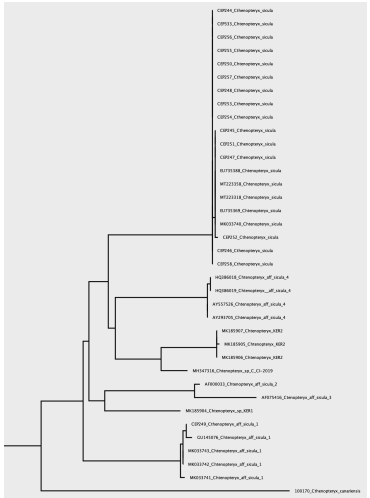
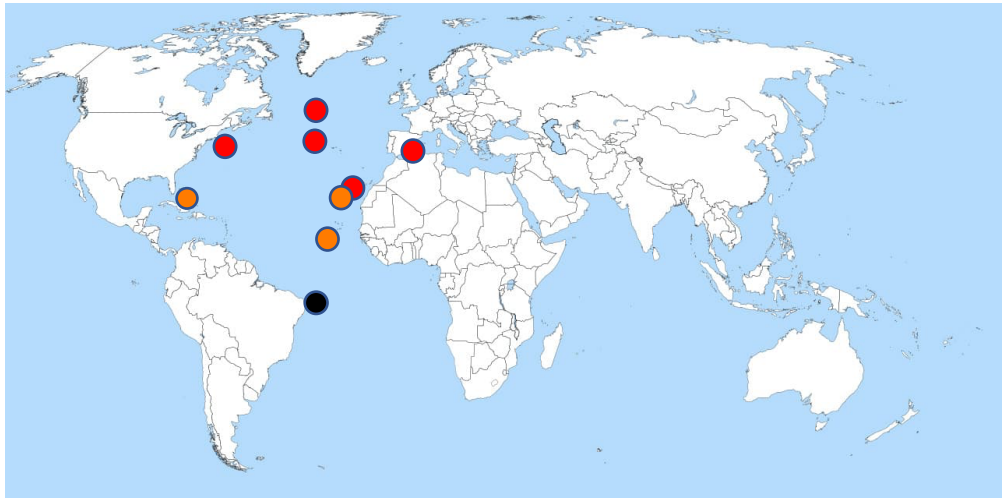
Is cryptic biodiversity a common phenomenon among Atlantic oceanic squids?





Fernando Á. Fernández-Álvarez, Roger Villanueva & A. Louise Allcock

Contact: f.a.fernandez.alvarez@gmail.com

1st International Electronic Conference on Biological Diversity, Ecology, and Evolution

Oceanic squids usually are considered to have large distribution ranges, sometimes even covering discontinuous areas

Food and Agriculture Organization of the United Nations

Fisheries Division

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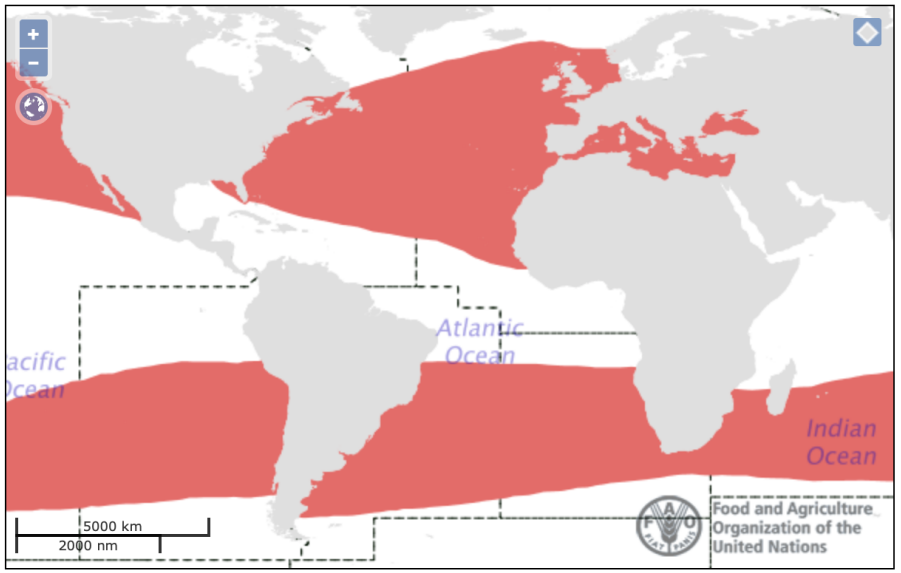
Species Fact Sheets

Ommastrephes bartrami (Lesueur, 1821)

See tree map

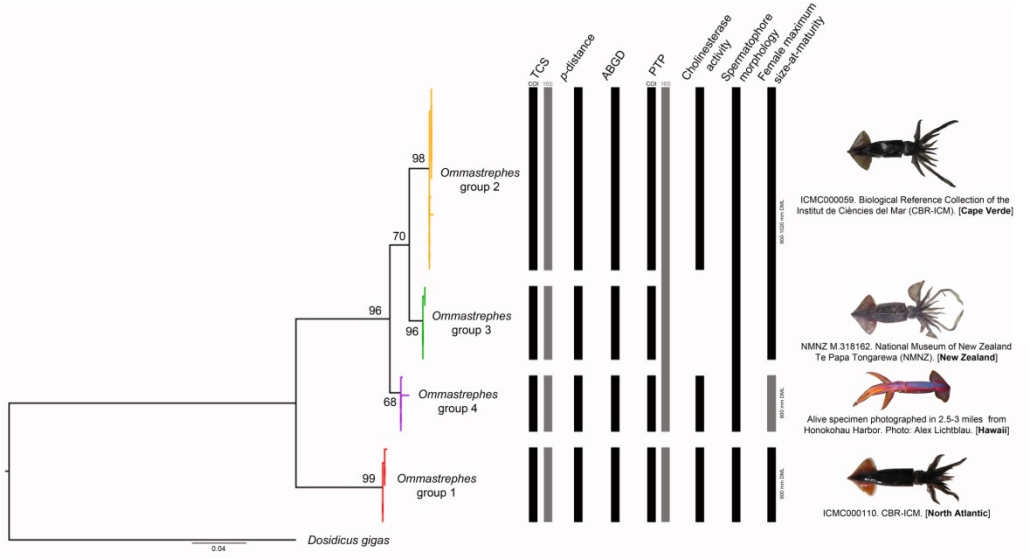
FAO Names

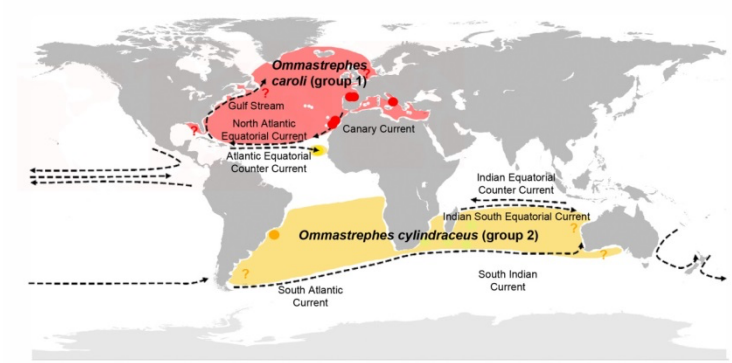
En - Neon flying squid, Fr - Encornet volant, Sp - Pota saltadora.
3Alpha Code: OFJ Taxonomic Code: 3210500301

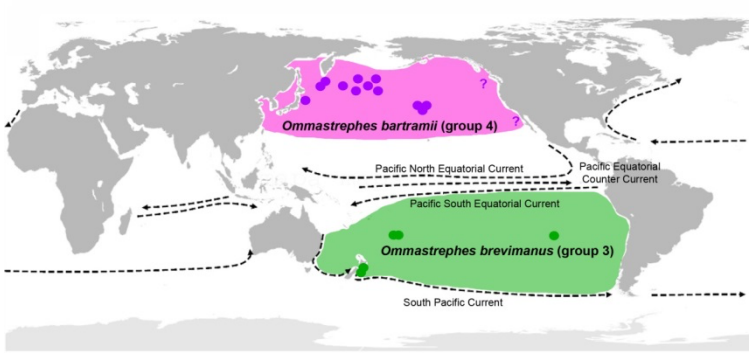


Launch the Aquatic Species Distribution map viewer

Map legend







Zoological Journal of the Linnean Society, 2020, **XX**, 1–23. With 3 figures.

Global biodiversity of the genus *Ommastrephes* (Ommastrephidae: Cephalopoda): an allopatric cryptic species complex

FERNANDO Á. FERNÁNDEZ-ÁLVAREZ[1,2*], HEATHER E. BRAID[3], CHINGIS M. NIGMATULLIN[4], KATHRIN S. R. BOLSTAD[3], MANUEL HAIMOVICI[5], PILAR SÁNCHEZ[1], KURICHITHARA K. SAJIKUMAR[6], NADAKKAL RAGESH[6] and ROGER VILLANUEVA[1]

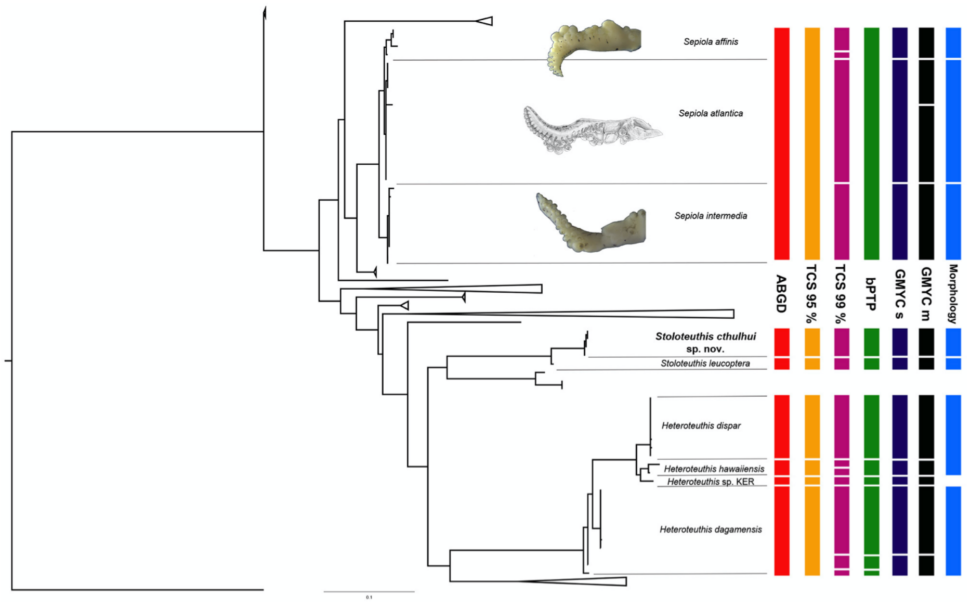
frontiers in Marine Science

ORIGINAL RESEARCH
published: 20 January 2021
doi: 10.3389/fmars.2020.632261

Morphological and Molecular Assessments of Bobtail Squids (Cephalopoda: Sepiolidae) Reveal a Hidden History of Biodiversity

Fernando Á. Fernández-Álvarez[1,2†], Pilar Sánchez[2†] and Roger Villanueva[2†]*

[1] Ryan Institute and School of Natural Sciences, National University of Ireland Galway, Galway, Ireland, [2] Institut de Ciències del Mar (CSIC), Barcelona, Spain



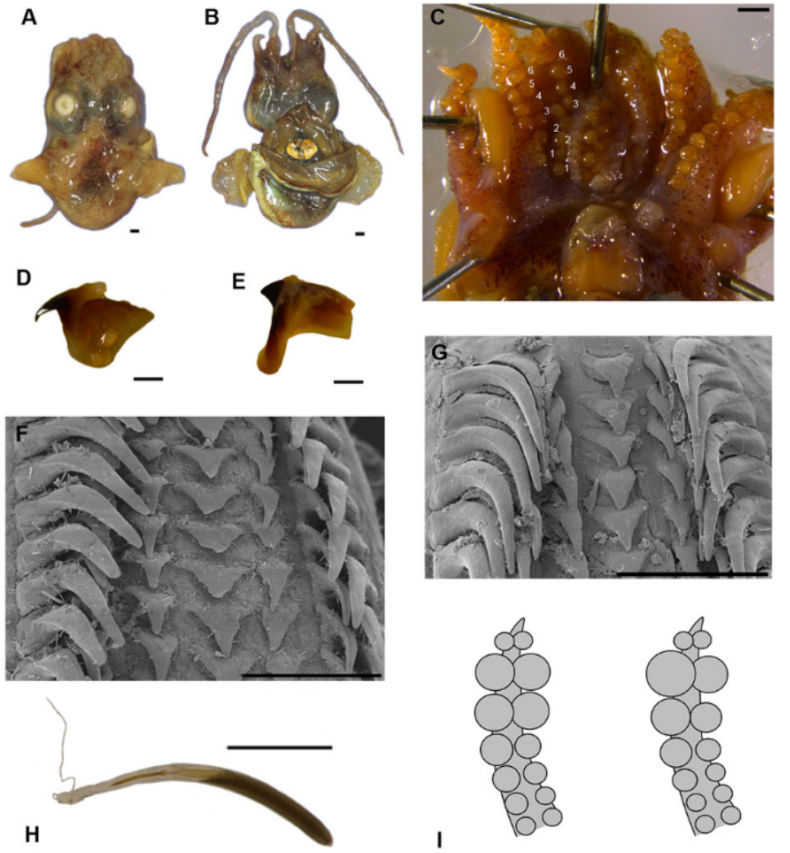
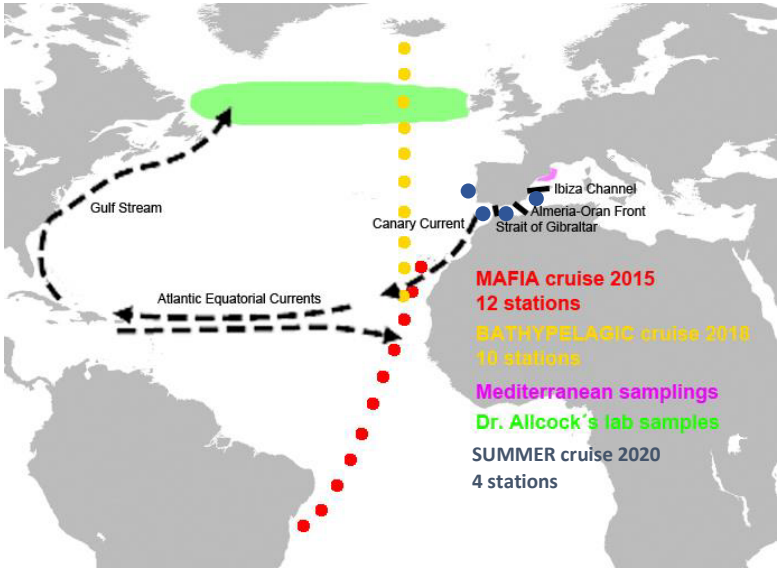


FIGURE 4 | *Stoloteuthis cthulhui* **sp. nov. (A)** Dorsal view of the mature female specimen 12.3 mm ML ICMC000163. **(B)** Ventral view of the mature male specimen 13.9 mm ML ICMC000164 (holotype). **(C)** Dissected arm crown showing the arrangement of the suckers of the arms of the mature male 17.9 mm ML ICMC000165. Numbers above the suckers of the right arm II depict the rows of suckers. **(D)** Lower beak of the mature specimen 16.7 mm ML ICMC000166. **(E)** Upper beak of the specimen ICMC000163. **(F)** Radula of the specimen ICMC000165. **(G)** Radula of the *Stoloteuthis leucoptera* specimen ICMC000175, mature female 13.3 mm ML. **(H)** Spermatophore of the specimen ICMC000166. **(I)** Arrangement and relative size of arm II suckers of the male of *Stoloteuthis cthulhui* (left) and *Stoloteuthis leucoptera* (right). Scale bars: A–E, H, 1 mm; F,G, 200 μm.



200 samples: 12 oegopsid species

Different:

Families (7)

Lifestyles


Ancistrocheirus lesueurii


Chtenopteryx sicula


Leachia atlantica


Liocranchia reindhartii


Bathothauma lyromma


Galiteuthis armata


Helicocranchia pfefferi


Abraliopsis morisii


Mastigoteuthis aggassizzi


Pterigyoteuthis gemmata

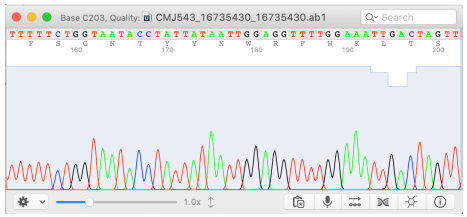

Grimalditeuthis bonplandi

Dissection

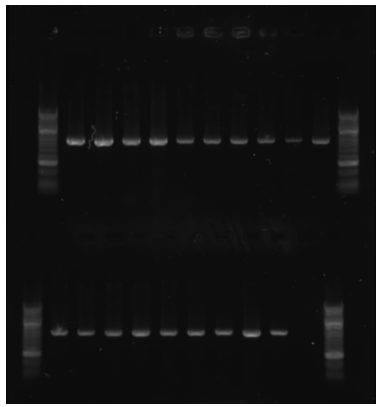
Tissue snap

DNA extraction

DNA amplification
(PCR)
[Folmer's region cox1]



Sequencing



- Complete matrix with GenBank sequences

PHYLOGENETIC ANALYSES

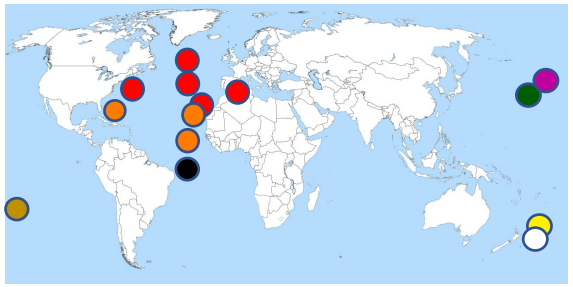
- Maximum Likelihood (IQTree)
- Coalescent analyses (Beast)

MOLECULAR SPECIES DELIMITATION METHODS

- bPTP
- GMYC

DISTANCE ANALYSES

Cthenopteryx sicula (Verany 1851)

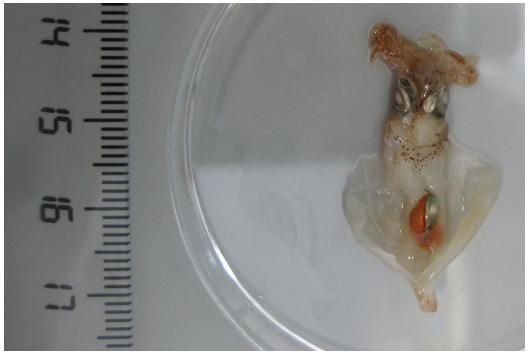


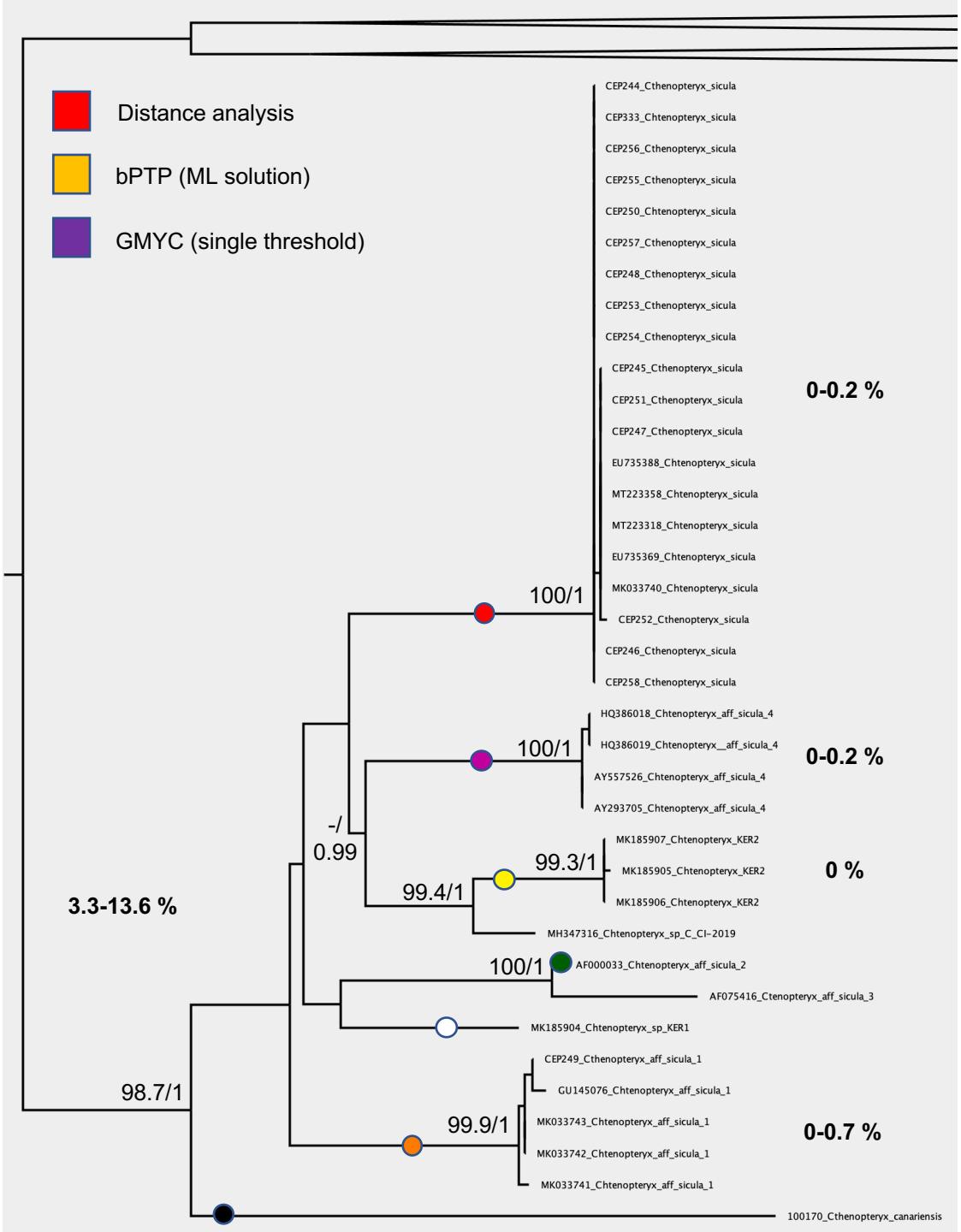
C. sicula

4 cryptic species:

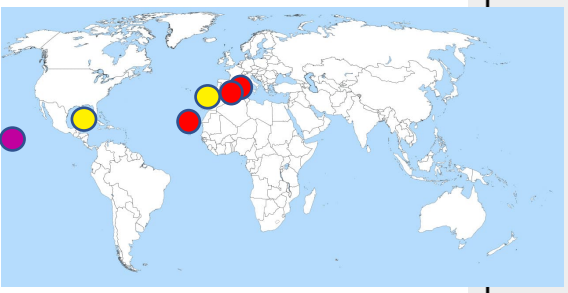
2 Atlantic, including nominal species

2 Pacific





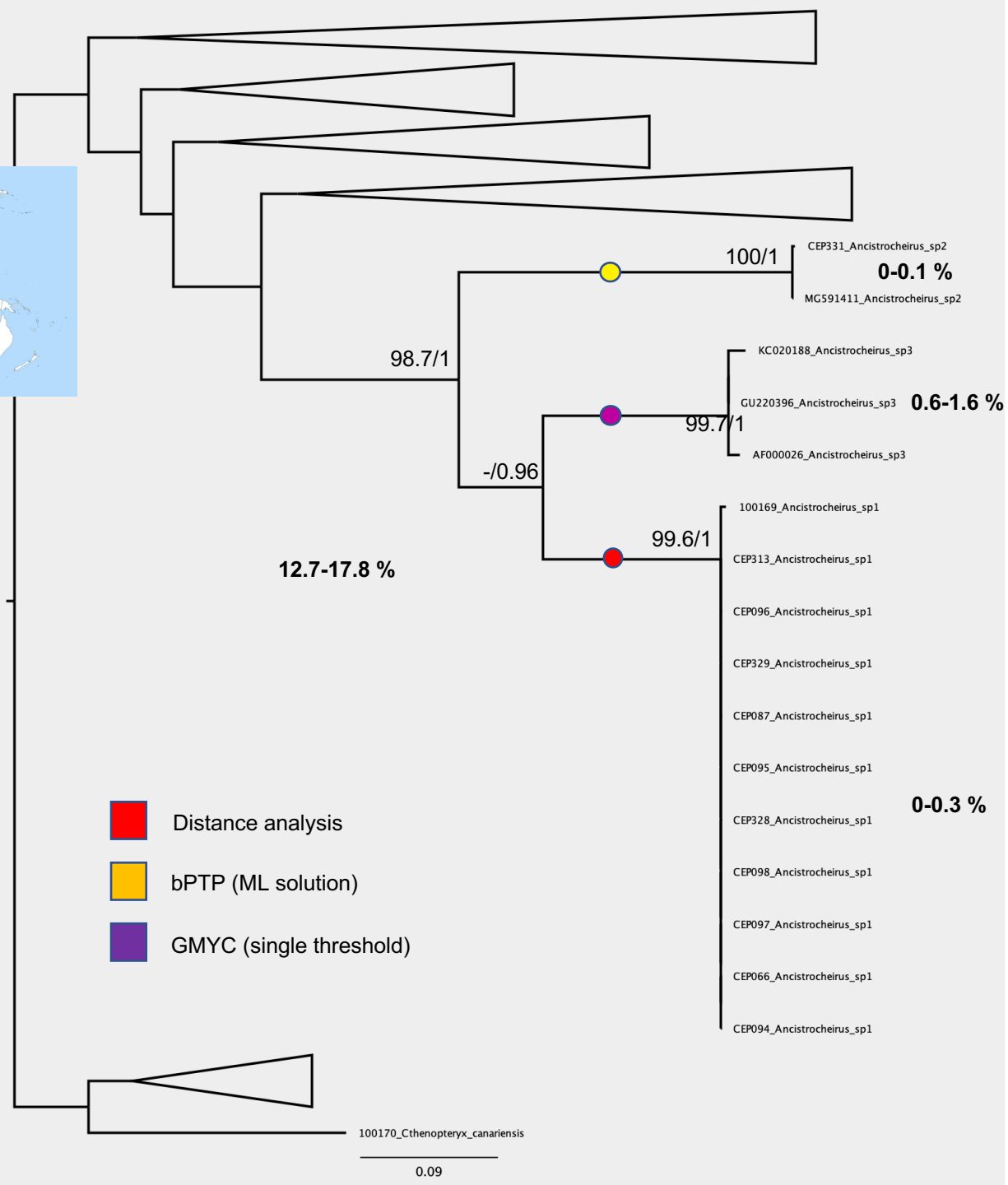
Ancistrocheiridae
Pfeffer 1912



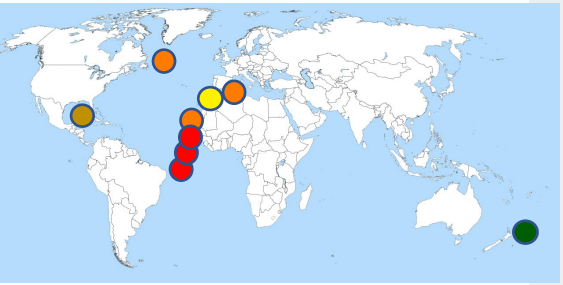
At least three species within this monotypic genus.

Highly divergent, no known morphological differences.

No type locality for the type species. Other available names.



Abraliopsis
Joubin 1896



Atlantic *Abraliopsis*

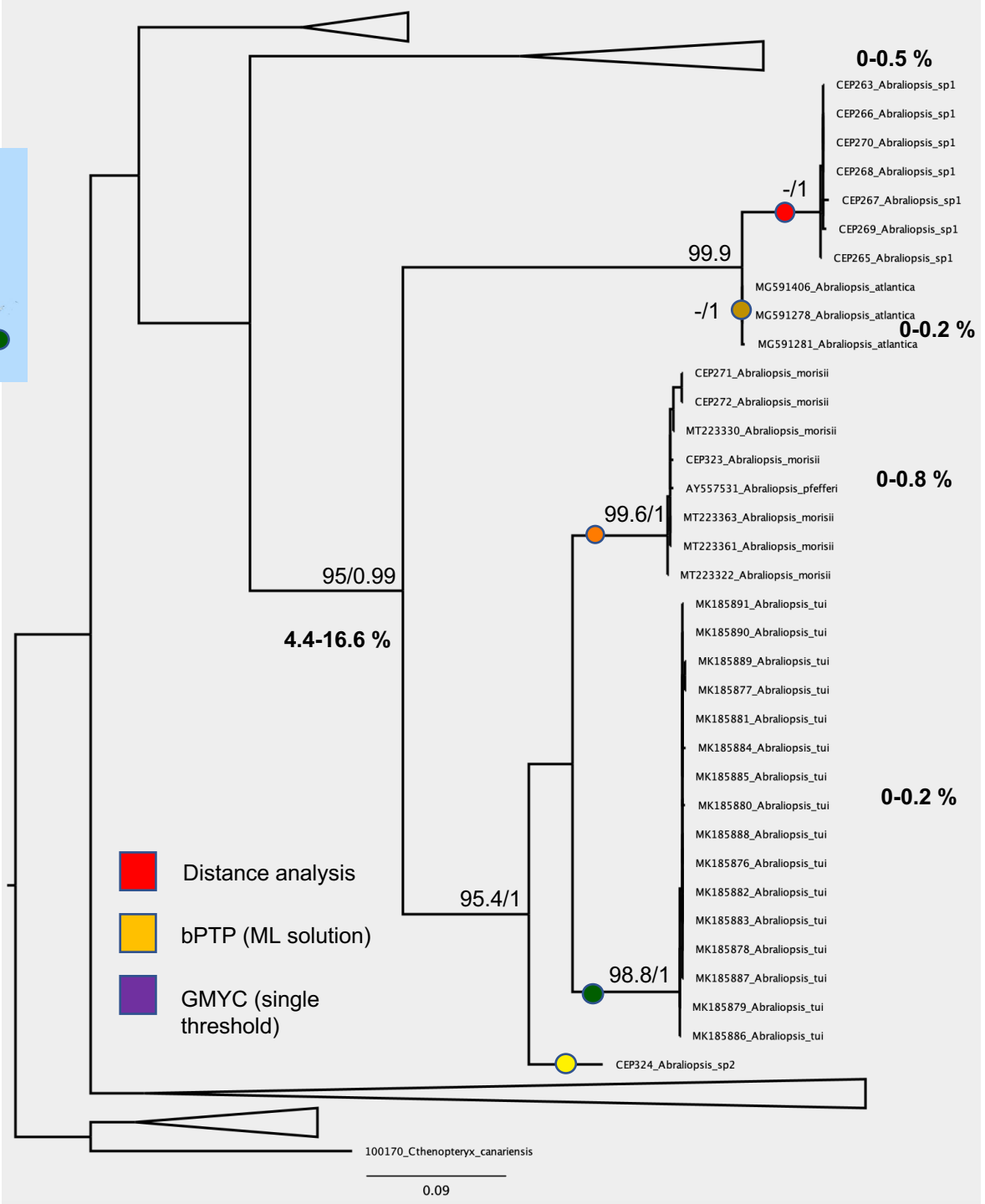
Abraliopsis morisii.
NA + Mediterranean

***Abraliopsis* sp. Z**. Undescribed.
SA

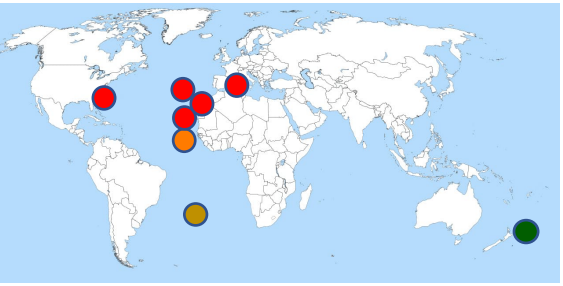
???

Abraliopsis gilchristi.
SA, SI & SP

Abraliopsis atlantica.
NEA & EA



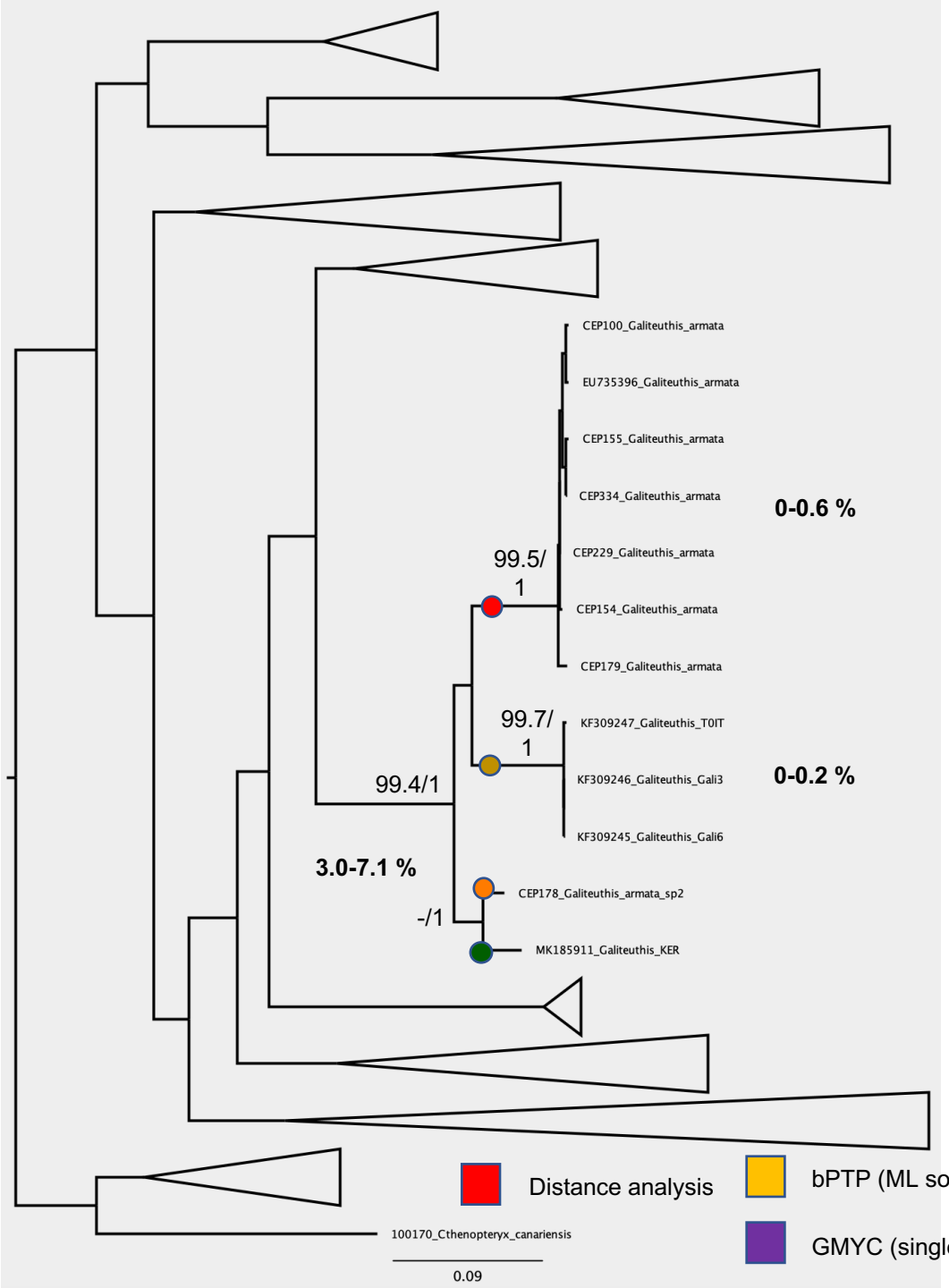
Galiteuthis armata
Joubin, 1898

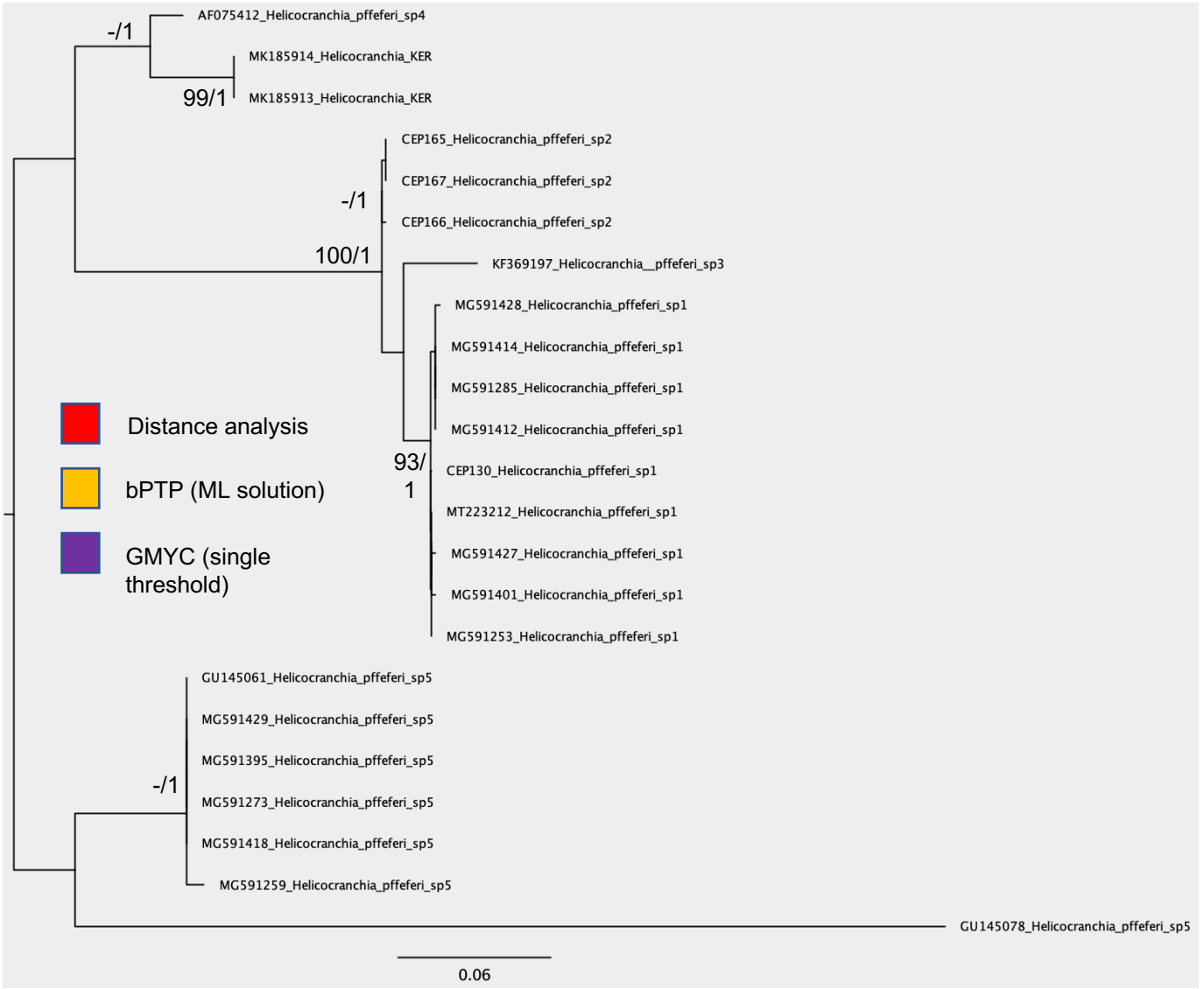


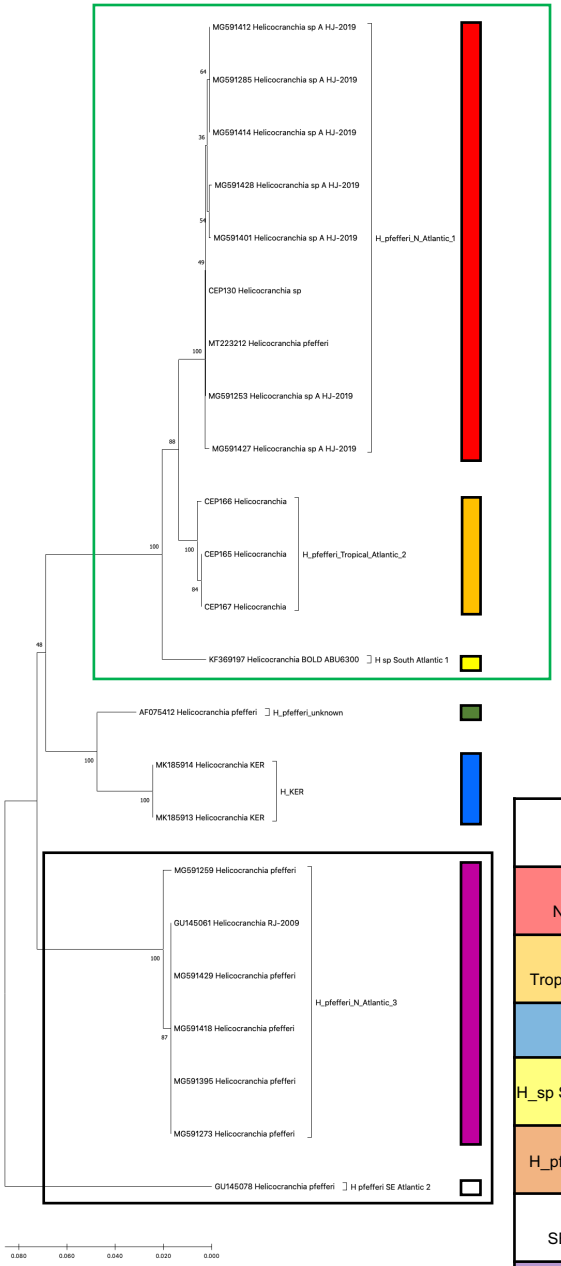
There is a single Atlantic species of *Galiteuthis*.

Our data suggest that there are three Atlantic species.

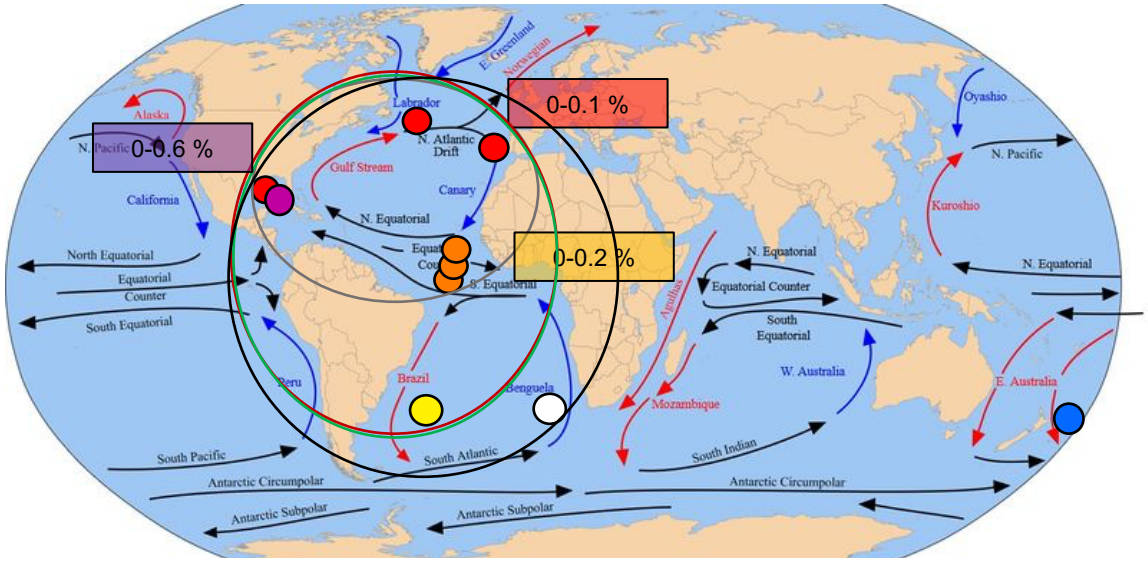
Low levels of divergence.




AF075412_Helicocranchia_pffeferi_sp4
-/1
MK185914_Helicocranchia_KER
99/1
MK185913_Helicocranchia_KER
CEP165_Helicocranchia_pffeferi_sp2
CEP167_Helicocranchia_pffeferi_sp2
-/1
CEP166_Helicocranchia_pffeferi_sp2
100/1
KF369197_Helicocranchia__pffeferi_sp3
MG591428_Helicocranchia_pffeferi_sp1
MG591414_Helicocranchia_pffeferi_sp1
MG591285_Helicocranchia_pffeferi_sp1
MG591412_Helicocranchia_pffeferi_sp1
93/
1
CEP130_Helicocranchia_pffeferi_sp1
MT223212_Helicocranchia_pffeferi_sp1
MG591427_Helicocranchia_pffeferi_sp1
MG591401_Helicocranchia_pffeferi_sp1
MG591253_Helicocranchia_pffeferi_sp1
Distance analysis
bPTP (ML solution)
GMYC (single threshold)
GU145061_Helicocranchia_pffeferi_sp5
MG591429_Helicocranchia_pffeferi_sp5
MG591395_Helicocranchia_pffeferi_sp5
-/1
MG591273_Helicocranchia_pffeferi_sp5
MG591418_Helicocranchia_pffeferi_sp5
MG591259_Helicocranchia_pffeferi_sp5
GU145078_Helicocranchia_pffeferi_sp5
0.06

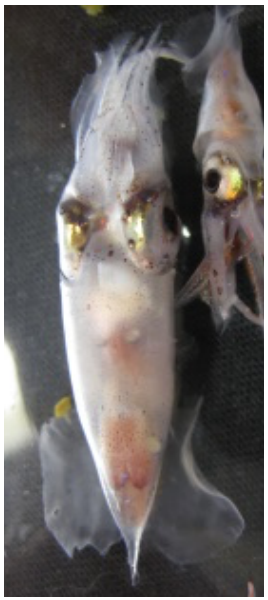


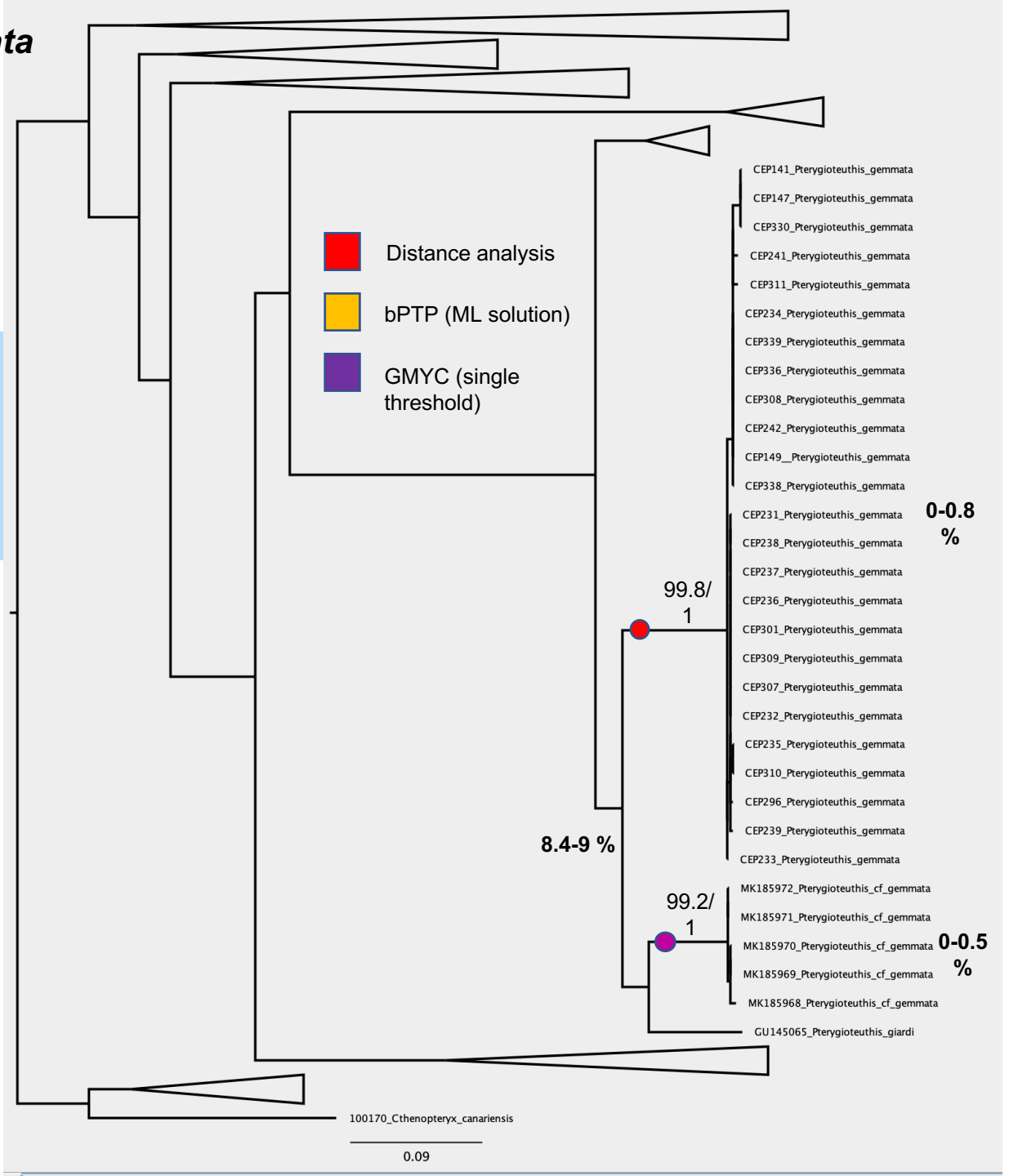
MEGAX, NJ tree, p-distances, 100bt



	H_pfefferi N_Atlantic_1	H_pfefferi Tropical_Atlantic_2	H_KER	H_sp South_Atlantic_1	H_pfefferi unknown	H_pfefferi SE_Atlantic_2	H_pfefferi N_Atlantic_3
H_pfefferi N_Atlantic_1							
H_pfefferi Tropical_Atlantic_2	2.2						
H_KER	11.21	10.82					
H_sp South_Atlantic_1	3.74	3.61	11.34				
H_pfefferi unknown	10.54	9.85	3.95	10.65			
H_pfefferi SE_Atlantic_2	17.12	16.32	14.95	16.15	14.95		
H_pfefferi N_Atlantic_3	12.58	12.71	9.79	12.89	8.99	15.46	

Pterygioteuthis gemmata
Chun, 1908





50 % of the tested species revealed cryptic lineages

Number of Atlantic cryptic lineages range from two (*C. sicula*, *Ancistrocheirus* spp.) to three (*G. armata*) and four (*H. pffeferi*)

Not clear how many cryptic lineages are included within *Abraliopsis* spp. At least two.

The divergence values among cryptic lineages of individuals of the same nominal species range from 2.2 to 17 %, likely representing different stages of divergence since each putative speciation phenomena

Molecular species delimitation methods were generally consistent and useful for species cryptic biodiversity within Atlantic oceanic squids

The Canary and the Atlantic Equatorial currents can be responsible of some of the cases of isolation and subsequent speciation, but more studies including larger number of specimens are necessary to test this hypothesis

It is necessary to develop more studies focussed on molecularly and morphologically assess the diversity of these animals at a global scale

THANKS!!!

for your attention



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Fernando Ángel Fernández-Álvarez
33.96 · Postdoc · Edit

Funding: Irish Research Council–Government of Ireland Postdoctoral Fellowship Award (ref. GOIPD/2019/460)

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