper
590	EcEST-809	2013	Chile	Estaquilla	KU134392	This paper
591	EcEST-810	2013	Chile	Estaquilla	KU134393	This paper
592	EcEST-811	2013	Chile	Estaquilla	KU134394	This paper
593	EcEST-813	2013	Chile	Estaquilla	KU134395	This paper
594	EcEST-815	2013	Chile	Estaquilla	KU134396	This paper
595	EcEST-816	2013	Chile	Estaquilla	KU134397	This paper
596	EcEST-803	2013	Chile	Estaquilla	KU134512	This paper

597	EcEST-771	2013	Chile	Estaquilla	KU134523	This paper
598	EcEST-772	2013	Chile	Estaquilla	KU134524	This paper
599	EcEST-775	2013	Chile	Estaquilla	KU134525	This paper
600	EcEST-776	2013	Chile	Estaquilla	KU134526	This paper
601	EcEST-777	2013	Chile	Estaquilla	KU134527	This paper
602	EcEST-778	2013	Chile	Estaquilla	KU134528	This paper
603	EcEST-779	2013	Chile	Estaquilla	KU134529	This paper
604	EcEST-780	2013	Chile	Estaquilla	KU134530	This paper
605	EcEST-781	2013	Chile	Estaquilla	KU134531	This paper
606	EcEST-783	2013	Chile	Estaquilla	KU134532	This paper
607	EcEST-784	2013	Chile	Estaquilla	KU134533	This paper
608	EcEST-787	2013	Chile	Estaquilla	KU134534	This paper
609	EcEST-769	2013	Chile	Estaquilla	KU134537	This paper
610	EcACH-745	2013	Chile	Achao	KU134209	This paper
611	EcACH-748	2013	Chile	Achao	KU134210	This paper
612	EcACH-757	2013	Chile	Achao	KU134211	This paper
613	EcACH-761	2013	Chile	Achao	KU134212	This paper
614	EcACH-751	2013	Chile	Achao	KU134370	This paper
615	EcACH-752	2013	Chile	Achao	KU134371	This paper
616	EcACH-753	2013	Chile	Achao	KU134372	This paper
617	EcACH-754	2013	Chile	Achao	KU134373	This paper
618	EcACH-749	2013	Chile	Achao	KU134520	This paper
619	EcACH-755	2013	Chile	Achao	KU134521	This paper
620	EcACH-762	2013	Chile	Achao	KU134522	This paper
621	EcACH-746A	2013	Chile	Achao	KU134631	This paper

622	EcACH-758	2013	Chile	Achao	KU134632	This paper
623	EcACH-759	2013	Chile	Achao	KU134633	This paper
624	EcACH-760	2013	Chile	Achao	KU134634	This paper
625	EcACH-763	2013	Chile	Achao	KU134635	This paper
626	EcACH-765	2013	Chile	Achao	KU134636	This paper
627	EcACH-756	2013	Chile	Achao	KU134649	This paper
628	EcACH-747	2013	Chile	Achao	KU134650	This paper
629	Ec666	2009	USA	Falmouth, Massachusetts	KU134541	This paper
630	Ec717	2005	Korea	Hanrim	KU134511	This paper

Table S3. Mitochondrial (COI-5P) and nuclear (ITS1) DNA sequence variation in *E. siliculosus*. Molecular diversity indices were calculated for the two molecular markers (COI-5P and ITS1). *N*= number of sequences; *nH*= number of haplotypes; *H*= gene diversity; *π*= nucleotide diversity; *S*= number of polymorphic sites. Standard deviations (SD) in parentheses.

			COI-5P					ITS1				
Region	**Site**	**Code**	**N**	***nH***	***H* (SD)**	**π (SD) ($.10^{-2}$)**	***S***	**N**	***nH***	***H* (SD)**	**π (SD) ($.10^{-2}$)**	***S***
United Kingdom	Dunstaffnage	DUN	4	2	0.500 (0.265)	0.166 (0.164)	2	4	3	0.833 (0.222)	0.343 (0.279)	4
	Pett level	PET	10	3	0.378 (0.181)	0.066 (0.076)	2	10	4	0.778 (0.091)	0.450 (0.288)	7
	Plymouth	PLY	23	2	0.403 (0.091)	0.067 (0.072)	1	23	6	0.739 (0.064)	0.344 (0.217)	8
	Restronguet	RES	12	3	0.591 (0.108)	0.116 (0.106)	2	12	6	0.849 (0.074)	0.333 (0.221)	9
	Total UK		**49**	**5**	**0.501 (0.060)**	**0.102 (0.091)**	**5**	**49**	**12**	**0.850 (0.029)**	**0.468 (0.273)**	**13**
France	Roscoff	ROS	16	2	0.125 (0.106)	0.021 (0.038)	1	16	10	0.892 (0.063)	0.445 (0.274)	13
	Traezh Hir	THZ	15	4	0.619 (0.120)	0.221 (0.163)	4	15	4	0.619 (0.120)	0.438 (0.271)	11
	Quiberon	QUI	14	2	0.363 (0.130)	0.060 (0.069)	1	14	4	0.648 (0.116)	0.344 (0.224)	6
	Total France		**45**	**5**	**0.549 (0.065)**	**0.123 (0.103)**	**5**	**45**	**16**	**0.848 (0.040)**	**0.534 (0.305)**	**19**
NW Iberia	Ribadeo	RIB	13	3	0.615 (0.078)	0.140 (0.119)	3	13	4	0.692 (0.115)	0.314 (0.209)	7
	Coruña	COR	13	3	0.295 (0.156)	0.051 (0.063)	2	13	8	0.808 (0.113)	0.321 (0.213)	12
	Viana	VIA	4	2	0.500 (0.265)	0.166 (0.164)	2	4	4	1.000 (0.177)	0.293 (0.246)	4
	Total Iberia		**30**	**6**	**0.529 (0.095)**	**0.121 (0.103)**	**7**	**30**	**13**	**0.862 (0.045)**	**0.338 (0.211)**	**18**
Mediterranean	**Naples**	**NAP**	**9**	**2**	**0.389 (0.164)**	**0.065 (0.075)**	**1**	**9**	**2**	**0.389 (0.164)**	**0.057 (0.066)**	**1**
Chile	Pan de Azúcar	PAN	10	2	0.356 (0.159)	0.118 (0.109)	2	10	2	0.200 (0.154)	0.029 (0.045)	1
	Caldera	CAL	29	5	0.665 (0.067)	0.169 (0.130)	5	29	10	0.796 (0.062)	0.647 (0.366)	16
	Concepción	CON	1	1	0	0	0	1	1	0	0	
	Achao	ACH	4	1	0	0	0	4	4	1.00 (0.177)	0.606 (0.453)	7

Total Chile	**44**	**5**	**0.748 (0.028)**	**0.237 (0.164)**	**5**	**44**	**12**	**0.853 (0.030)**	**0.653 (0.364)**	**18**
TOTAL	**177**	**15**	**0.706 (0.026)**	**0.177 (0.013)**	**15**	**177**	**41**	**0.911 (0.011)**	**0.596 (0.330)**	**47**

Table S4. Mitochondrial (COI-5P) and nuclear (ITS1) DNA sequence variation in *E. crouaniorum*. Molecular diversity indices were calculated for the two molecular markers (COI-5P and ITS1). *N*= number of sequences; *nH*= number of haplotypes; *H*= gene diversity; π= nucleotide diversity; *S*= number of polymorphic sites. Standard deviations (SD) in parentheses.

			COI-5P					ITS1				
Region	**Site**	**Code**	**N**	***nH***	***H* (SD)**	**π (SD) (.10^{-2})**	**S**	**N**	***nH***	***H* (SD)**	**π (SD) (.10^{-2})**	**S**
United Kingdom	Wick	WIC	8	1	0	0	0	8	7	0.964 (0.077)	0.846 (0.507)	19
	Berwick	BER	11	2	0.436 (0.133)	0.072 (0.079)	1	11	5	0.855 (0.066)	0.234 (0.162)	5
	Mull of Galloway	MUL	12	3	0.318 (0.164)	0.055 (0.067)	2	12	9	0.939 (0.058)	0.626 (0.367)	20
	Plymouth	PLY	11	3	0.618 (0.104)	0.302 (0.212)	4	11	7	0.891 (0.074)	0.946 (0.538)	20
	Total UK		**42**	**6**	**0.474 (0.087)**	**0.164 (0.126)**	**6**	**42**	**23**	**0.938 (0.024)**	**0.728 (0.393)**	**36**
France	Roscoff	ROS	15	5	0.562 (0.143)	0.190 (0.145)	6	15	12	0.962 (0.040)	0.663 (0.379)	28
	Traezh Hir	THZ	9	3	0.556 (0.165)	0.101 (0.100)	2	9	7	0.917 (0.092)	0.493 (0.308)	16
	Quiberon	QUI	12	6	0.758 (0.122)	0.183 (0.145)	5	12	6	0.849 (0.074)	0.269 (0.176)	8
	Total France		**36**	**10**	**0.624 (0.092)**	**0.170 (0.130)**	**11**	**36**	**22**	**0.916 (0.037)**	**0.523 (0.295)**	**38**
NW Iberia	Ribadeo		8	1	0	0	0	8	5	0.893 (0.086)	0.694 (0.423)	14
	Coruña	RIB	5	3	0.800 (0.164)	0.166 (0.154)	2	5	5	1.000 (0.127)	0.753 (0.504)	15
	Ría de Arousa	COR	5	2	0.600 (0.175)	0.100 (0.109)	1	5	4	0.900 (0.161)	0.243 (0.191)	4
	Viana	VIA	2	2	1.000 (0.500)	0.332 (0.406)	2	2	2	1.000 (0.500)	1.453 (1.512)	12
	Total Iberia		**20**	**5**	**0.679 (0.080)**	**0.148 (0.121)**	**4**	**20**	**14**	**0.963 (0.026)**	**0.711 (0.396)**	**40**
Chile	Las Cruces	LAC	6	3	0.600 (0.215)	0.111 (0.112)	2	6	4	0.800 (0.172)	0.543 (0.359)	11
	Concepción	CON	7	2	0.571 (0.120)	0.095 (0.099)	1	7	5	0.905 (0.103)	0.984 (0.596)	16
	Valdivia	VAL	11	2	0.327 (0.153)	0.054 (0.066)	1	11	6	0.800 (0.114)	0.466 (0.286)	18
	Estaquilla	EST	24	1	0	0	0	24	8	0.808 (0.053)	0.668 (0.371)	14
	Achao	ACH	4	1	0	0	0	4	4	1.000 (0.177)	0.364 (0.285)	5
	Total Chile		**52**	**3**	**0.429 (0.059)**	**0.073 (0.073)**	**2**	**52**	**23**	**0.928 (0.019)**	**0.836 (0.444)**	**31**
		TOTAL	**150**	**18**	**0.583 (0.046)**	**0.154 (0.118)**	**18**	**150**	**68**	**0.953 (0.010)**	**0.759 (0.401)**	**80**

Table S5. Mitochondrial (COI-5P) and nuclear (ITS1) DNA sequence variation in *Ectocarpus* 6. Molecular diversity indices were calculated for the two molecular markers (COI-5P and ITS1). *N*= number of sequences; *nH*= number of haplotypes; *H*= gene diversity; π= nucleotide diversity; *S*= number of polymorphic sites. Standard deviations (SD) in parentheses.

		COI-5P					**ITS1**				
Site	**Code**	***N***	***nH***	***H* (SD)**	**π (SD) ($.10^{-2}$)**	***S***	***N***	***nH***	***H* (SD)**	**π (SD) ($.10^{-2}$)**	***S***
Pisagua	PIS	1	1	0	0	0	1	1			0
Caldera	CAL	2	2	1.000 (0.500)	0.829 (0.908)	5	2	2	1.000 (0.500)	0.267 (0.377)	1
Quintay	QUI	9	4	0.750 (0.112)	0.525 (0.340)	7	9	5	0.806 (0.120)	0.781 (0.511)	11
Las Cruces	LAC	29	6	0.791 (0.048)	0.440 (0.269)	8	29	19	0.934 (0.034)	1.953 (1.046)	38
Concepción	CON	2	1	0	0	0	2	2	1.000 (0.500)	0.533 (0.653)	2
Valdivia	VAL	3	3	1.000 (0.272)	0.663 (0.564)	6	3	2	0.667 (0.314)	2.667 (2.104)	15
TOTAL		**46**	**8**	**0.822 (0.022)**	**0.511 (0.300)**	**10**	**46**	**25**	**0.897 (0.037)**	**1.615 (0.868)**	**45**

Table S6. Species nomenclature used in literature for the species of the *Ectocarpus siliculosi* group.

Montecinos et al.	Stache-Crain et al. 1997	Peters et al. 2010a	Peters et al. 2010b	Peters et al. 2015
E. siliculosus	1a	*E. siliculosus*	GT6-1a	*E. siliculosus*
E. crouaniorum	2c	*E. crouaniorum*	GT8-2c	*E. crouaniorum*
Ectocarpus 1	4	*E. siliculosus* (?)	4	4
Ectocarpus 2	4	---	---	4
Ectocarpus 3	3	---	---	3
Ectocarpus 4	---	---	---	---
Ectocarpus 5	---	---	---	1d
Ectocarpus 6	---	---	GT1	1c
Ectocarpus 7	1c	*E. siliculosus*	GT4-1c	1c
Ectocarpus 8	1b	---	---	---
Ectocarpus 9	1b	---	---	---
Ectocarpus 10	1b	---	GT2-1b	1b
Ectocarpus 11	---	---	GT3	1b
Ectocarpus 12	2b	---	GT8-2b	2b
Ectocarpus 13	2a	---	---	2a

Figure S1. Distribution of pairwise distances for the marker COI-5P and automatic barcode gap discovery (ABGD) results. (a) Frequency distribution of K2P distances between haplotype pairs for the marker COI-5P. (b) ABGD results showing the number of groups (primary partitions) obtained for a range of prior maximum divergence of intraspecific diversity.

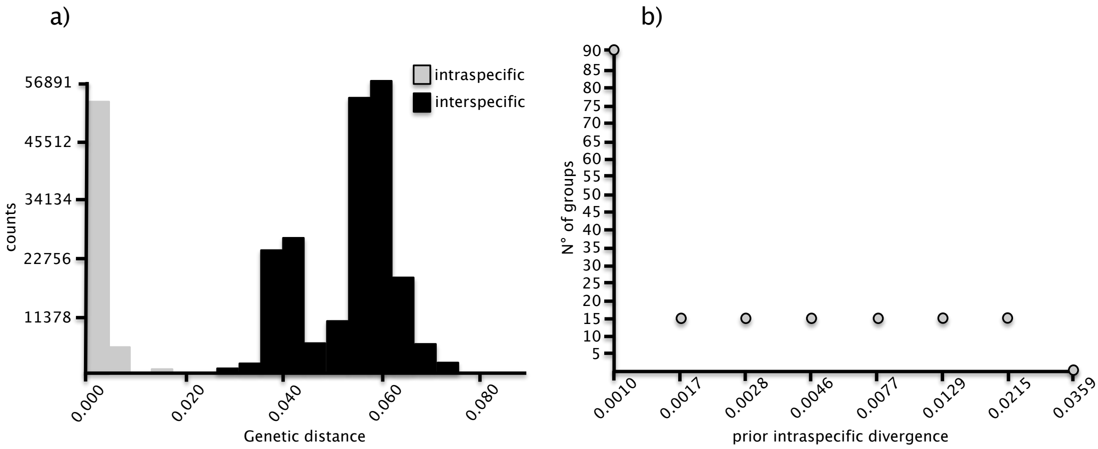


Figure S2. Ultrametric Bayesian tree showing the results obtained using the GMYC single threshold based on COI-5P. The vertical dotted red line shows the point of transition between coalescence and speciation processes.

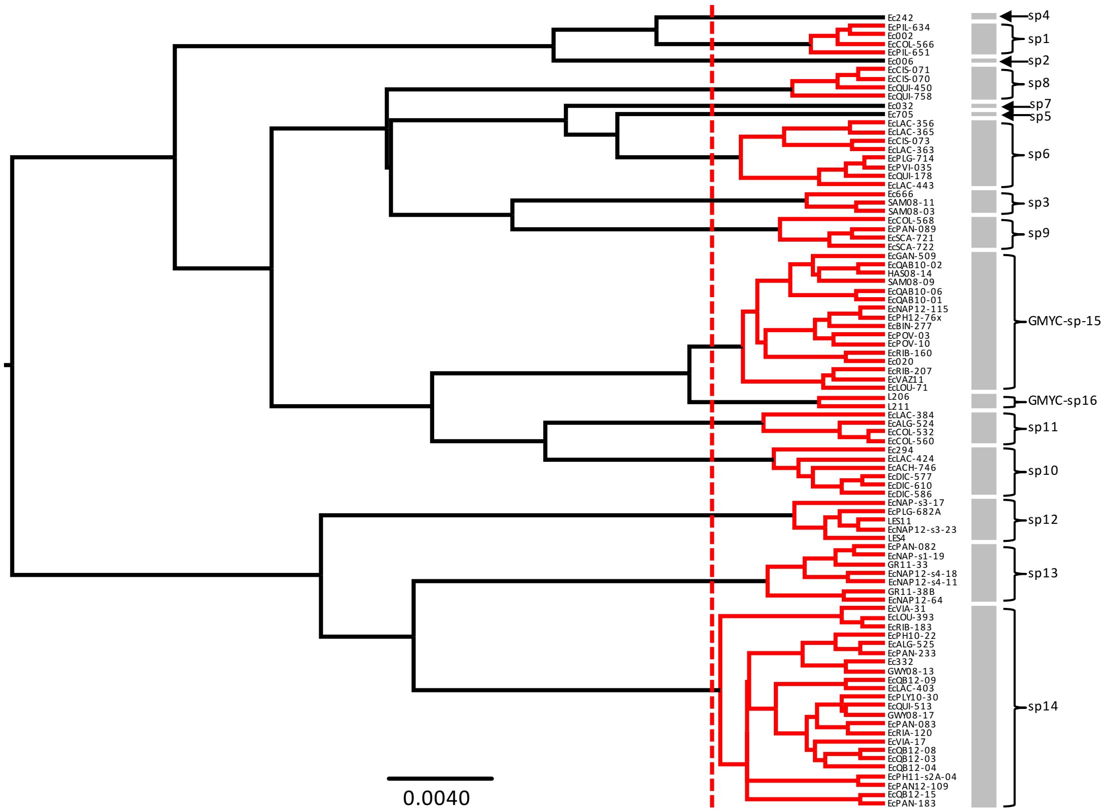


Figure S3. Distribution of pairwise distances between haplotype pairs for the marker ITS1 (left) and automatic barcode gap discovery (ABGD, primary partitions) results for the four different alignments (right). Sub-alignment 1*:* *E. siliculosus*, *Ectocarpus* 1, *Ectocarpus* 2, *Ectocarpus* 4; sub-alignment 2: *Ectocarpus* 5, *Ectocarpus* 6, *Ectocarpus* 7; sub-alignment 3: *Ectocarpus* 8, *Ectocarpus* 9, *Ectocarpus* 10, *Ectocarpus* 11; sub-alignment 4: *E. crouaniorum*, *Ectocarpus* 12, *Ectocarpus* 13.