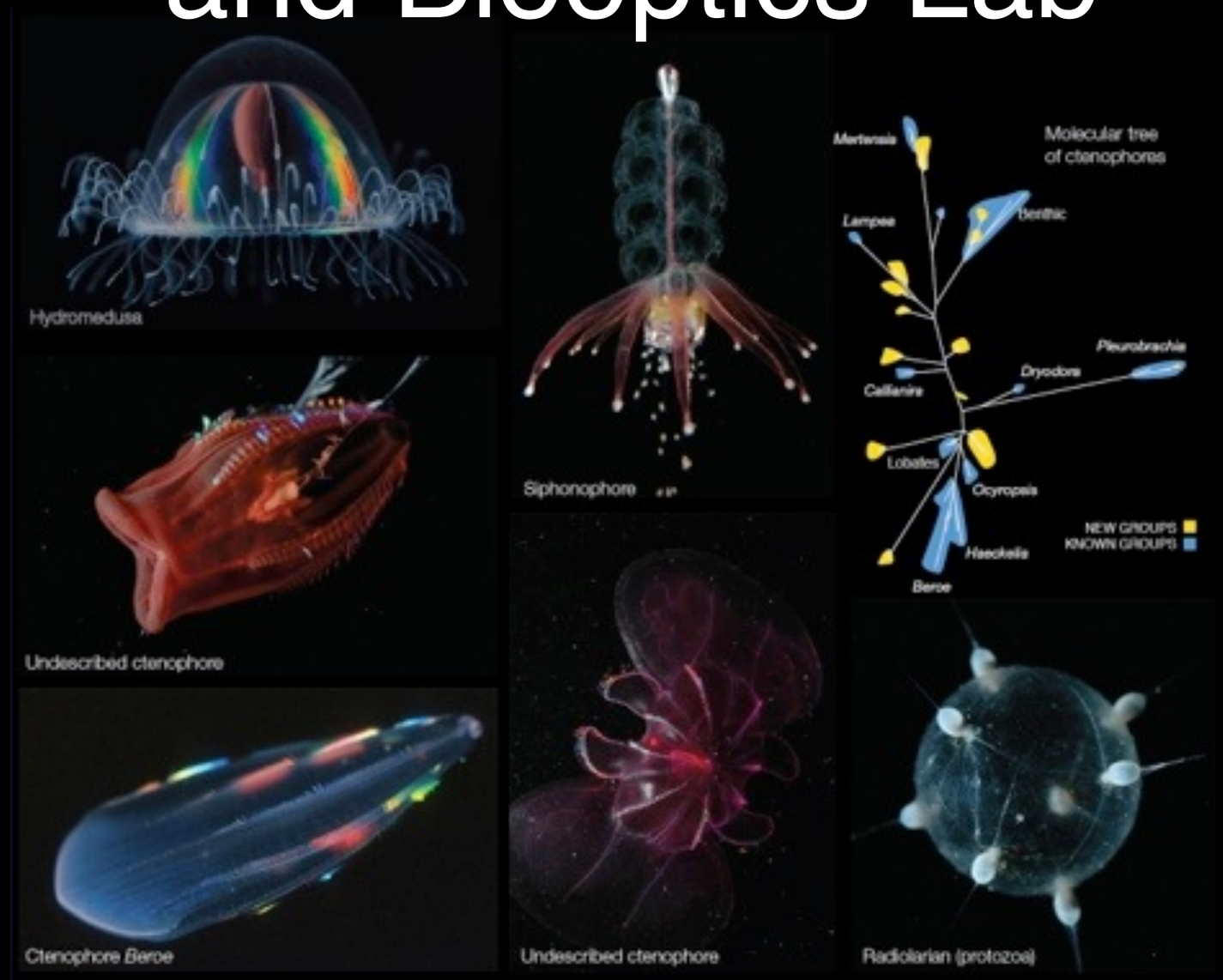
Zooplankton Biodiversity and Biooptics Lab



Steve Haddock haddock@mbari.org
Lynne Christianson
Darrin Schultz dschultz@mbari.org

GELATINOUS ZOOPLANKTON

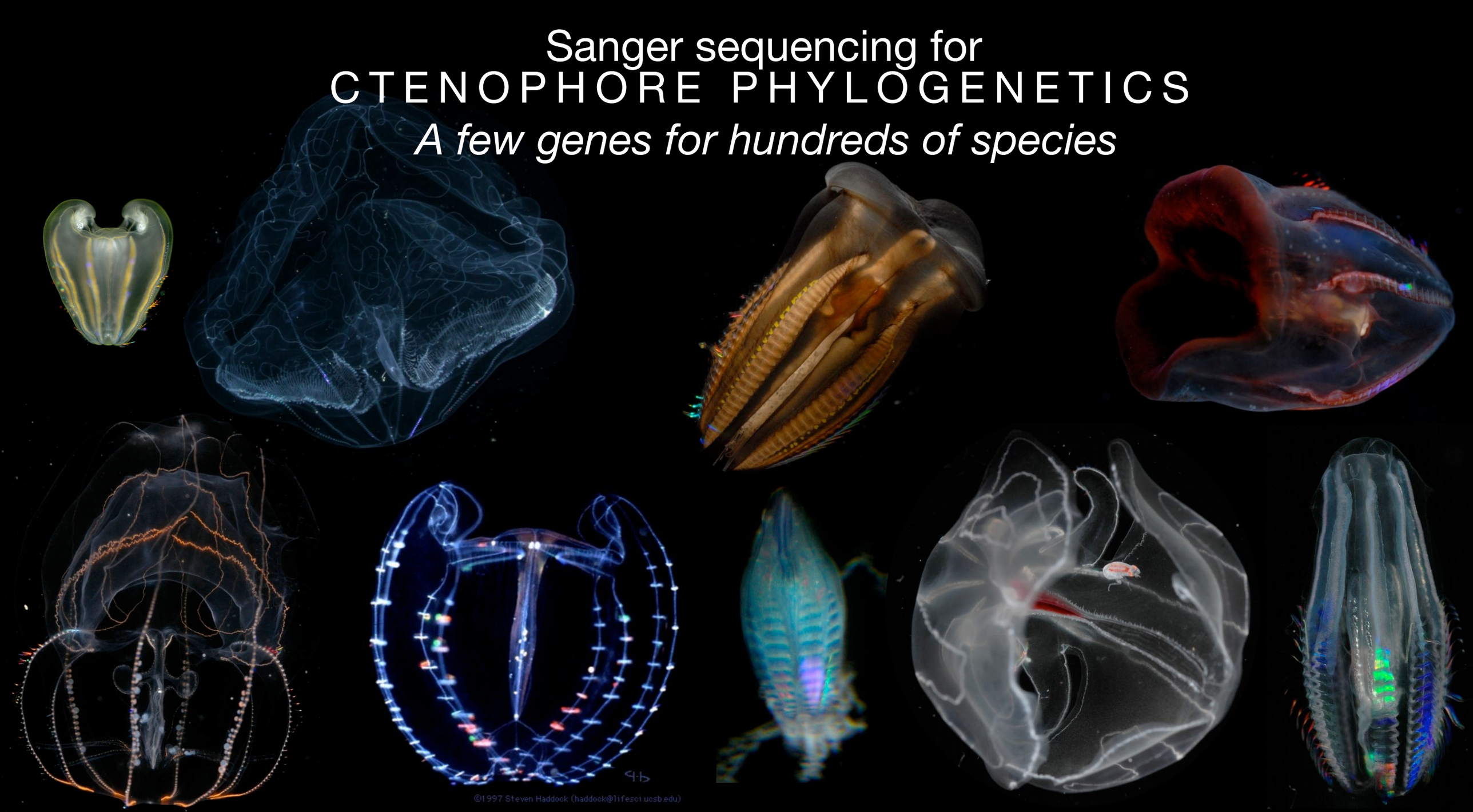
Casey Dunn

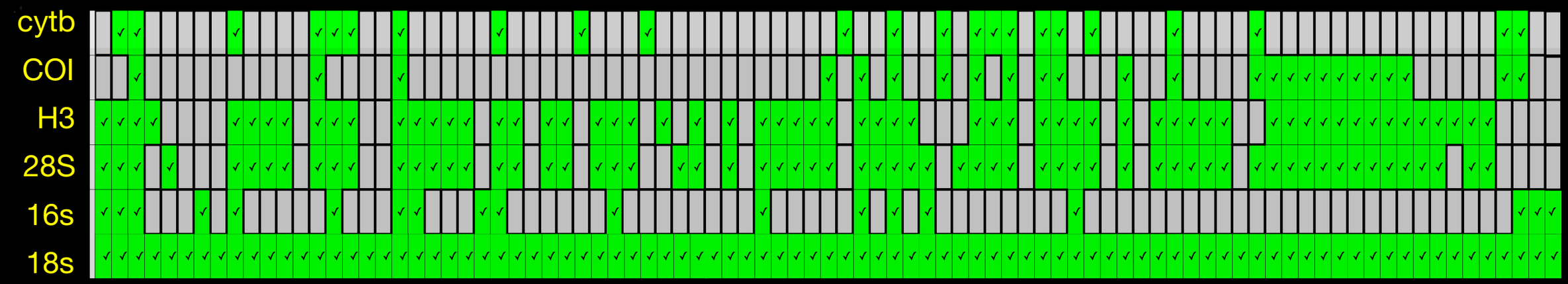
Ctenophores

Siphonophores

Sanger sequencing for
CTENOPHORE PHYLOGENETICS

A few genes for hundreds of species





Transcriptomes (94)

Thousands of genes for dozens species

SIPHONOPHORES

Abylopsis
Apolemia
Chelophyes
Chuniphyes_moserae
Chuniphyes_multidentata
Cordagalma
Craseoa
Desmophyes
Diphyes
Erenna
Forskalia
Hippopodius
Lilyopsis
Lions_mane
Lychnagalma
Marrus
Nanomia
Resomia
Rhisophysa
Rosacea
Stephalia

CRUSTACEANS

Gaussia Luminous Tail
Gaussia Non-Luminous
Pleuromamma_robusta

WORMS

(Polychaete & Chaetognath)
C.macrocephala
E.fowleri Body
E.fowleri Tail
Harmothoe
Tomopteris
Flota
Swima bombiviridis

MOLLUSCS

Chiroteuthis
Dosidicus
Octopoteuthis
Phylliroe
Pterygioteuthis
Vampyroteuthis

CTENOPHORES

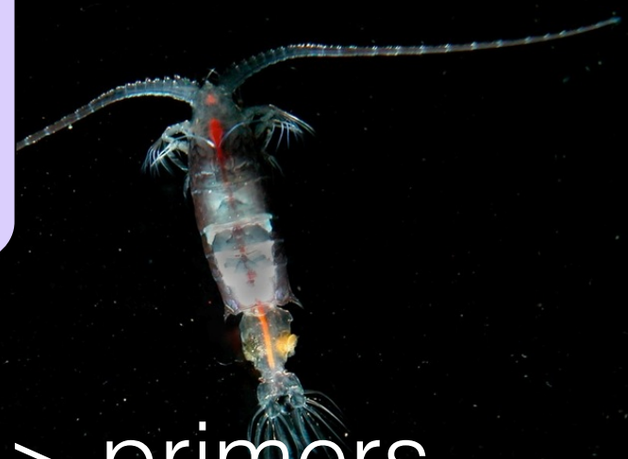
Bathocyroe fosteri
Bathyctena chuni
Benthic ctenophore
Beroe abyssicola
Beroe_forskalii
Bolinopsis infundibulum
Charistephane
Ctenoceros red
Dryodora
Euplokamis
Haeckelia rubra
Hormiphora
Lampea
Lampocteis cruentiventer
Nephelo red
Nephelo white
Ocyropsis maculata
Thalassocalyce
Vermillion lobate
Velamen parallelum
Weird cteno

OTHER CNIDARIA

Atolla vanhoeffeni
Halitrephes_valdiviae
Aegina_citrea
Solmissus incisa
Tetraplatia volitans

PROTISTS (Radiolaria)

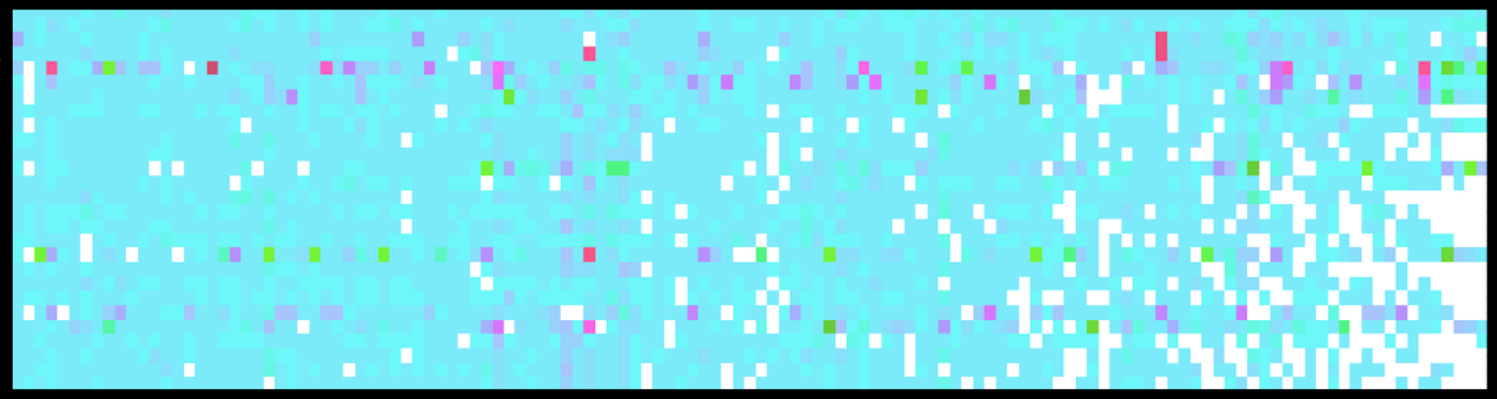
T_globosa
T_campanella
T. braueri



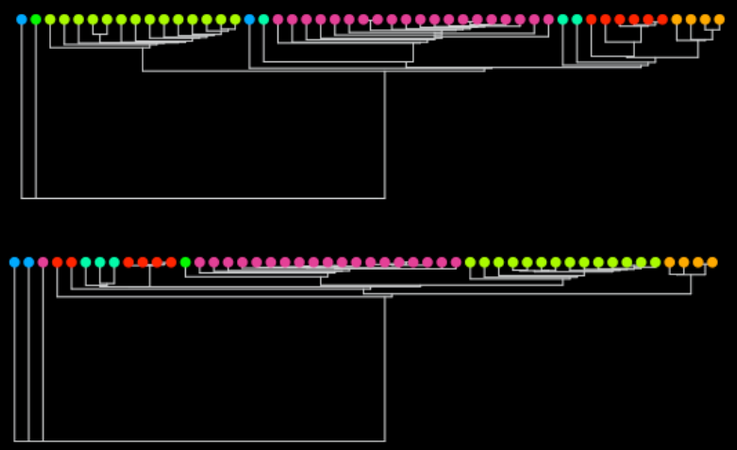
Transcriptomes -> mtDNA genomic -> primers

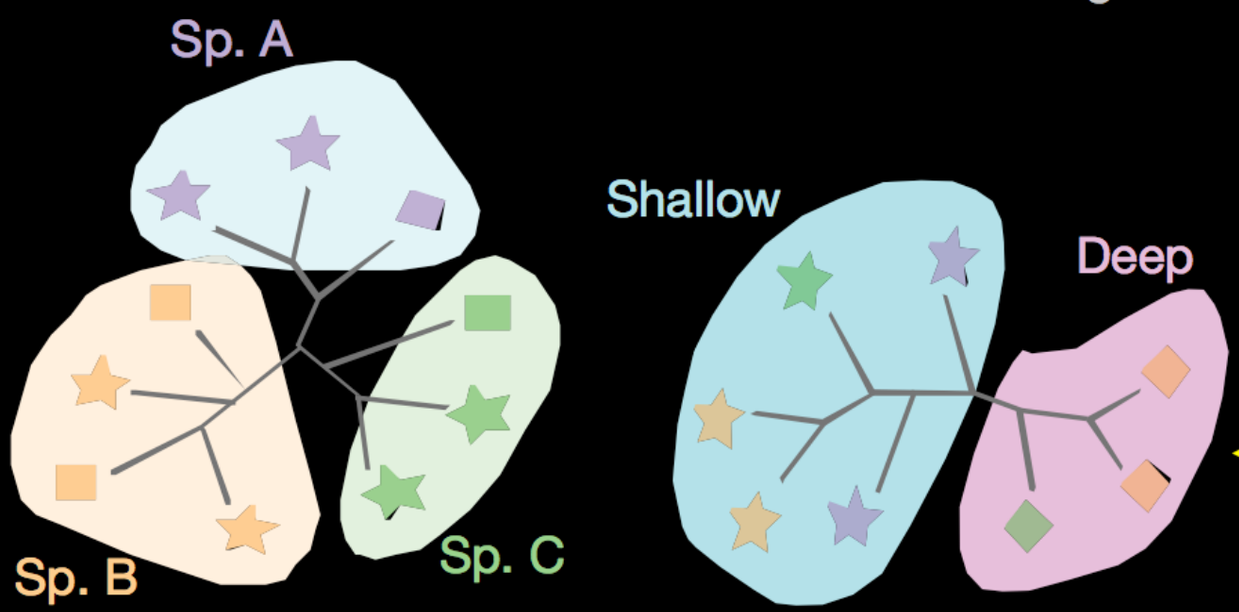
Transcriptome sequencing to identify adaptations to the deep-sea

CHECK QUALITY:
FInd species with
anomalously
long gene seqs



FIND SPECIES RELATIONSHIPS:
based on hundreds
or thousands of genes

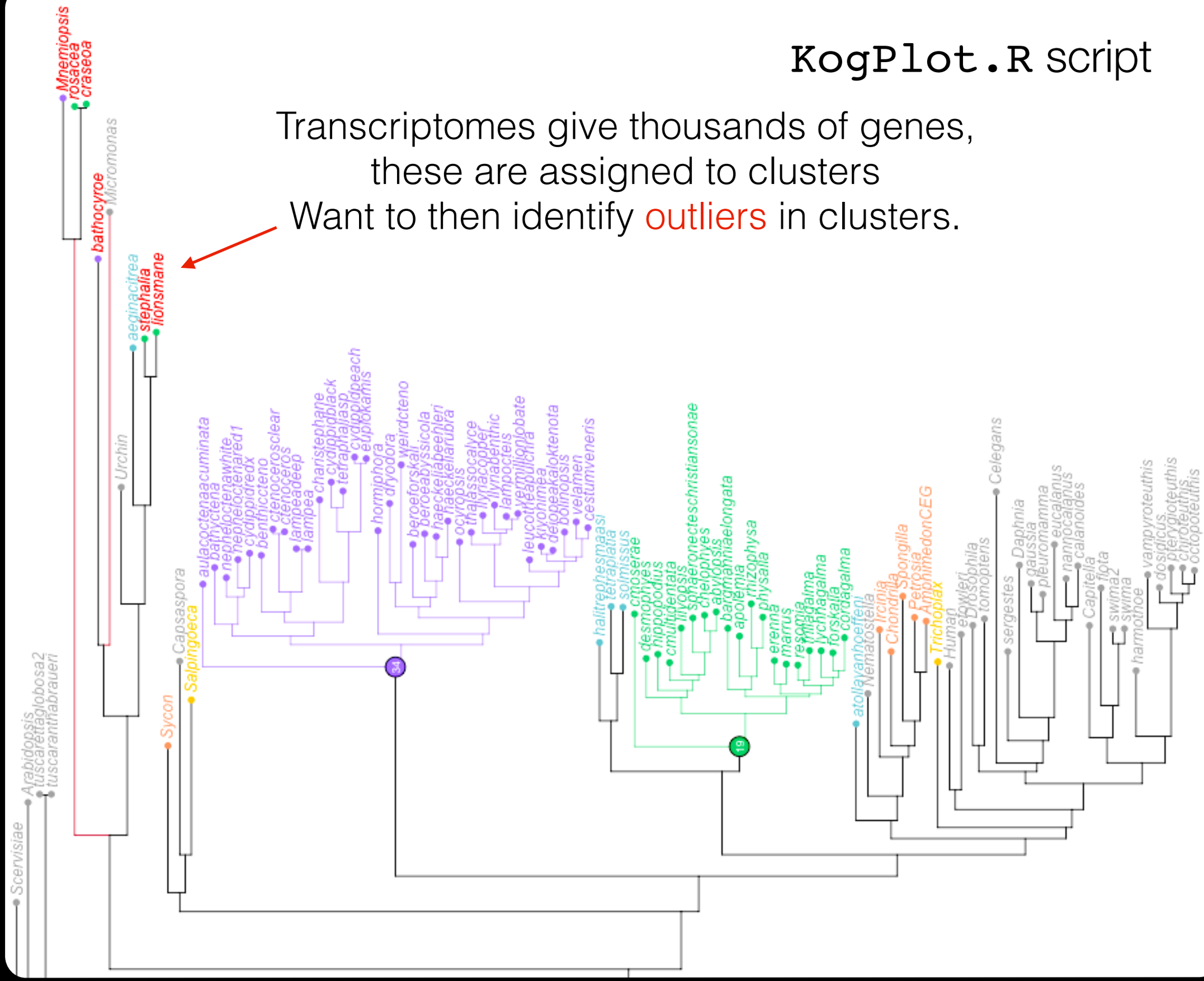




IDENTIFY PHYSIOLOGICALLY
IMPORTANT GENES:
cluster by depth
rather than by species

`KogPlot.R` script

Transcriptomes give thousands of genes,
these are assigned to clusters
Want to then identify outliers in clusters.



Resources

Internal BLAST database for many hundreds of zooplankton specimens, including undescribed species.

At least one undescribed siphonophore was found in this recent microbial survey

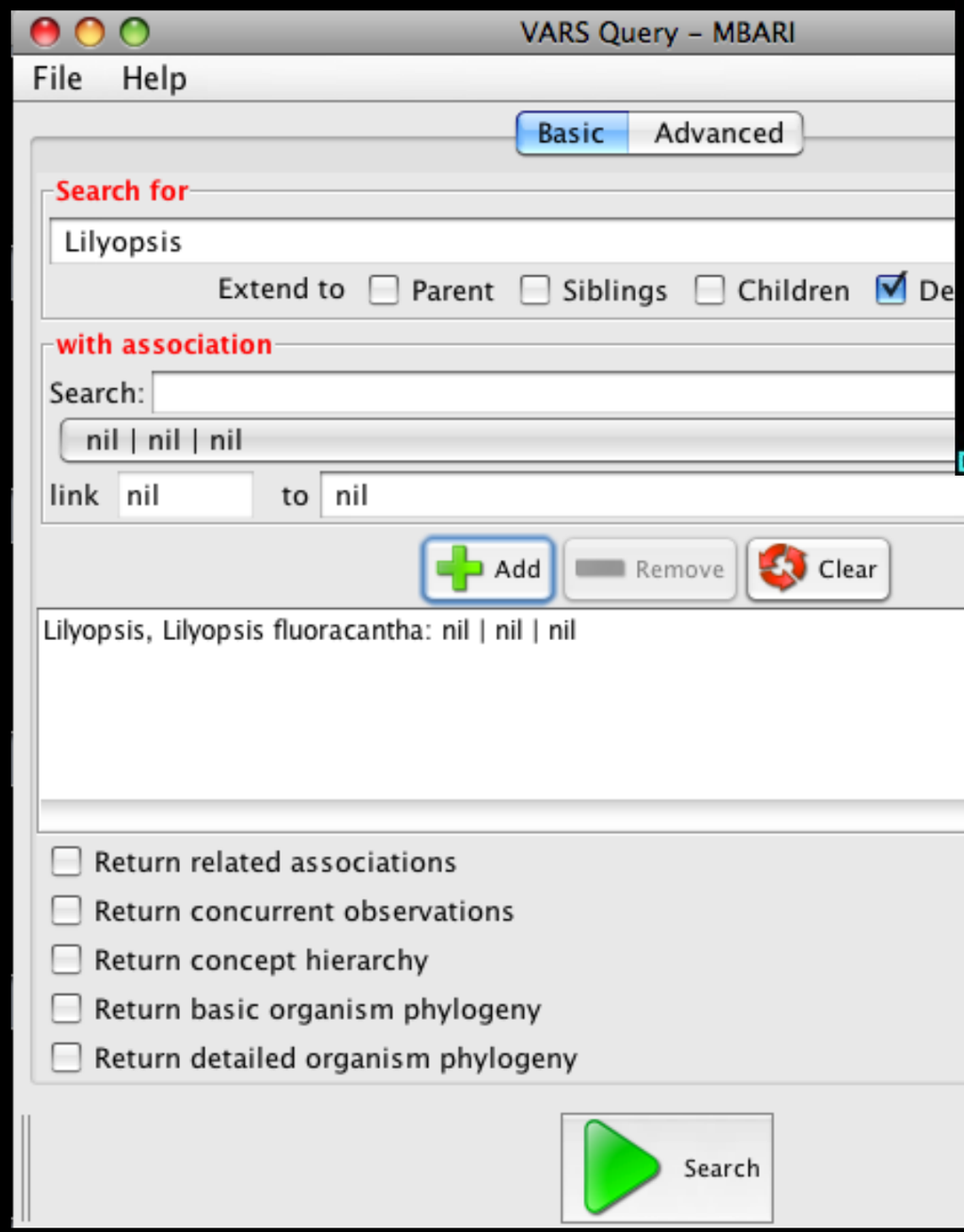
AEM
Journals.ASM.org

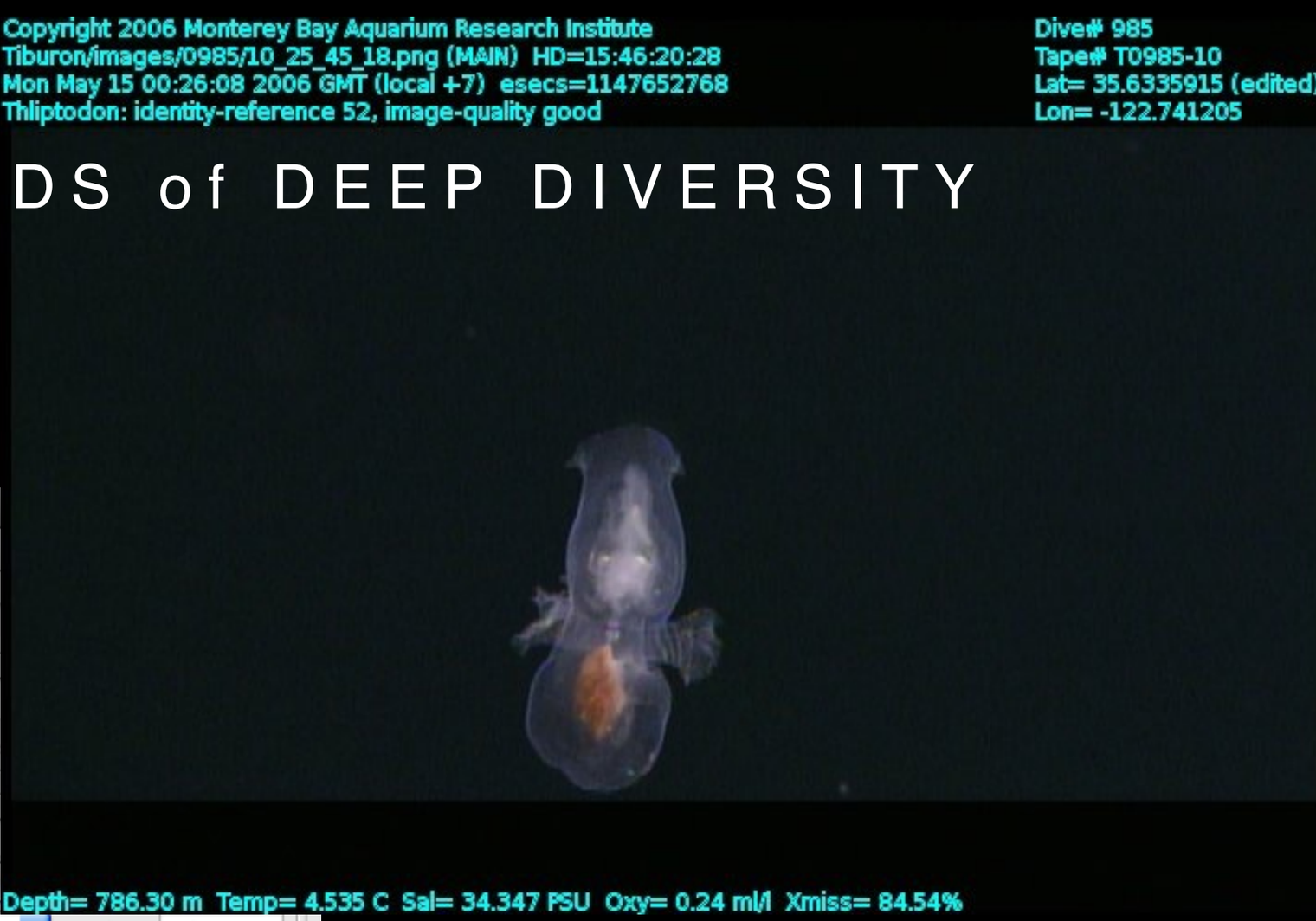
Investigating Microbial Eukaryotic Diversity from a Global Census: Insights from a Comparison of Pyrotag and Full-Length Sequences of 18S rRNA Genes

Alle A. Y. Lie,[a] Zhenfeng Liu,[a] Sarah K. Hu,[a] Adriane C. Jones,[a] Diane Y. Kim,[a] Peter D. Countway,[b] Linda A. Amaral-Zettler,[c,d] S. Craig Cary,[e,h] Evelyn B. Sherr,[f] Barry F. Sherr,[f] Rebecca J. Gast,[g] David A. Caron[a]

Department of Biological Sciences, University of Southern California, Los Angeles, California, USA[a]; Bigelow Laboratory for Ocean Sciences, East Boothbay, Maine, USA[b]; The Josephine Bay Paul Center for Comparative Molecular Biology and Evolution, Marine Biological Laboratory, Woods Hole, Massachusetts, USA[c]; Department of Geological Sciences, Brown University, Providence, Rhode Island, USA[d]; Environmental Research Institute, School of Science, University of Waikato, Hamilton, New Zealand[e]; College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, Oregon, USA[f]; Woods Hole Oceanographic Institution, Woods Hole, Massachusetts, USA[g]; College of Earth, Ocean, and Environment, University of Delaware, Lewes, Delaware, USA[h]

VIDEO RECORDS of DEEP DIVERSITY

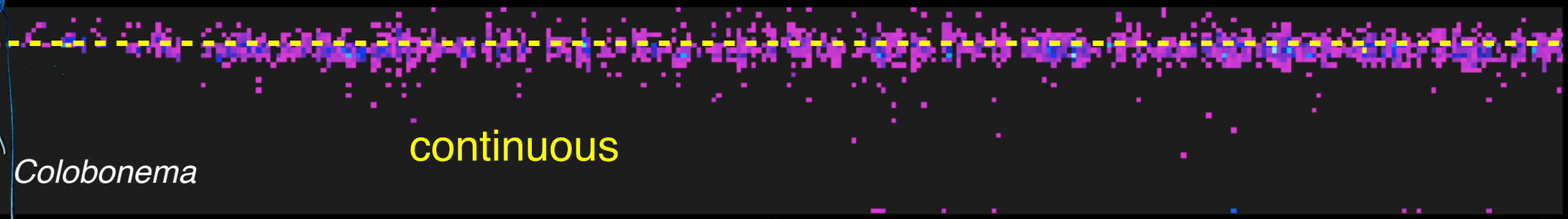




- VARS: Video annotations from 1989- present
- Can search on any concept
- Metadata stored with species
- One taxon *Nanomia*: (146,159 records)

20-year x 2000 meters from ROV video records

Colobonema



0

1000

2000

1989

1999

2009

20-year x 2000 meters from ROV video records

Colobonema

continuous

Mitrocoma

El Niño

0

1000

2000

1989

1999

2009

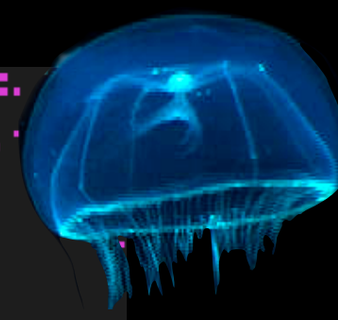
20-year x 2000 meters from ROV video records

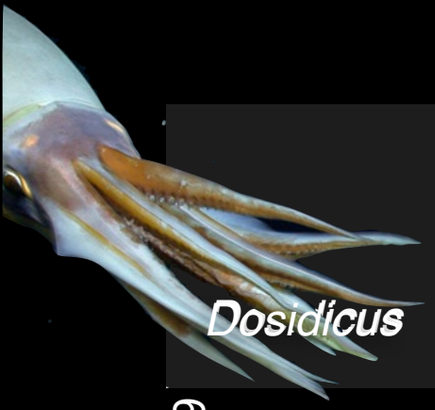
Colobonema

continuous

Mitrocoma

El Niño





Dosidicus

increasing

0

1000

2000

1989

1999

2009

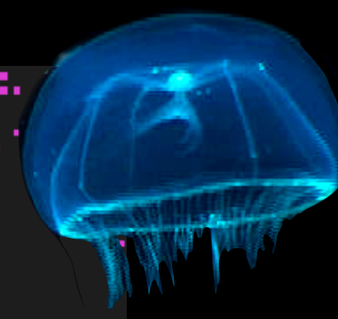
20-year x 2000 meters from ROV video records

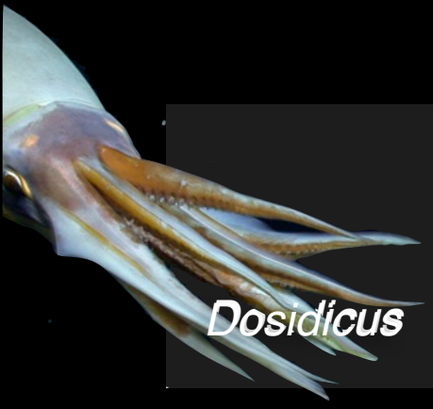
Colobonema

continuous

Mitrocoma

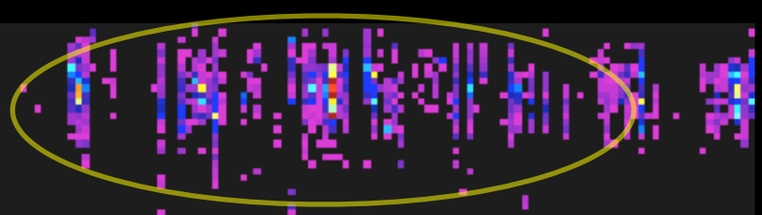
El Niño





Dosidicus

increasing



“Agalma”

increase or awareness?

0

1000

2000

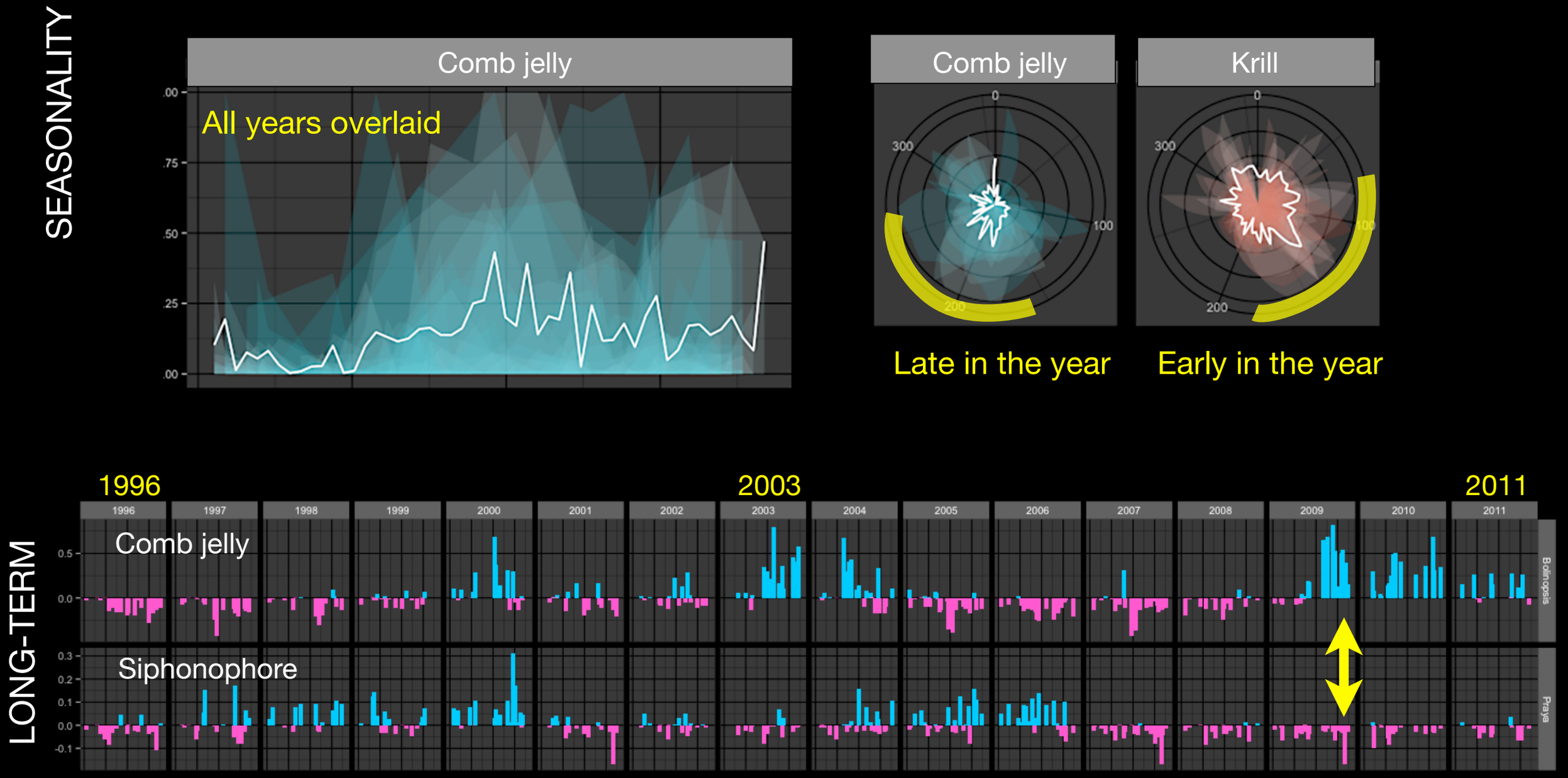
1989

1999

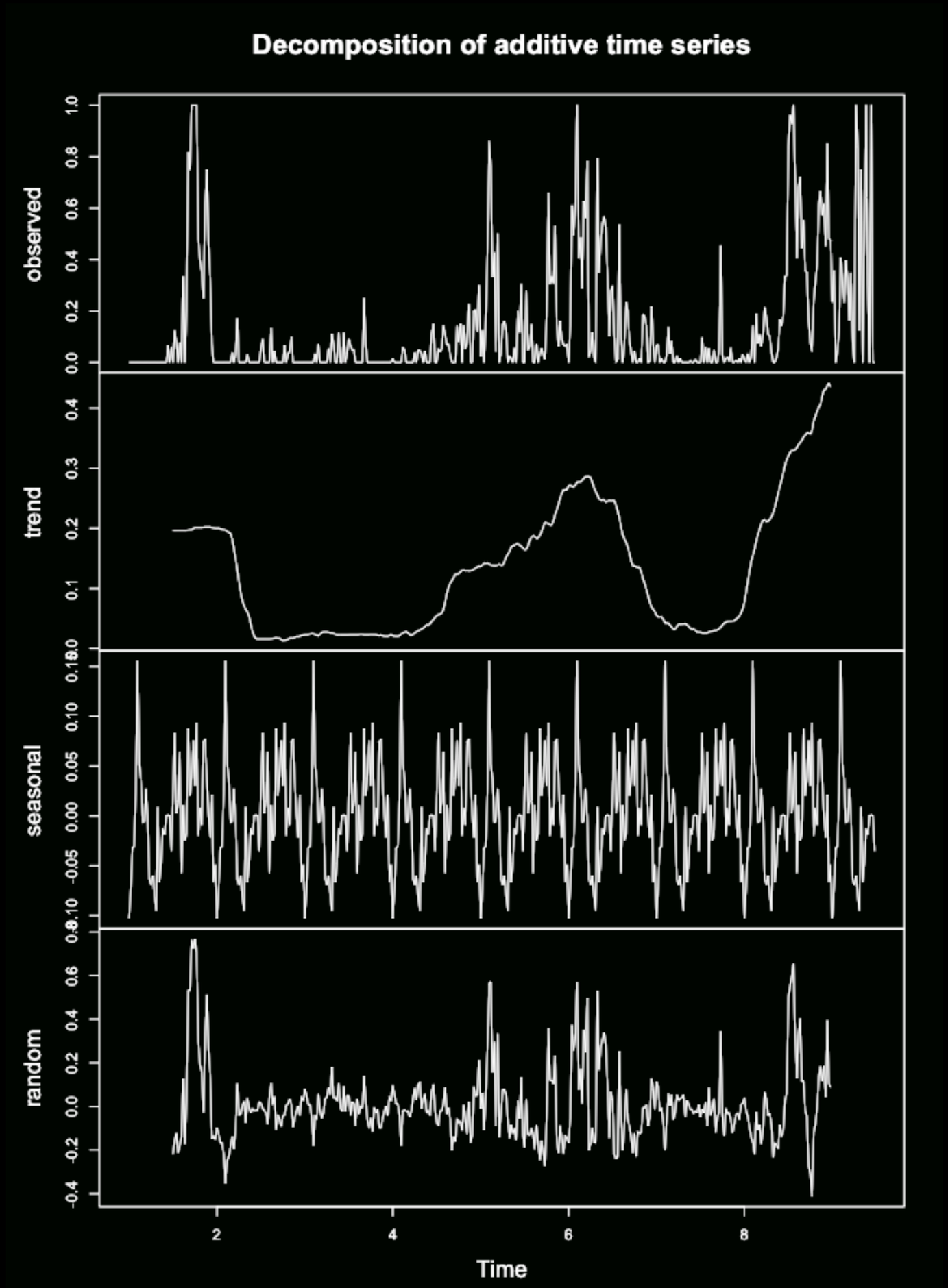
2009

Tools for analyzing and visualizing data

Identifying long-term ecosystem trends



with Alexander Jaffe



Original data
(= sum of below)

Long-term trend

Periodic element

Random element

Diversity profiles by taxon

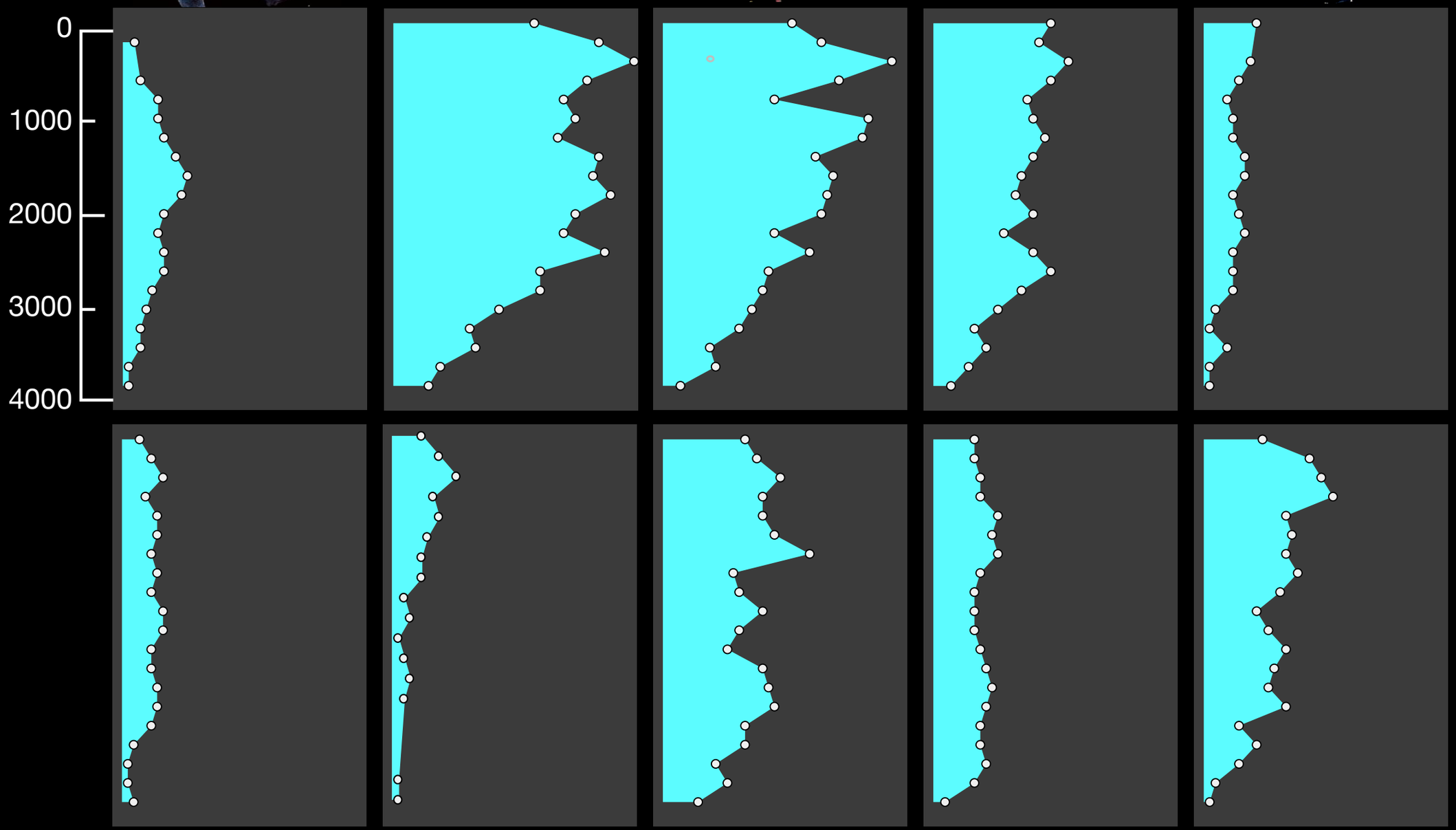
Scyphozoa

Hydromedusae

Siphonophora

Ctenophora

Thaliacea



Appendicularia

Cephalopoda

Crustacea

Polychaeta

Teleostomi