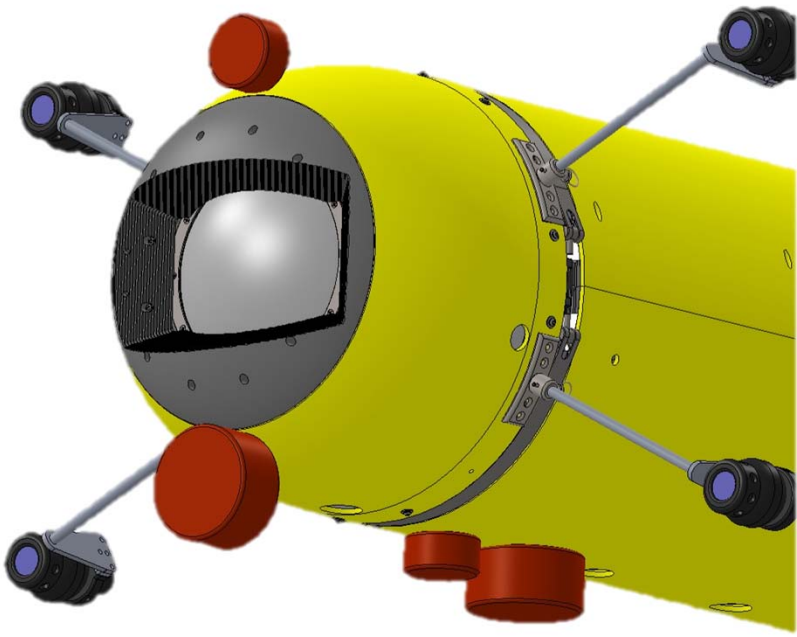
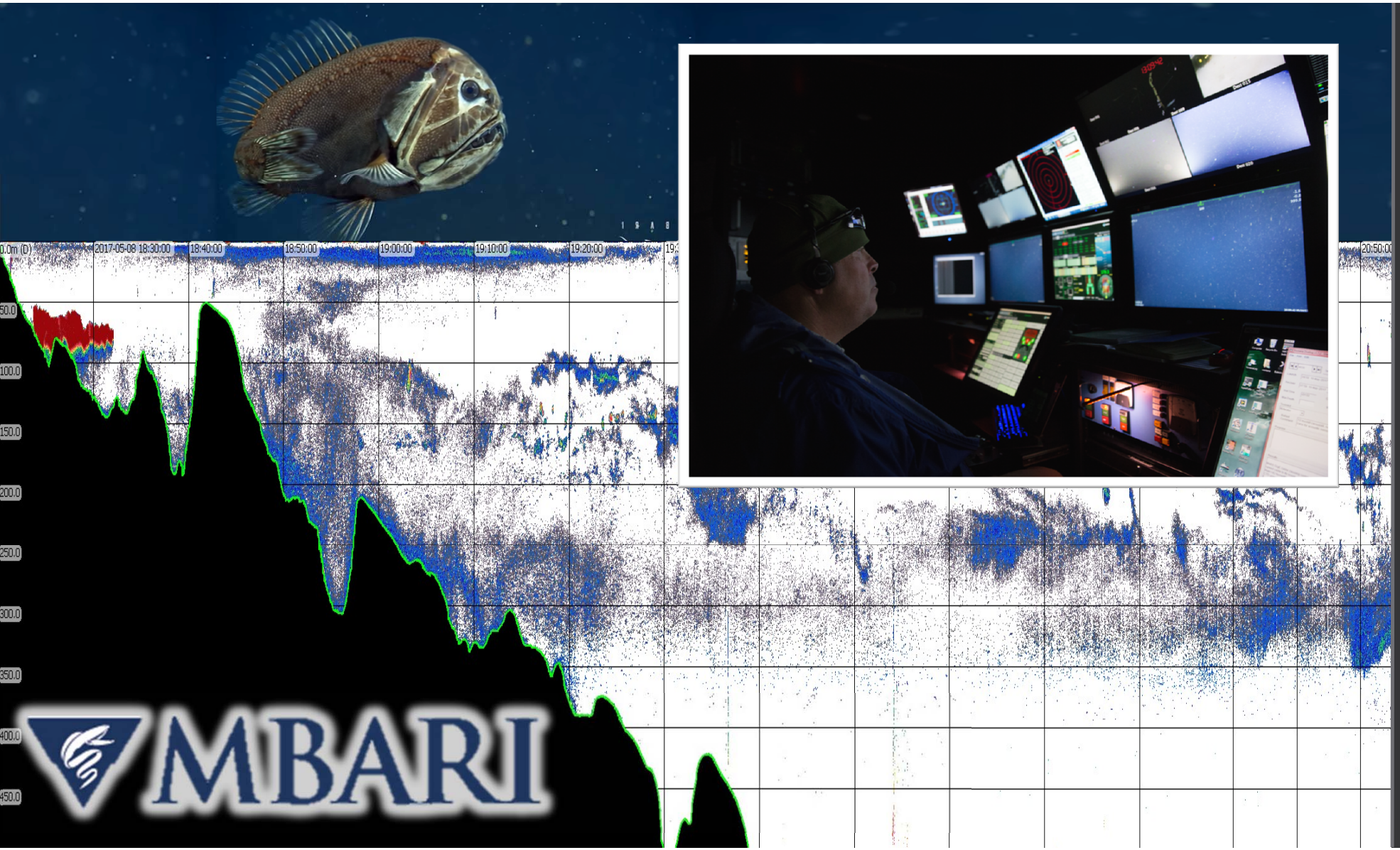
# Next generation: bioacoustic sensing from Dorado

## i2MAP + EK80




Kelly Benoit-Bird (PI)
Bruce Robison
Chad Waluk
Kim Reisenbichler
Eric Martin (LE)
Francois Cazenave
Paul McGill
Hans Thomas

# Integrating acoustics and imaging




# Integrating acoustics and imaging

# Complementary tools
# *New* information via integration

## Acoustics

- Large sampling volume
- Low taxonomic resolution
- 3-dimensional (with split beam)
- Undetectable by most animals
- Measure of **length** if **species** is known
- Describe spatial relationships of individuals and volumes (e.g. aggregations)
- Provides context and gross individual movement (tracking)
- Estimate **density**

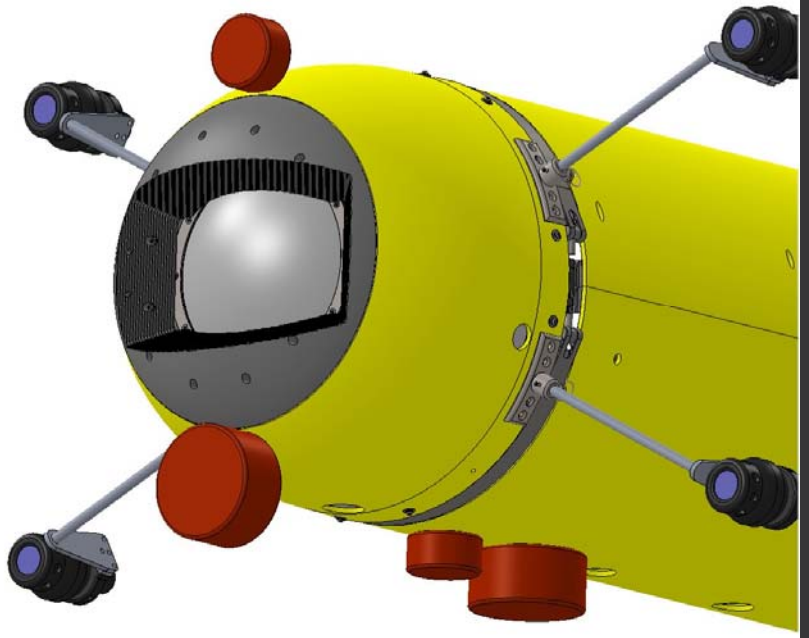
## Imaging

- Small sampling volume
- Resolve species
- Flattened 3D (with one camera)
- Requires lighting
- Measure of **length** (with one camera) if **speed** or **range** from camera is known
- Describe spatial relationships of individuals within frames and along transect
- Observe orientation and fine scale behaviors
- Estimate **density**

Integrating acoustics and imaging

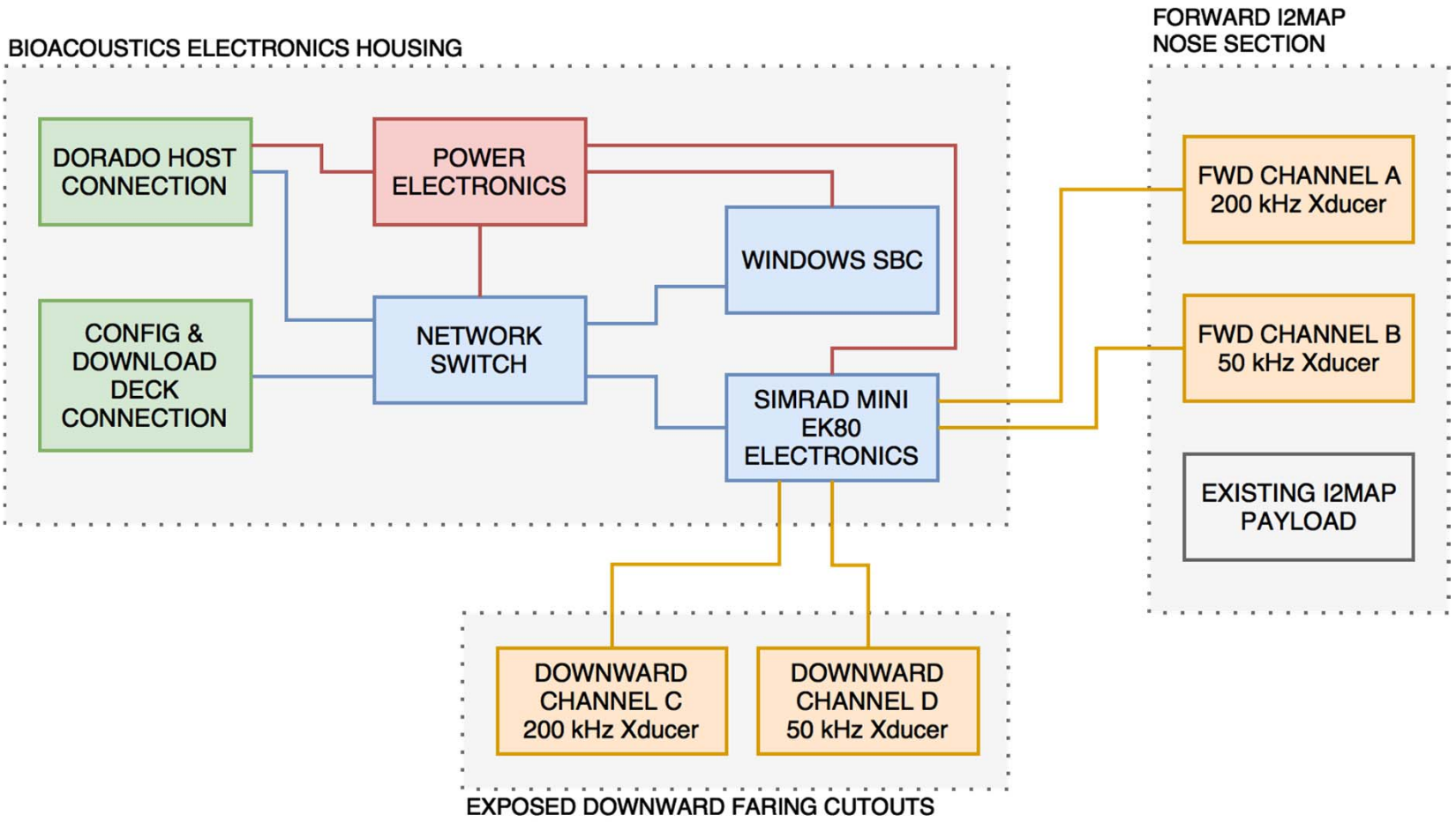
# Add Next Generation Echosounders to i2MAP

- Simrad EK80 mini
  - Low power
  - Small form factor
  - Broadband capable
  - Analogous to latest ship-borne instruments
- 2 forward looking transducers
  - Paired with video
  - ~70 kHz and ~200 kHz
  - 50-250 kHz band
  - >150 m range with all frequencies
- 2 downward looking transducers
  - Provide context to local measurements and potentially direct sampling
  - Same capabilities
  - Maximum range ~600 m with lowest frequency



Integrating acoustics and imaging

# Basic Concept

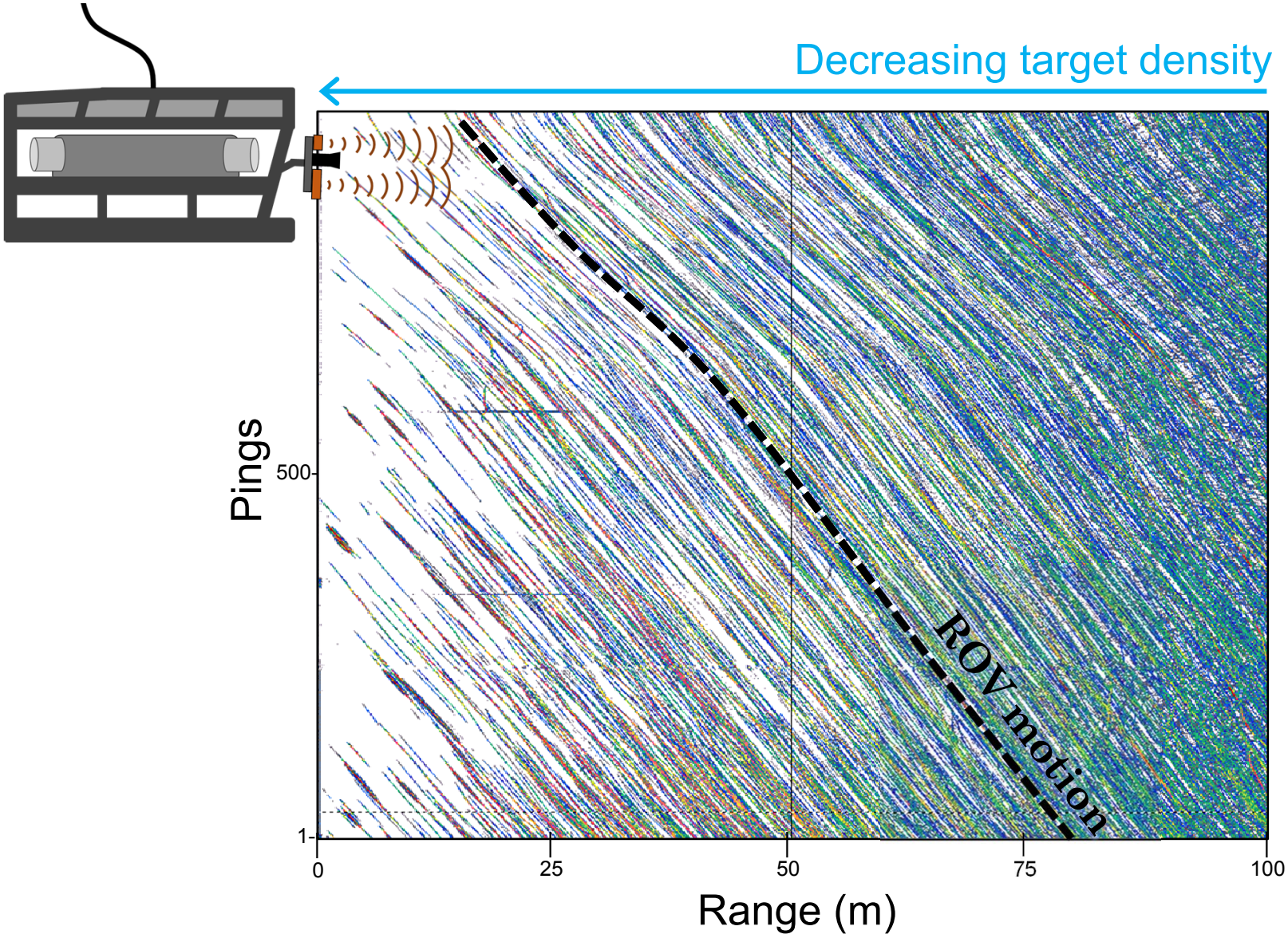


# Technical Goals - 2018

- Design & manufacturing
  - subsea housing containing the EK80 electronics
  - supporting computer and supplementary components
- Integrate the transducers and this housing into the I2MAP configured Dorado AUV
- Tank testing to reduce electrical and acoustical system noise
- Conduct sea trials of the integrated system (3 days requested)
- Evaluate vehicle stability with added drag components

# Science Goals – 2019-2020

- Behavioral responses to survey platform
  - Compare to Ventana
- Broadband acoustic signatures
  - Improve acoustic classification from all platforms
- Spatial distribution of organisms in midwater
  - Are animals aggregated?
  - At what scales?
  - How are they organized?
  - How do aggregations affect the ecosystem?

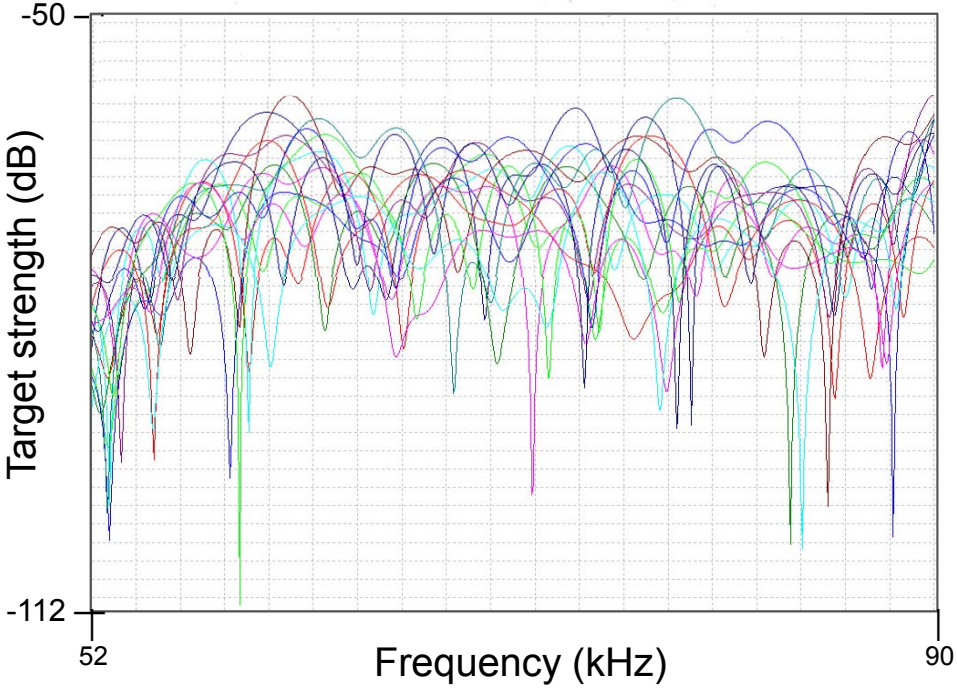


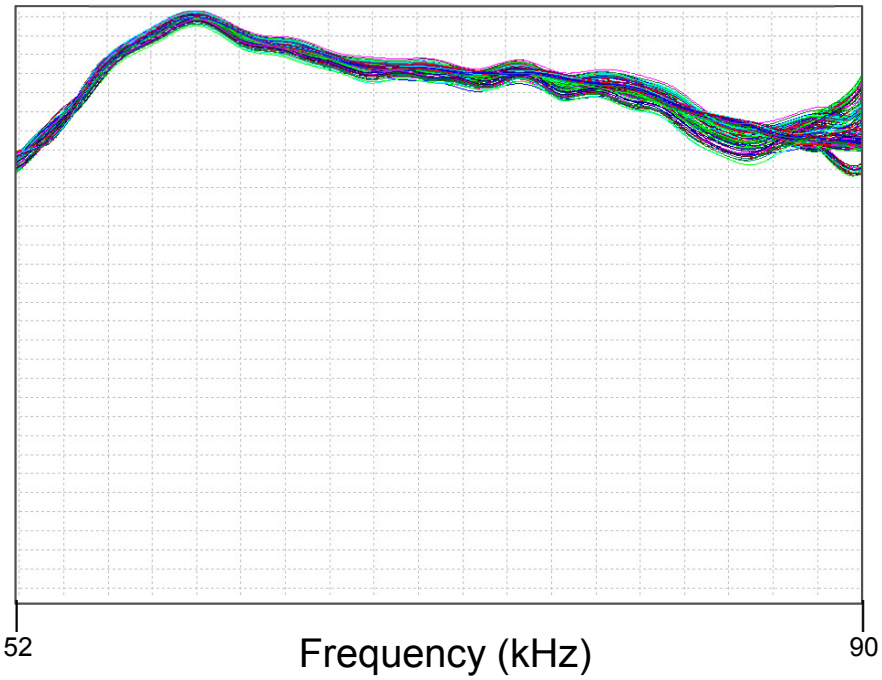

Behavioral responses

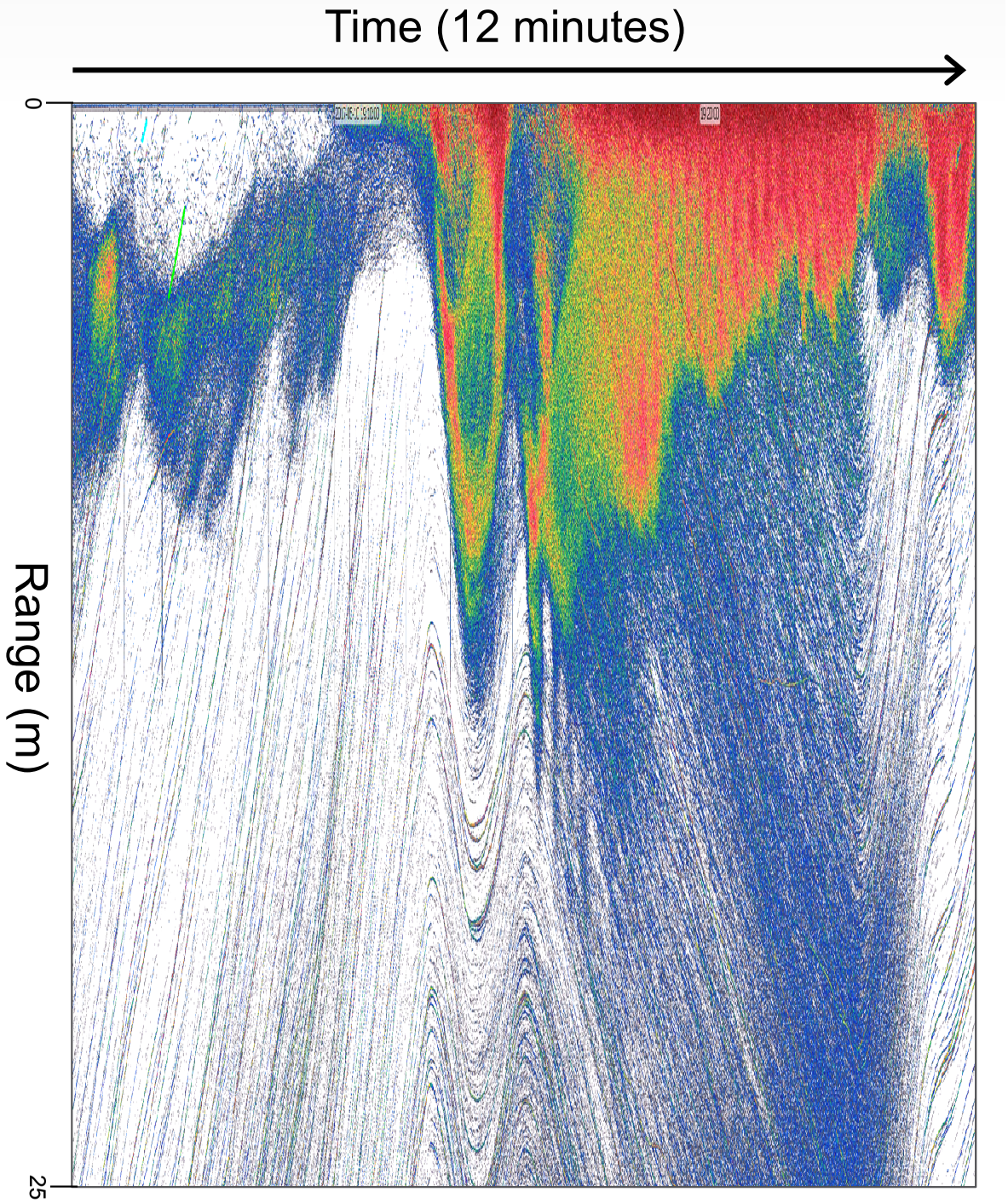
# Backscatter signatures

## Krill
*Euphausia pacifica*

## Fish
*Leuroglossus stilbius*





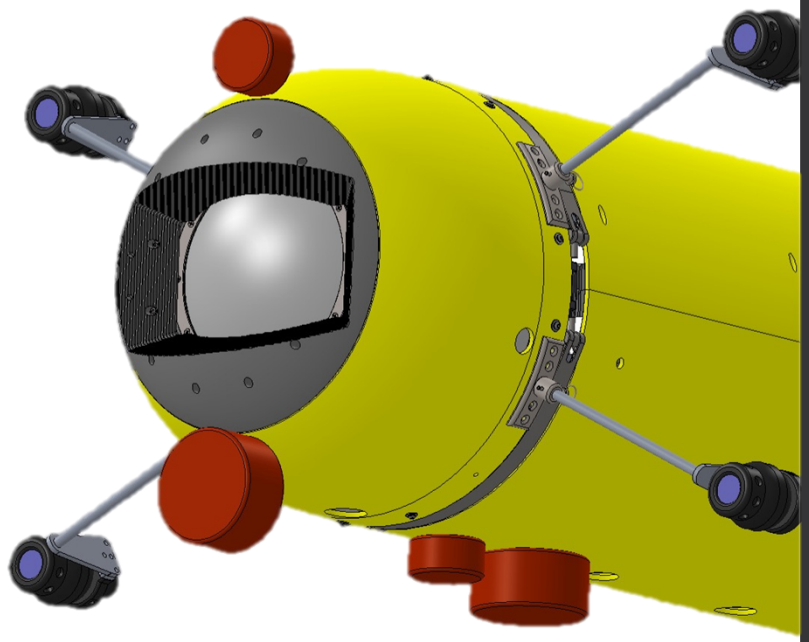

Spatial structure in midwater

# Future Applications

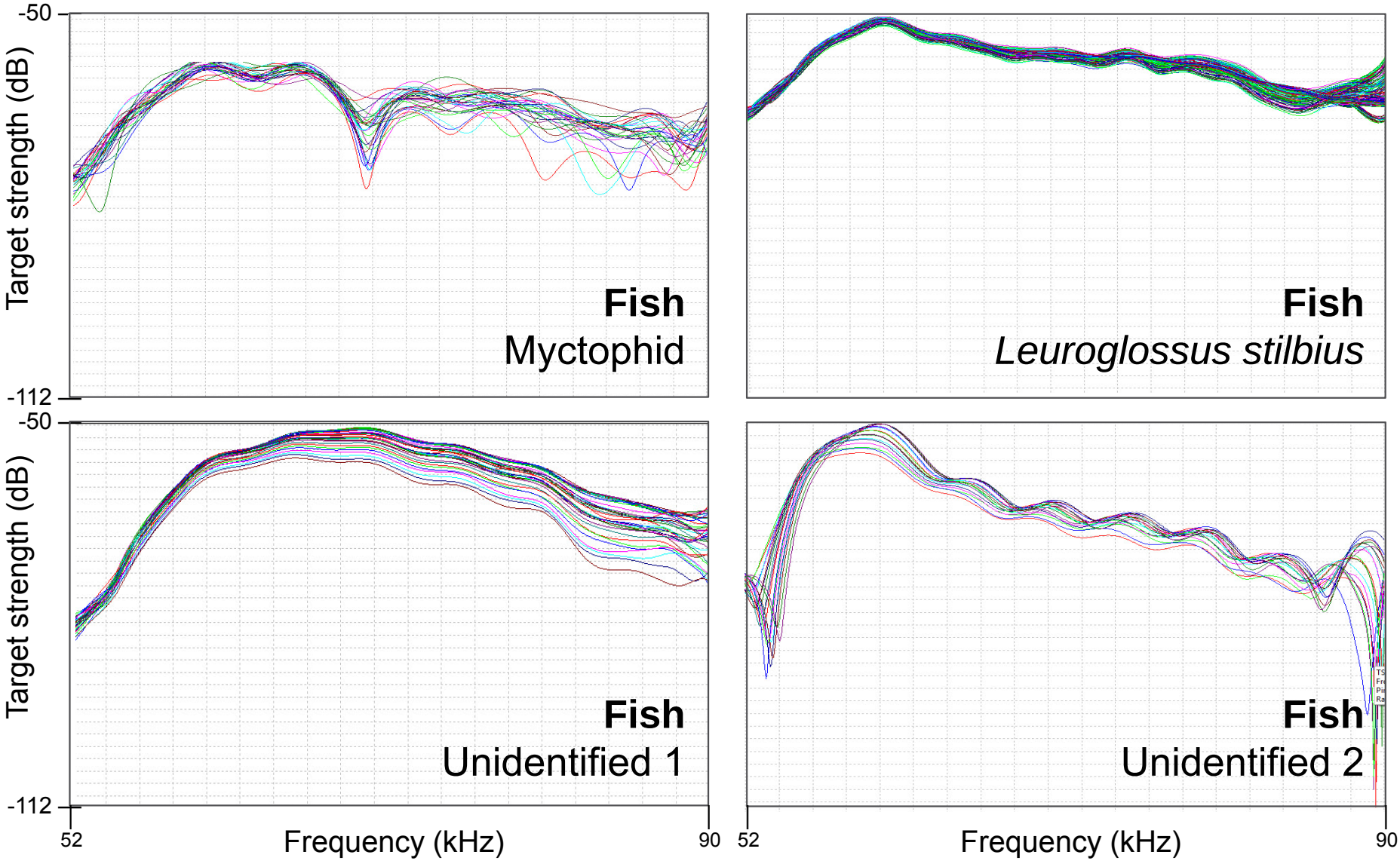
- Deployments in new locations to examine epipelagic and semi-demersal animals
- Experimental manipulations of the platform (speed, light type, etc.) to minimize behavioral disturbances
- Use of the acoustic payload in other Dorado configurations (CTD, gulper)
- Real time onboard processing of acoustic data for adaptive mission actions

# Project Team

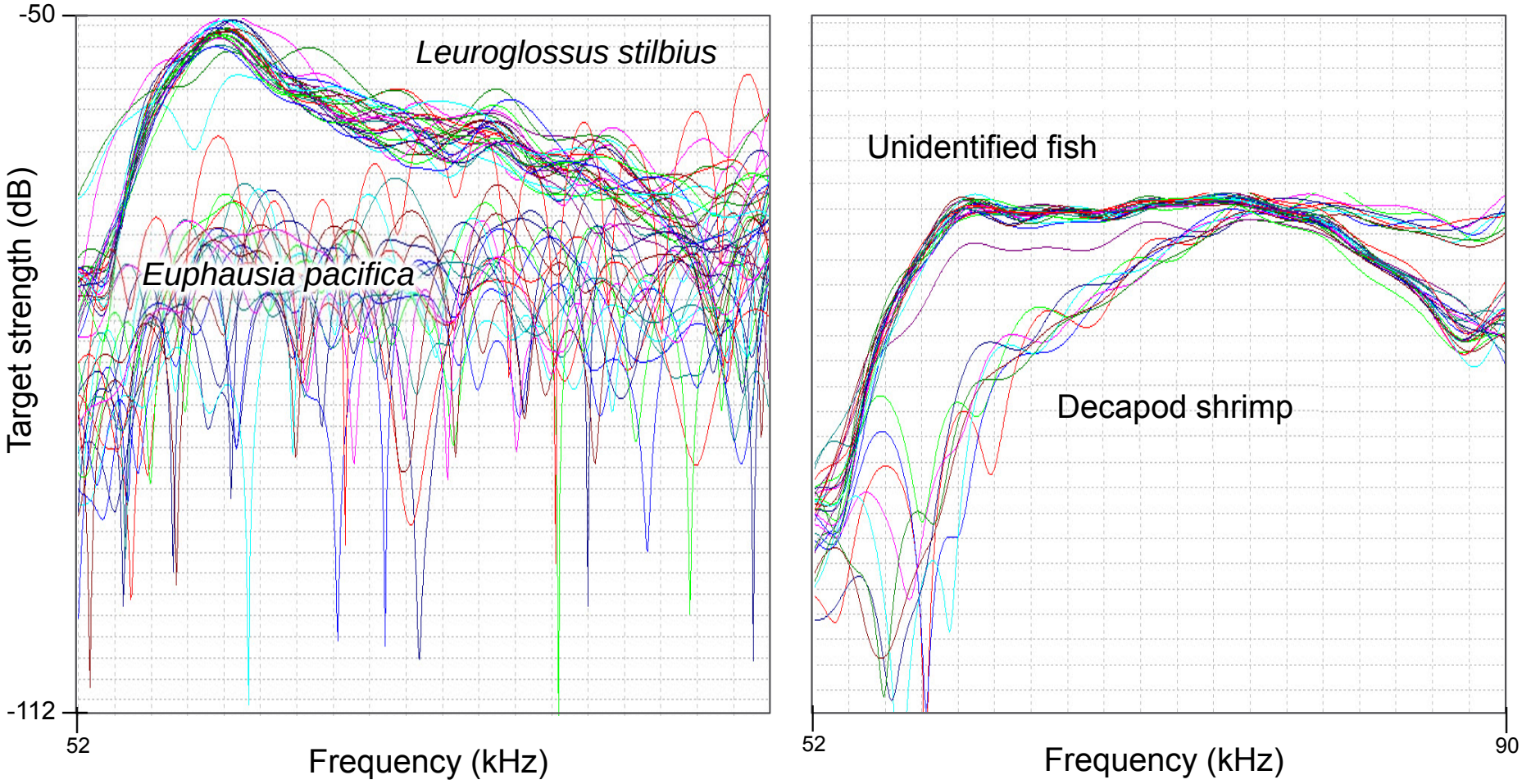
- Kelly Benoit-Bird
- Bruce Robison
- Chad Waluk
- Kim Reisenbichler
- Eric Martin
- Francois Cazenave
- Paul McGill
- Hans Thomas



M B A R I




# Backscatter signatures




Two targets observed simultaneously