Nudibranch accession numbers from a global sample set (Neuston Phylogeny project)

Website: https://www.bco-dmo.org/dataset/505477
Version: 2014-02-21

Project
» Community Phylogeny and Global Phylogeography of the Neuston (Neuston Phylogeny)

Contributors	Affiliation	Role
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Dataset Description

This data was published as Table S2 in Celia K. C. Churchill, Alvin Alejandrino, A´ngel Valde´s and Diarmaid O´ Foighil (2013) Parallel changes in genital morphology delineate cryptic diversification of planktonic nudibranchs. Proc R Soc B:280: 20131224. http://dx.doi.org/10.1098/rspb.2013.1224.

Methods & Sampling

Glaucus atlanticus specimens were collected between 2006 and 2012 either from the beach or in the open ocean via snorkel or scuba. The specimens were then preserved in at least 70% ethanol and morphologically identified. One to five individuals were chosen from each ocean gyre for genetic analysis. Nucleotides from 4 molecular markers were amplified: rRNA-16S, rRNA-28S, Histone-3 and mt-COI. Details of the extraction, amplification and analyses can be found in the methods section of the Churchill (2013).

Data Processing Description

Relevant References:

Celia K. C. Churchill, Ángel Valdés and Diarmaid Ó Foighil (2014) Afro-Eurasia and the Americas present barriers to gene flow for the cosmopolitan neustonic nudibranch Glaucus atlanticus. Marine Biology DOI 10.1007/s00227-014-2389-7.

Celia K. C. Churchill, Alvin Alejandrino, A´ngel Valde´s and Diarmaid O´ Foighil (2013) Parallel changes in genital morphology delineate cryptic diversification of planktonic nudibranchs. Proc R Soc B:280: 20131224.http://dx.doi.org/10.1098/rspb.2013.1224.

Celia K. C. Churchill, Ellen E. Strong and Diarmaid O´Foighil (2011) Hitchhiking juveniles in the rare neustonic gastropod Recluzia cf. jehennei (Janthinidae). Journal of Molluscan Studies (2011) 0: 1-4.

doi:10.1093/mollus/eyr020

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Data Files

File
nudibranch_accession_nums.csv (Comma Separated Values (.csv), 7.25 KB) MD5:e0d923c86afb0678d887d612e8f1c970 Primary data file for dataset ID 505477

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Parameters

Parameter	Description	Units
species	species of nudibranch Glaucus	unitless
isolate	isolate code	unitless
genus	genus name	unitless
family	taxonomic family	unitless
voucher	museum voucher number	unitless
rRNA_16S	GenBank accession number for rRNA-16S	unitless
rRNA_28S	GenBank accession number for rRNA-28S	unitless
Histone_H3	GenBank accession number for nuclear Histone-H3	unitless
mtCOI	GenBank accession number for mitochondrial cytochrome c oxidase subunit I	unitless

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Instruments

Dataset-specific Instrument Name	Automated Sequencer
Generic Instrument Name	Automated DNA Sequencer
Dataset-specific Description	ABI 3730xl automated sequencer (Applied Biosystems, Inc.) http://www6.appliedbiosystems.com/products/abi3730xlspecs.cfm
Generic Instrument Description	A DNA sequencer is an instrument that determines the order of deoxynucleotides in deoxyribonucleic acid sequences.

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Deployments

OFoighil_2014

Website	https://www.bco-dmo.org/deployment/505320
Platform	OFoighil_2014
Description	Mollusc genetic analyses from globally collected samples.

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Project Information

Community Phylogeny and Global Phylogeography of the Neuston (Neuston Phylogeny)

Coverage: 5 subtropical gyre systems: North Atlantic, South Atlantic, North Pacific, South Pacific, Indian Ocean.

Abstract:

This project aims to construct the first marine community phylogeny. It is inspired by the integrative perspective that lies at the core of the modern concept of biodiversity. Empirical realization of this integration requires that study systems be simple enough to be tractable, yet (ideally) contain compelling ecological and evolutionary phenomena. The target marine community, the neuston, embodies these characteristics to an exceptional degree. It consists of a relatively small number of interacting species that drift at the water/atmosphere interface of the planet's subtropical gyres (40% of oceanic surface area) and play an important role in open-ocean epipelagic food webs. The ecological base of the neuston community is an endosymbiosis involving chondrophore cnidarian hosts (Porpitidae) and their dinoflagellate photosymbionts. Chondrophores are preyed upon by a variety of predators, chief among them two lineages of highly specialized gastropods (Janthinidae and Glaucinae). This prominent open ocean community has been poorly studied, apart from its resident insect genus Halobates. The investigator aims to complete a combined phylogeny/phylogeography of neuston taxa across three trophic levels (photosymbionts, chondrophore hosts, predatory gastropods) and all 5 subtropical gyre systems. The two main goals of the community phylogeny section are to determine the evolutionary origins of the photosymbiosis, and to establish the benthic sister lineages of both gastropod lineages in order to identify the synapomorphic changes associated with ancestral ecological transitions from benthos to neuston. The primary aims of the phylogeographic section are to establish the spatial scale of speciation for the target neustonic taxa, and to test three hypotheses of within-species genetic structuring: global panmixis; ocean basin panmixis; within gyre panmixis. The investigator has developed a multi-faceted sampling strategy that involves ichthyoplankton research colleagues in multiple gyres systems, the bi-coastal, ocean-going ships and students of the Woods Hole Semester at Sea program, national and international museum collections, and an informal network of colleagues worldwide that will sample spontaneous neuston stranding event. He has also established collaborative relationships with colleagues expert in cnidarian, nudibranch, caenogastropod and epitoniid diversity, who will work closely with him on their respective groups within the neuston and, for gastropods, also within benthic sister lineages. To-date, preliminary samples from 3 of the 5 gyres have yielded results that not only demonstrate the feasibility of the

primary project goals, but also provide exciting initial insights into the generality of the photosymbiotic association, the putative benthic sister lineages of neustonic gastropods, the likely presence of cryptic species complexes, and the divergent patterns of among-gyre and among-basin genetic structuring exhibited by sister taxa.

This project has an unusually extensive student outreach component in the form of the >100 Sea Education Association (SEA) undergraduates and high school students that will participate in multiple upcoming SSV Seamans & SSV Cramer cruises and who will collect neuston taxa. The investigator will provide detailed electronic feedback to the SEA courses, in the field, so that students will be able to connect the organisms they collect with the biogeographic and evolutionary hypotheses being testing, and to determine for themselves which hypotheses the available data reject, or corroborate. One graduate and three undergraduate UM students will receive in-depth training during this project. The graduate student, Celia Churchill, has participated in offshore neuston sampling, generated much of the preliminary data, and recently presented at her first scientific meeting. She will work/train with the P.I., and also with 4 expert collaborators, directly in their laboratories for 2 of them. One UM undergraduate student has already worked directly on this project and the investigator will recruit at least two more. Substantial international outreach and collaborative activities are planned across research specialties, especially involving ichthyoplankton colleagues working in different gyre systems, as well as international museum colleagues. This study promises to significantly enhance background knowledge of the vast subtropical gyre surface ecosystem, now heavily impacted, even in mid-ocean, by the incremental accumulation of non-biodegradable, plastic flotsam. This is a major new marine conservation issue that is just now entering public discourse, e.g., see recent descriptions of the North Pacific's Giant Garbage Patch in the popular press.

PUBLICATIONS PRODUCED AS A RESULT OF THIS RESEARCH

Ó Foighil, D; Lee, T; Slapcinsky, J. "Prehistoric anthropogenic introduction of partulid tree snails in Papua New Guinean archipelagos," JOURNAL OF BIOGEOGRAPHY, v.38, 2011, p. 1625. View record at Web of Science

Churchill, CKC; Ó Foighil, D; Strong, EE; Gittenberger, A. "Females floated first in bubble-rafting snails," CURRENT BIOLOGY, v.21, 2011, p. R802. View record at Web of Science

Churchill, CKC; Strong, EE; Ó Foighil, D. "Hitchhiking Juveniles in the Rare Neustonic Gastropod Recluzia Cf. Jehennei (Janthinidae)," Journal Of Molluscan Studies, v.77, 2011, p. 441. View record at Web of Science

Ó Foighil, D; Li, JC; Lee, T; Johnson, P; Evans, R; Burch, JB. "Conservation Genetics of a Critically Endangered Limpet Genus and Rediscovery of an Extinct Species," PLOS ONE, v.6, 2011. View record at Web of Science

Focal Publications

Churchill, C.K., Valdés, Á. Ó Foighil, D. 2014. Afro-Eurasia and the Americas present barriers to gene flow for the cosmopolitan neustonic nudibranch Glaucus atlanticus. Marine Biology, In Press.

Churchill, C.K., Valdés, Á. Ó Foighil, D. 2014. Molecular and morphological systematics of neustonic nudibranchs (Mollusca, Gastropoda, Glaucidae, Glaucus) with descriptions of three new cryptic species. In Press, Invertebrate Systematics.

Churchill, C.K., Alejandrino, A., Valdés, Á. Ó Foighil, D. 2013. Parallel changes in genital morphology delineate cryptic diversification of planktonic nudibranchs. Proceedings of the Royal Society B. 280:20131224. http://dx.doi.org/10.1098/rspb.2013.1224

Exemplar media coverage: www.earthtimes.org/nature/glaucus-twin/2394/

Churchill, C.K. and Ó Foighil, D. 2013. Bubble rafting snails. McGraw-Hill Yearbook of Science and Technology 2013, pp. 56-58.

Churchill, C.K., Ó Foighil, D., Strong, E.E. and Gittenberger, A. 2011. Females floated first in bubble-rafting snails. Current Biology. 21: R802-R803. Featured on the journal cover, in Science and in multiple online media outlets, e.g., http://www.msnbc.msn.com/id/44849146/ns/technology_and_science-science/#.UPMcgY5_dsR

Churchill C.K., Strong, E.E. and Ó Foighil, D. 2011. Hitchhiking juveniles in the rare neustonic gastropod Recluzia cf. jehennei (Janthinidae). Journal of Molluscan Studies. 77:441-444.

Non-Focal publications

Li, J., Ó Foighil, D. & Park, J.K. 2013. Triton’s trident: cryptic Neogene divergences in a marine clam (Lasaea

australis) correspond to Australia's three temperate biogeographic provinces Molecular Ecology 22:1933-1946.

http://onlinelibrary.wiley.com/doi/10.1111/mec.12220/full

Exemplar media: http://phys.org/news/2013-03-cryptic-clams-biologists-species-plain.html

Scott, P.V., Ó Foighil, D. & Li, J. 2013. Where's Waldo? A new commensal species, Waldo arthuri (Mollusca: Bivalvia: Galeommatidae), from the Northeastern Pacific Ocean. Zookeys, 316:67-80. www.pensoft.net/journals/zookeys/article/4256

Exemplar media coverage: http://www.sciencedaily.com/releases/2013/07/130716120022.htm

http://www.foxnews.com/science/2013/07/20/heres-waldo-strange-new-alien-like-clam-species-found/

Miura, O., Köhler, F., Lee, T., Li, J. & Ó Foighil, D. 2013. Rare, divergent Korean Semisulcospira spp. mitochondrial haplotypes have Japanese sister lineages. Journal of Molluscan Studies, 79:86-89. http://mollus.oxfordjournals.org/content/79/1/86.full.pdf+html

Li, J., Ó Foighil, D. & Middelfart, P. 2012. The evolutionary ecology of biotic association in a megadiverse bivalve superfamily: sponsorship required for permanent residency in sediment. PLoS ONE, 7(8): e42121. Featured in multiple online media outlets, e.g., http://www.sciencedaily.com/releases/2012/08/120809090308.htm

Li, J. and Ó Foighil, D. 2012. Host-specific morphologies but no host races in the commensal bivalve Neaeromya rugifera. Invertebrate Biology, 131:197-203.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0850625

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