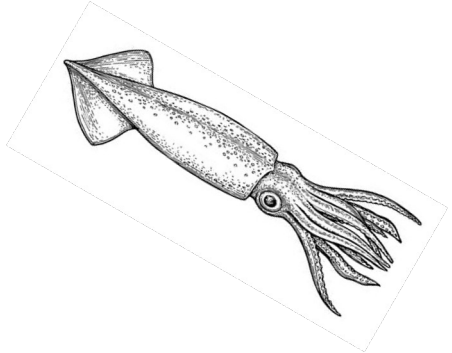
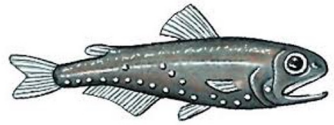




Pelagic Species Trait Database:

an open data resource to promote trait-based fisheries research

Miram Gleiber, Natasha Hardy, Zachary Roote, Caitlin Morganson, Alana Krug-Macleod, Iris George, Cindy Matuch, Cole Brookson, Larry Crowder, Stephanie Green

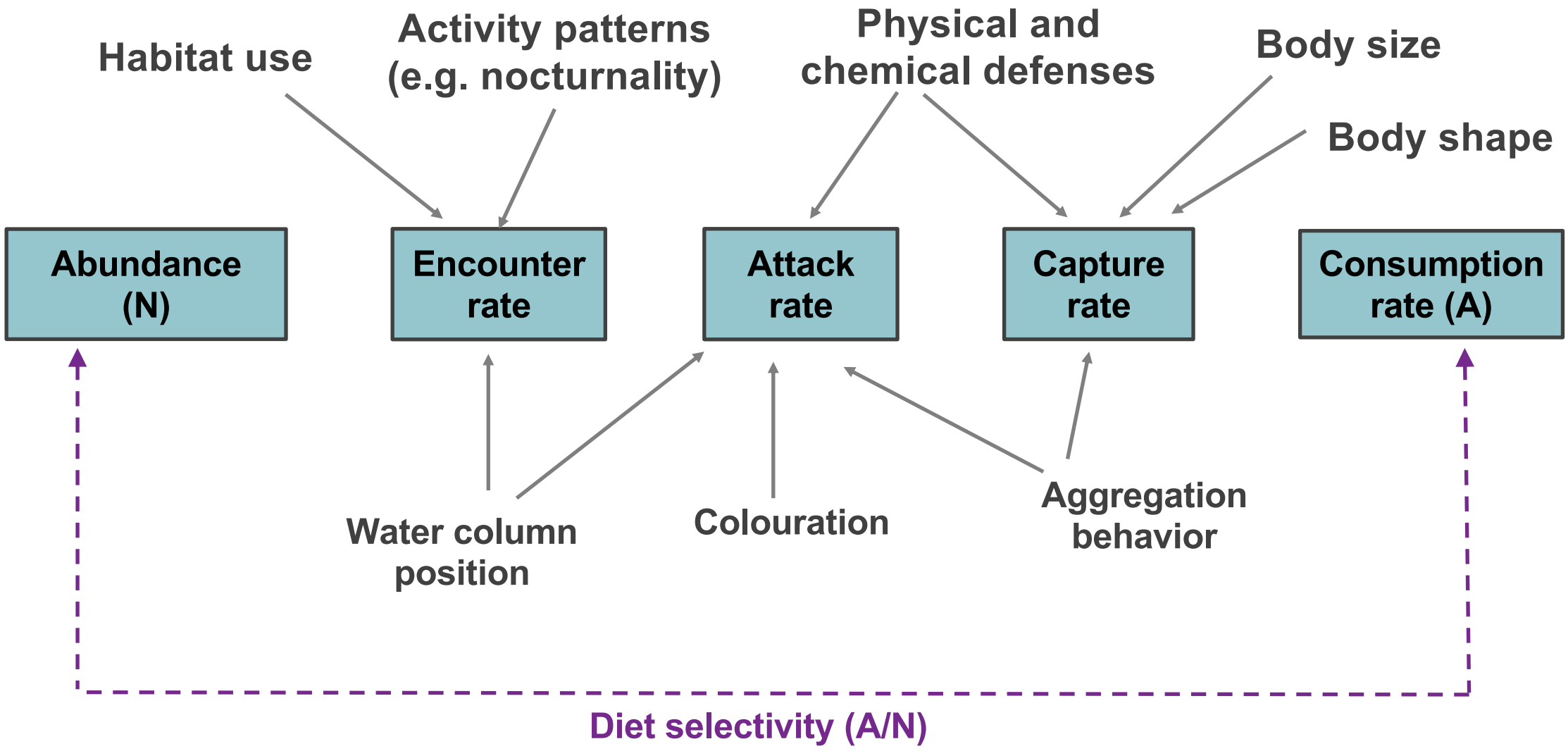
AQUATIC GLOBAL CHANGE ECOLOGY & CONSERVATION

LENFEST OCEAN PROGRAM

UNIVERSITY OF ALBERTA

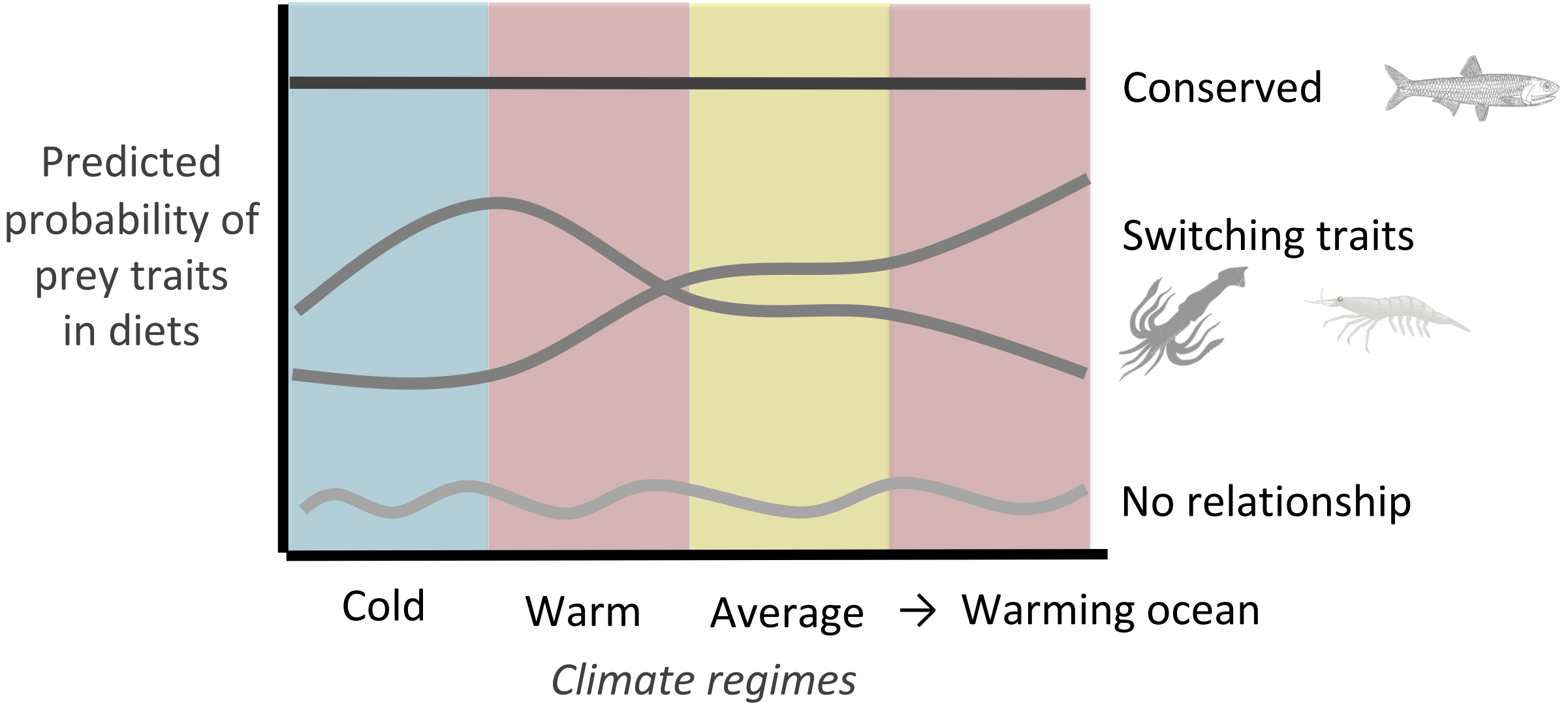
Stanford University

Traits influence predator-prey interactions



Lindardich, Brookson, Green (2021) GCB; Green et al. (2019) Ecosphere; Green and Côté (2014) JAE

Trait-based predictions for future change



Pelagic Species Trait Database

doi:10.5683/SP3/0YFJED

521 species

- Families: 118 fish, 27 cephalopods, 65 other inverts
- CCLME + global pelagic/forage
- Multiple stages (adult, juvenile, larva)

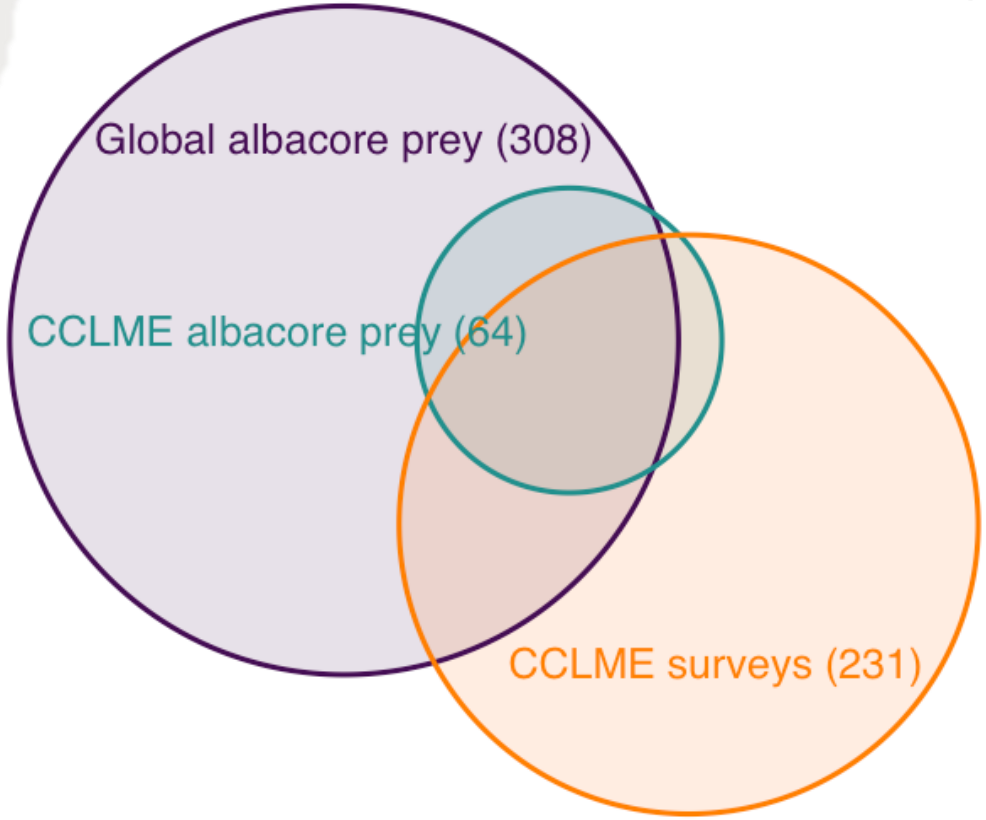
58 traits

Habitat & behavior

Morphology

Nutritional quality

Population status



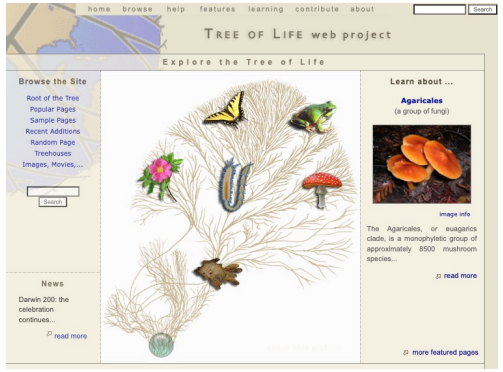
CCLME surveys = 2005 – 2019 NOAA
2017 – 2019 DFO Canada
2020 Int'l Year of the Salmon

CCLME albacore prey = 2005 – 2019

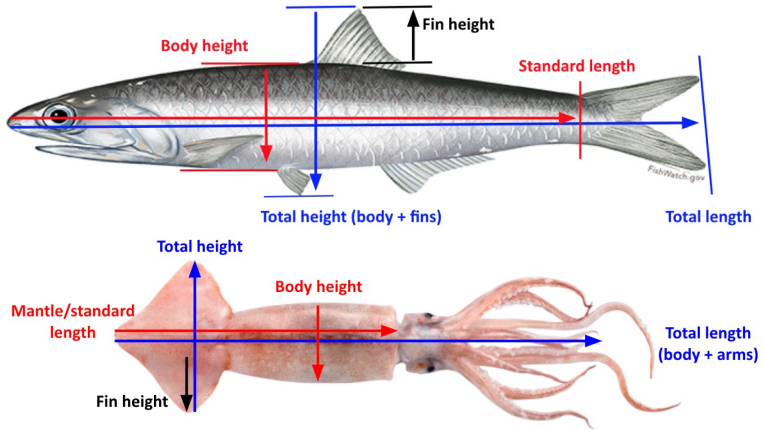
Global albacore prey = 1880-2020

Trait Collection Methods

Literature search
(*trait* + *species* + *stage*)



Online resources & databases



Morphometric measurements
(2700 images processed)

Trait data collection all-stars

Zachary Roote

Alana Krug-MacLeod

Caitlin Morganson

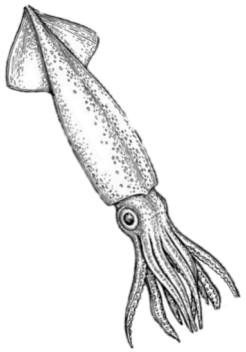
Iris George

Cindy Matuch

Database Contents

Overview

- ❑ README
- ▦ All traits summary
- ▦ Species list



Trait modules

1. **Habitat/behavioral**
   - ▦ Traits + sources
2. **Morphological**
   - ▦ Traits + sources + mean values
   - ▦ Disaggregated data + sources
3. **Nutritional Quality**
   - ▦ Mean values
   - ▦ Disaggregated data + sources
4. **Population status**
   - ▦ Traits + sources

Data collection/augmentation

Morphometric ratios

- ❑ Protocol
- ❑ Measurement guide
- ▦ Data collection table

Nutritional quality

- ❑ Lit. search protocol
- ▦ Data collection table

All other traits

- ▦ Trait collection instructions
- ▦ Data collection table

Trait data processing code (.Rmd)

- ▦ Table + metadata w/column descriptions
- ❑ Document

1. Habitat & Behavioral Traits

Temperature (°C; T)

30
20
10
0

Maximum Depth (m; Dmax)

0
500
1000
1500
2000+

Vertical Habitat (VH)

- benthic
- demersal
- epipelagic
- mesopelagic
- bathypelagic

Horizontal Habitat (HH)

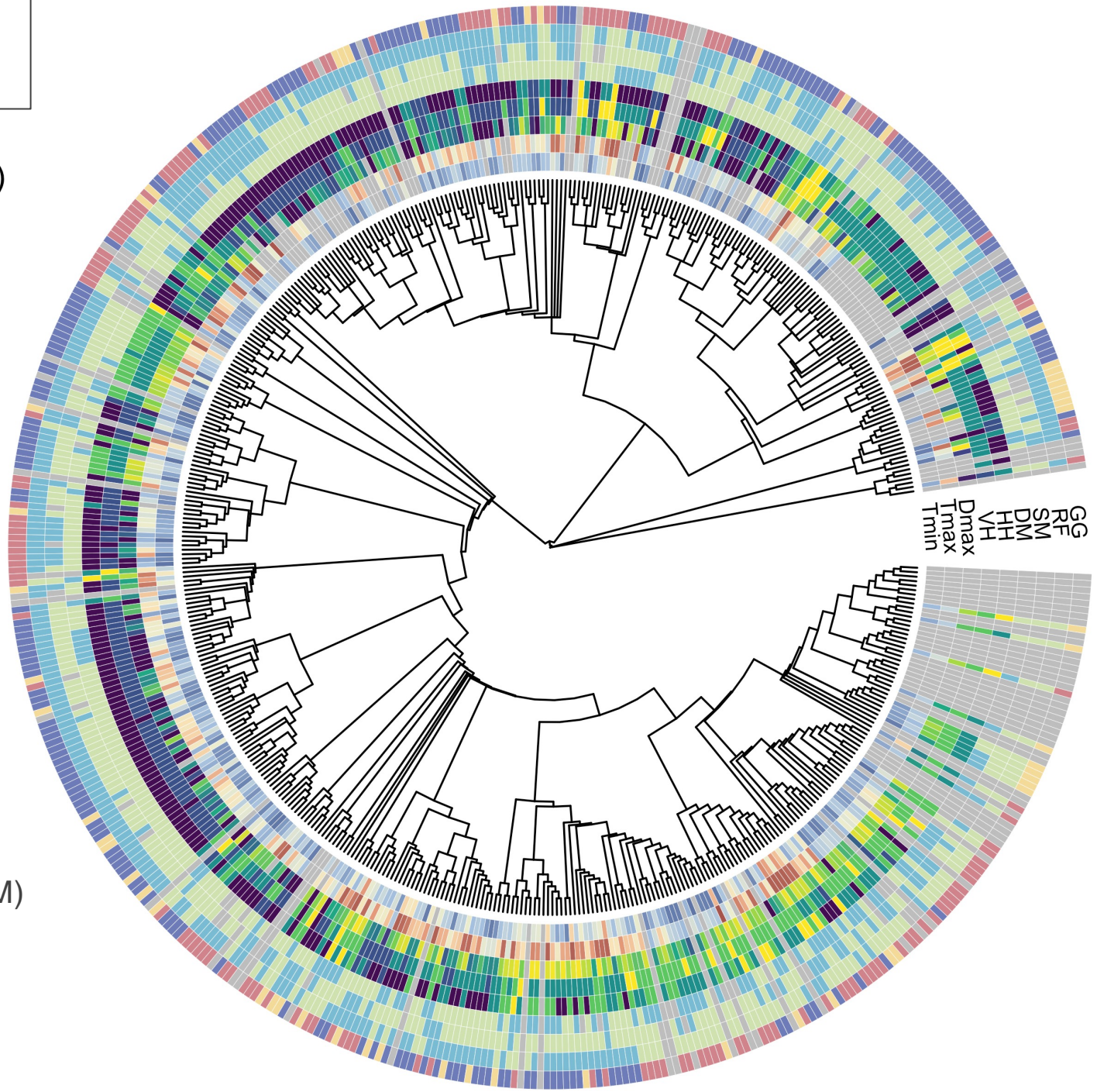
- reef-associated
- coastal
- continental shelf
- continental slope
- oceanic

Gregariousness (GG)

- solitary
- shoaling
- schooling

- yes
- no

Diel migrant (DM)
Seasonal migrant (SM)
Refuge use (RF)



Stages: adult, juvenile, larva

2. Morphological Traits

Body Shape (BS)

- globiform
- depressiform
- compressiform
- fusiform
- elongated
- eel-like

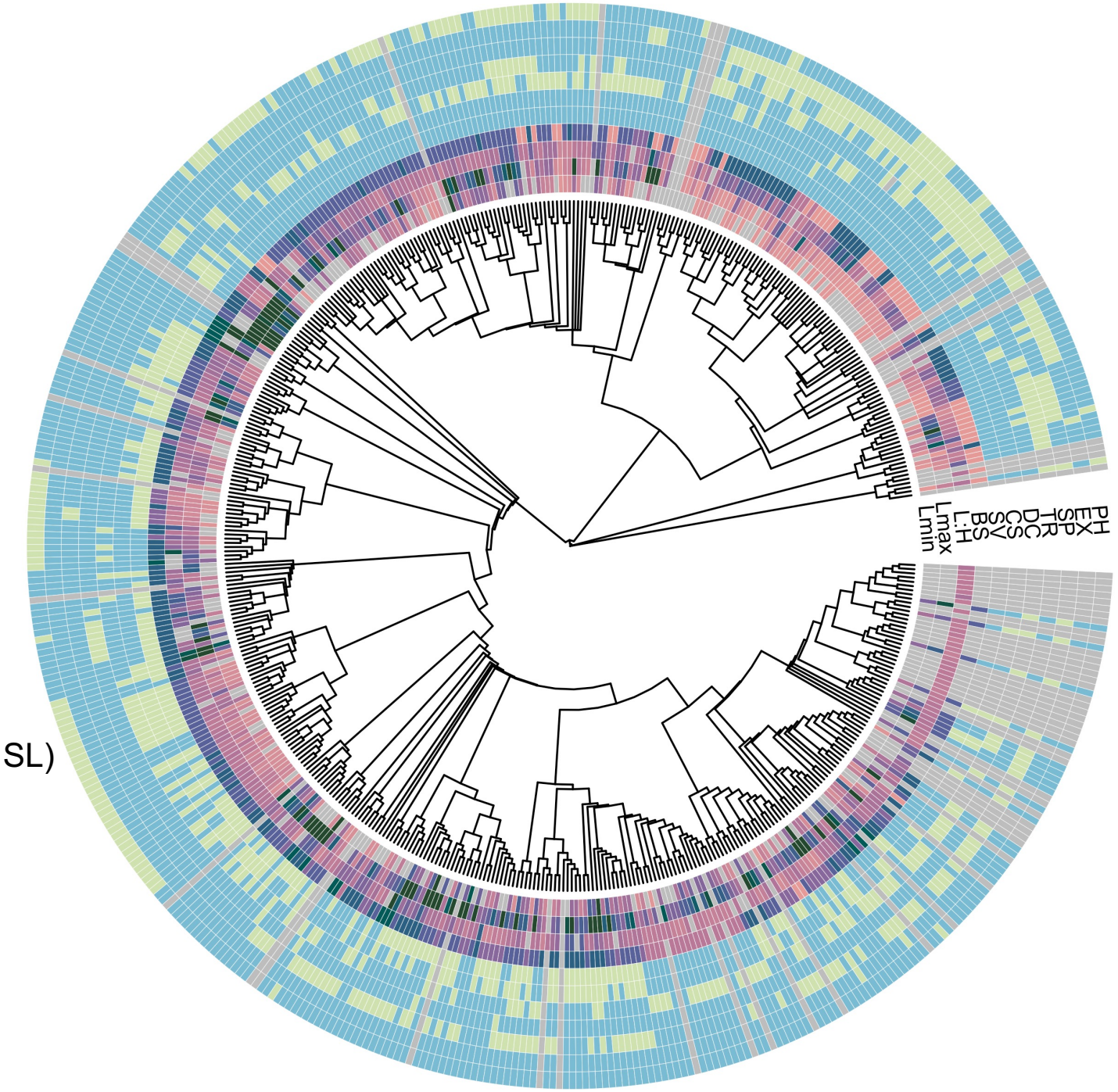
Total Length (cm; L)

0
25
50
75
100+

yes
no

Silvering (S)
Countershading (CS)
Disruptive coloration (DC)
Transparency (TR)

Spines (SP)
Exoskeleton (EX)
Photophores (PH)

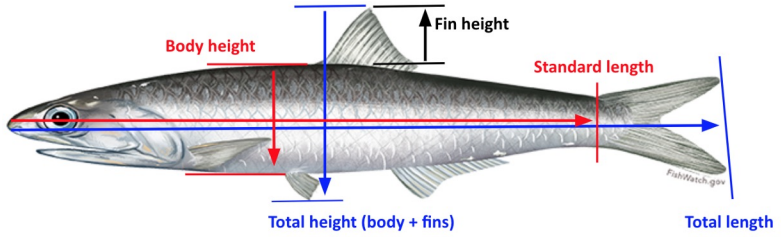


Morphometric ratios

Length:Height ratio (L:H)

0
5
10
15+

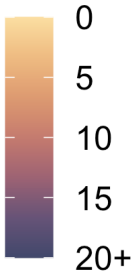
- Eye-body ratios (eye : TL, SL)
- TL : SL, ML conversions



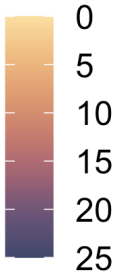
Stages: adult, juvenile, larva (except ratios)

3. Nutritional Traits

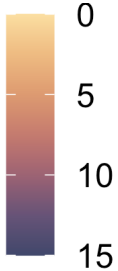
Lipid content (%ww; L)



Protein content (%ww; P)



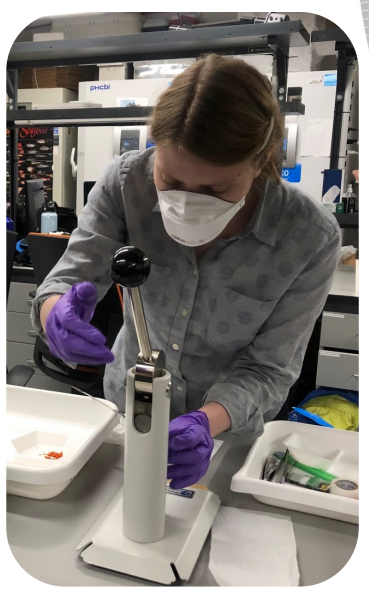
Energy density (kg/J ww; ED)

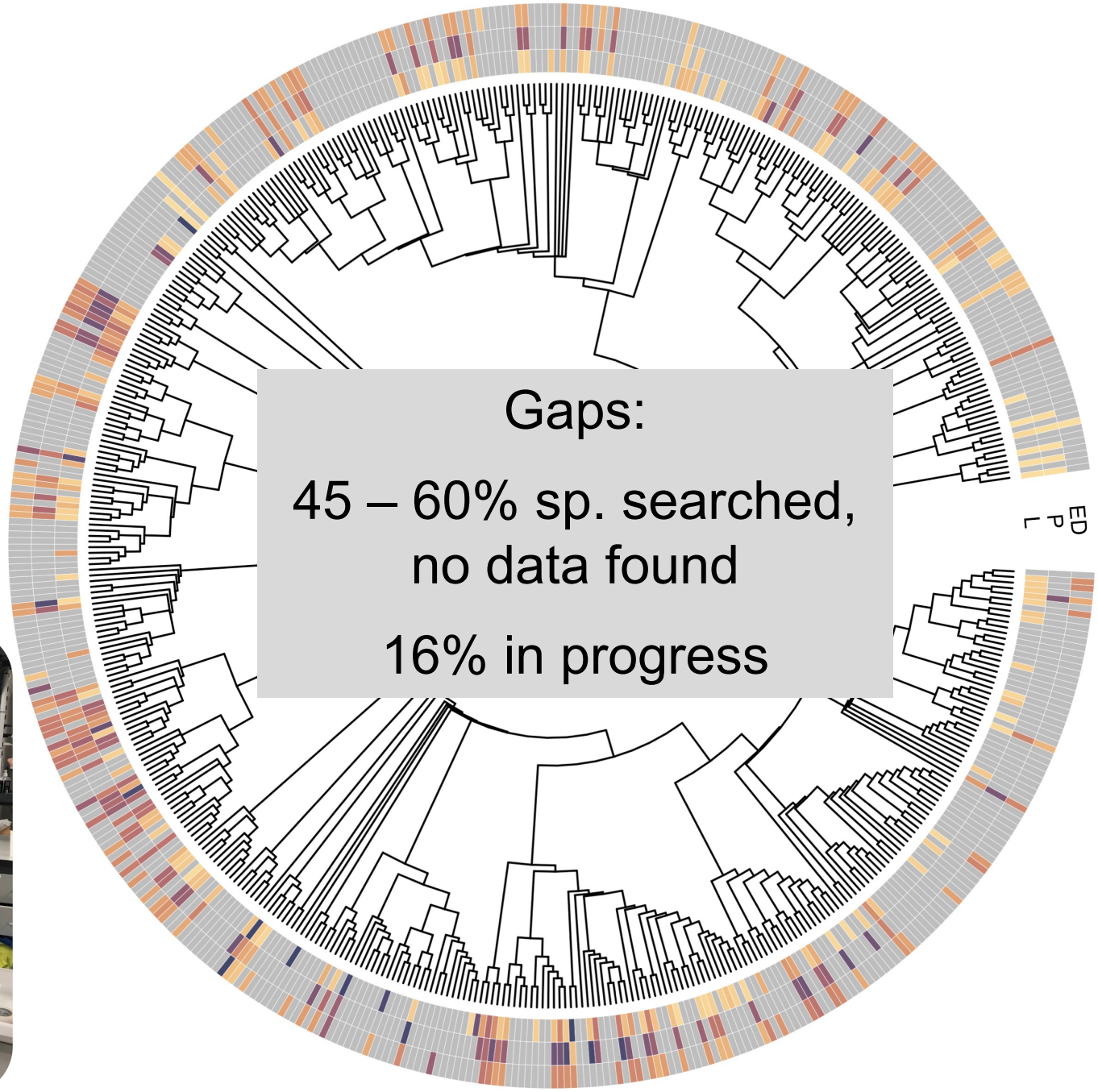


Means for Pacific Ocean & global
Stages combined (adult & juvenile)

Zachary Roote
(UA undergrad)

Alana Krug-MacLeod
(UA M.S. student)





Gaps:

45 – 60% sp. searched, no data found

16% in progress

4. Population Status Traits

Trophic level (TL)

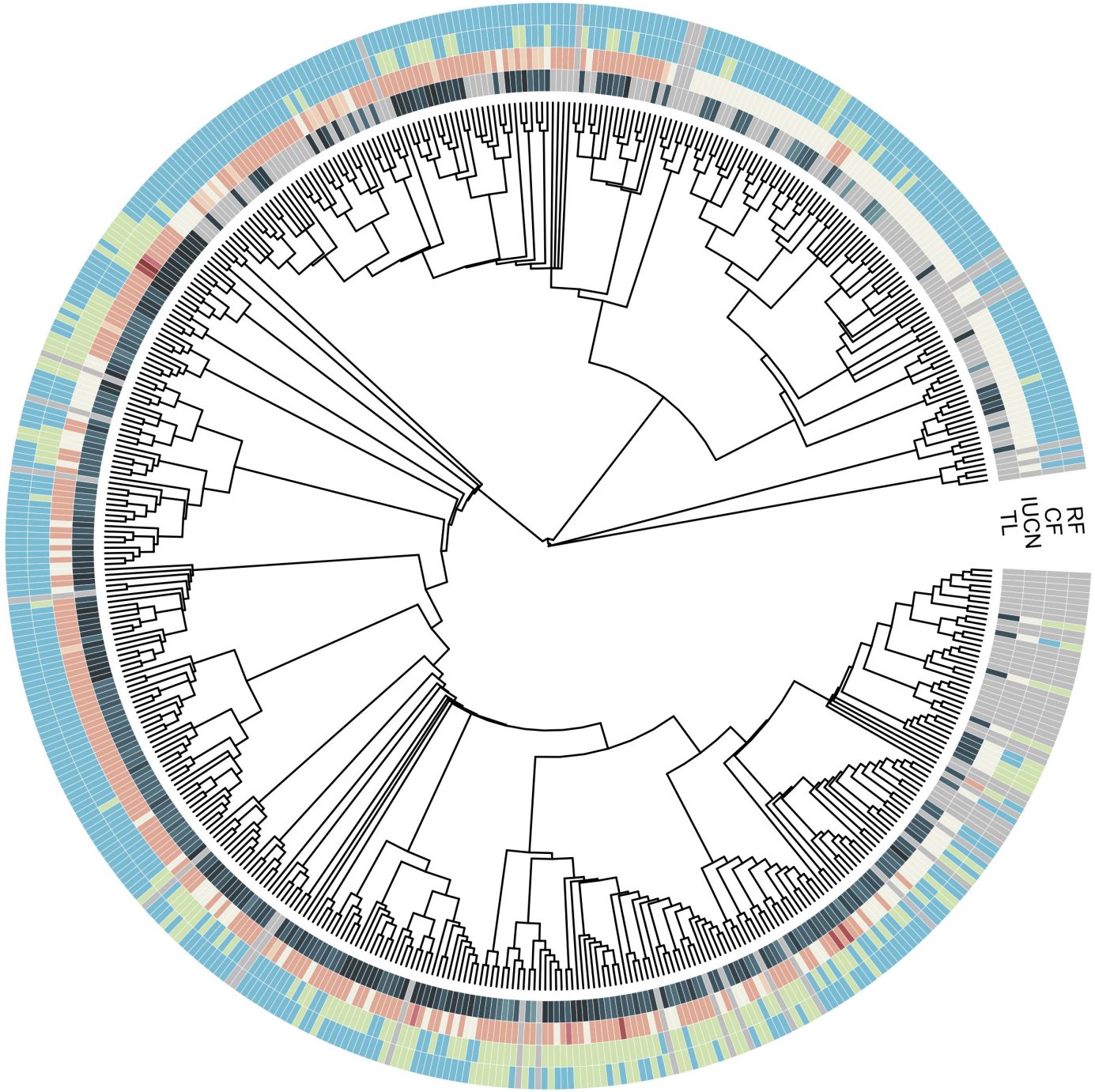
1
2
3
4
5

FishBase

IUCN Redlist Status (RL)

- Critically Endangered
- Vulnerable
- Near Threatened
- Least Concern
- Data Deficient
- Not Evaluated

- yes Commercial Fishery (CF)
- no Recreational Fishery (RF)



Stages: adult, juvenile, larva

The Dataverse® Project

borealis

Search ▾ User Guide Support English ▾ Log In

Version 1.0

Citation & DOI

Gleiber, Miram R.; Hardy, Natasha A.; Roote, Zachary; Morganson, Caitlin J.; Krug-Macleod, Alana; George, Iris; Matuch, Cindy; Brookson, Cole B.; Crowder, Larry B.; Green, Stephanie J., 2022, "Pelagic Species Trait Database", https://doi.org/10.5683/SP3/0YFJED, Borealis, V1, UNF:6:m0KxK6MaPJSFPTf55tYV9g== [fileUNF]

Cite Dataset ▾ Learn about Data Citation Standards.

Access Dataset ▾

Contact Owner | Share

Dataset Metrics

83 Downloads

Click to download, (with guestbook sign in)

Metadata

Description

Anthropogenic stressors such as climate change are forcing species distributions and abundances into novel configurations, altering species interactions, rewiring ecological communities and impacting the socioeconomic benefits they provide (Poloczanska et al. 2016). Understanding how species will interact with one another as environments change is important for predicting how ecological systems will be altered by forces such as climate change and biological invasions. Trait-based approaches are emerging as a useful method for predicting future community structure and population dynamics under global change (Green et al. 2022). Assembling comprehensive databases of traits for biological communities facilitates ecological modeling of future species abundances and distributions under ongoing global change (Gallagher et al. 2020, Green et al. 2022).

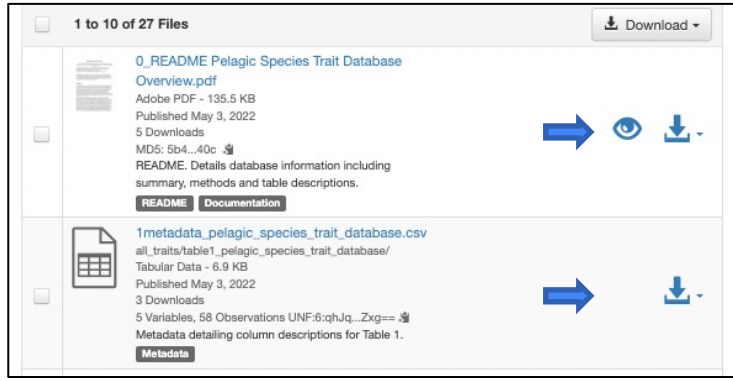
Read full Description [+]

Subject Earth and Environmental Sciences

Keyword functional traits, fish traits, cephalopod traits, pelagic invertebrates traits, habitat traits, behavioral traits, morphological traits, morphometrics, nutritional quality, population status, california current, lipid content, protein content, energy density, trait collection instruction, literature search instruction, instructional, learning tool

Related Publication Green S. J., C. B. Brookson, N. A. Hardy, and L. B. Crowder. 2022. Trait-based approaches to global change ecology: moving from description to prediction. Processing of the Royal Society B 289: 20220071

Notes Species in the database: Abralia redfieldi, Abralia trigonura, Abraliopsis affinis, Abraliopsis felis, Abraliopsis gilchristi, Abraliopsis morisii, Acanthephyra pelagica, Acanthocybium solandri, Acanthurus triostegus, Achirus mazatlanus, Aegina citrea, Aequorea victoria, Agonopsis sterletus, Agonopsis vulsa, Ahliesaurus brevis, Albatrossia pectoralis, Alepisaurus ferox, Alloclinus holderi, Allosmerus elongatus, Alloteuthis subulata, Alopias vulpinus, Alosa sapidissima, Alpheus glaber, Amarsipus carlsbergi, Ammodytes hexapterus, Ammodytes tobianus, Ammodytoides gilli, Ammodytoides pylei, Anarrhichthys ocellatus, Anchylomera blossevillei, Ancistrocheirus lesueurii, Ancistroteuthis lichtensteinii, Anoplopoma fimbria, Anotopterus nikparini, Anotopterus pharao, Antigonia capros, Antimora rostrata, Arctozenus risso, Argentina sialis, Argonauta argo, Argonauta nodosus, Argonauta nouryi, Argyropelecus aculeatus, Argyropelecus hemigymnus, Argyropelecus olfersii, Argyropelecus sladeni, Aristostomias scintillans, Arnoglossus imperialis, Ateleopus natalensis, Atheresthes stomias, Atherinops affinis, Atherinopsis californiensis, Atlanta peronii, Atylus tridens, Aurelia aurita, Aurelia labiata, Avocettina infans, Axius stirhynchus, Balistes punctatus, Barathronus parfaiti, Bathophilus flemingi, Bathyagonus nigripinnis, Bathyagonus pentacanthus, Bathylagoides wesethi, Bathyraja interrupta, Belone belone, Bentheogennema burkenroadi, Benthosema glaciale, Beringraja binoculata, Beroe abyssicola, Beroe gracilis, Berryteuthis anonychus, Berryteuthis magister, Beryx splendens, Blennius ocellaris, Bolinopsis infundibulum,



The Dataverse® Project

borealis
Version 1.0

Search ▾ User Guide Support English ▾ Log In

Citation &

Meta

Dataset Terms

Please confirm and/or complete the information needed below in order to continue.

Terms of Use

This work is licensed under a Creative Commons Attribution 4.0 International License.

Name *

Email *

Institution

Position

Additional Questions

Requesting contact information from users prior to downloading the database allows us to ensure that updated versions are distributed to the user community, as well as solicit feedback from the community on the design and contents of the database.

How do you plan to use the information in this database?

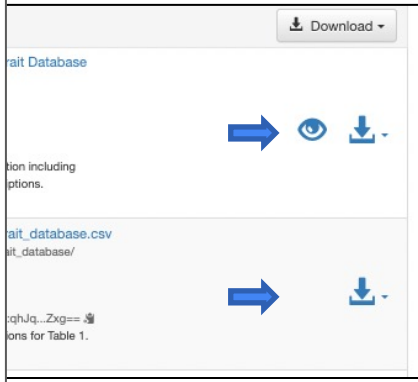
Do you have any feedback about the database contents/design? (Feedback can also be emailed to the lead author, miramgleiber@gmail.com)

Would you like to be notified about updated versions of the database?

Select...

Accept Cancel

to download,
h guestbook
sign in)



natalensis, Atheresthes stomias, Atherinops affinis, Atherinopsis californiensis, Atlanta peronii, Atylus tridens, Aurelia aurita, Aurelia labiata, Avocettina infans, Axius stirhynchus, Balistes punctatus, Barathronus parfaiti, Bathophilus flemingi, Bathyagonus nigripinnis, Bathyagonus pentacanthus, Bathylagoides wesethi, Bathyraja interrupta, Belone belone, Bentheogennema burkenroadi, Benthosema glaciale, Beringraja binoculata, Beroe abyssicola, Beroe gracilis, Berryteuthis anonychus, Berryteuthis magister, Beryx splendens, Blennius ocellaris, Bolinopsis infundibulum,

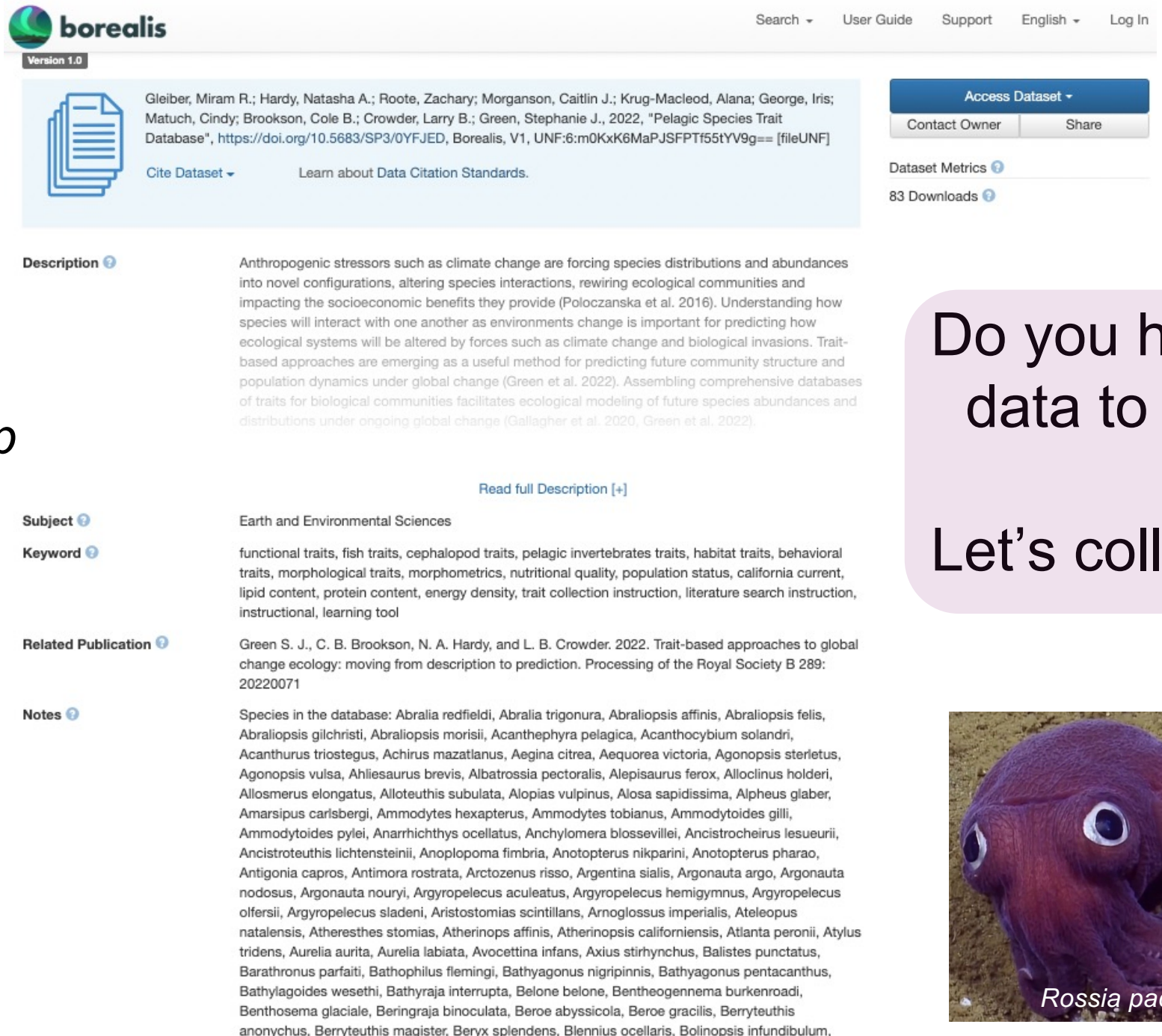
Next steps?

SCIENTIFIC DATA

Data descriptor *in prep*

borealis
The Canadian Dataverse Repository
Le dépôt Dataverse canadien

Version 2.0



Do you have trait data to share?

Let's collaborate!

Applying trait information to pelagic predator feeding ecology

LENFEST OCEAN PROGRAM

Global meta-analysis of albacore foraging
(*Hardy et al.*)

Trait-based Albacore diet shifts in the CCLME
(*Hardy et al.*)

Pelagic trait database

Albacore resource use in the CCLME
(*Gleiber/Hardy et al.*)

Albacore prey nutritional variability in the CCLME
(Krug-Macleod et al.)

UNIVERSITY OF ALBERTA

Stephanie Green

NOAA FISHERIES

Stanford

Larry Crowder

Traits-based tools to inform species re-distribution under climate change

Objective:
Test trait-based (vs taxonomically-based) prey fields in explaining predator range and abundance change.

Focal system:
Albacore tuna in the California Current Large Marine Ecosystem (CCLME)

Applying trait information to pelagic predator feeding ecology

Global meta-analysis of albacore foraging
(*Hardy et al.*)

Trait-based Albacore diet shifts in the CCLME
(*Hardy et al.*)

Pelagic trait database

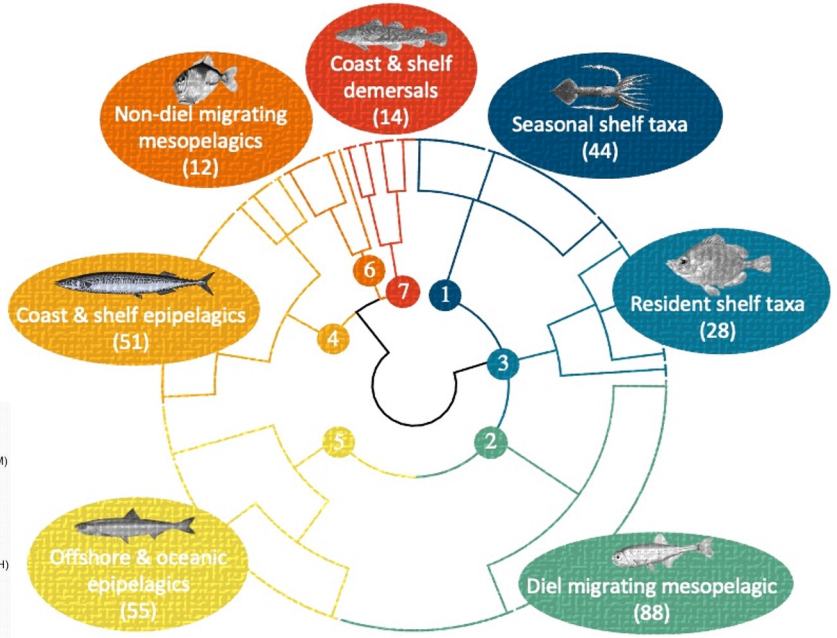
Albacore resource use in the CCLME
(*Gleiber/Hardy et al.*)

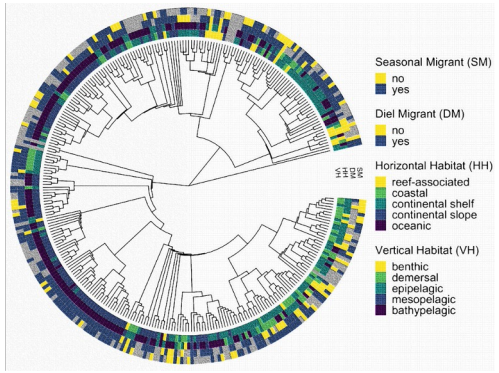
Albacore prey nutritional variability in the CCLME
(Krug-Macleod et al.)

Global meta-analysis of albacore foraging

(Hardy et al. in prep; Fish & Fisheries)

Natasha Hardy





- **Used 4 habitat traits to synthesize diverse diet composition** of >300 prey species for albacore
- **7 prey guilds** consumed by albacore globally
- **Trait-based models > taxa-based** models in capturing differences in albacore diets across ocean basins

Applying trait information to pelagic predator feeding ecology

Global meta-analysis of albacore foraging
(*Hardy et al.*)

Trait-based Albacore diet shifts in the CCLME
(*Hardy et al.*)

Pelagic trait database

Albacore resource use in the CCLME
(*Gleiber/Hardy et al.*)

Albacore prey nutritional variability in the CCLME
(Krug-Macleod et al.)

Miram Gleiber

Integrating forage surveys, diet studies, & trait information to explore prey preferences of albacore tuna

Today 5:00pm, Session 5, Auditorio 3

Natasha Hardy

Modelling diet shifts in albacore tuna in relation to forage community composition & prey trait information across a 2005–2019 time series

Friday 9:40am, Session 1, Auditorio 2

Alana Krug-MacLeod

Effect of climate state on variation in nutritional value for small pelagic species

Friday 12:00pm, Session 4, Sala 1

Project team:


Stephanie Green


Natasha Hardy


Miram Gleiber


Larry Crowder


Cole Brookson


Mike Jacox


Barb Muhling


Caitlin Morganson


Cindy Matuch


Alana Krug-MacLeod


Zachary Roote


Iris George


Steven Bograd


Elliott Hazen


Anela Choy


Elan Portner

Nutritional data:
Elizabeth Daly,
Kim Bernard

NOAA FISHERIES

Project partners:

PICES

ICES CIEM

LENFEST OCEAN PROGRAM

Thursday, December 1, 2022
2pm ET (11am PT)
Register: bit.ly/GCWebinar2

Pelagic Species Trait Database

58 traits: Habitat, Behavior, Morphology, Nutrition

512 sp: Fish, Cephalopods, Crustaceans, Other Inverts