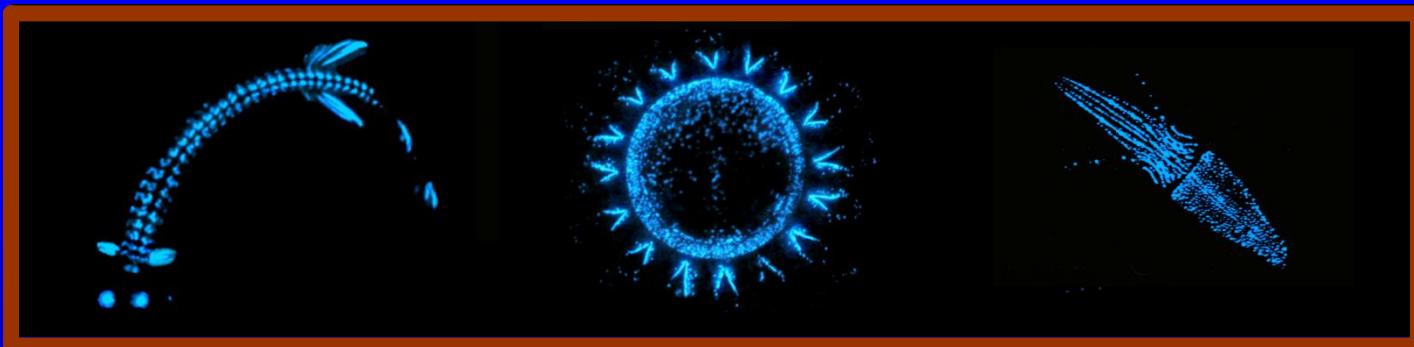
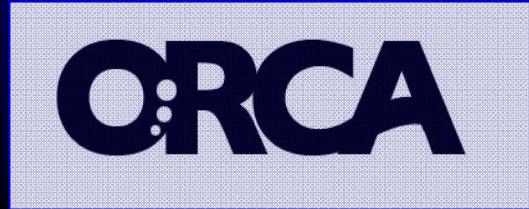


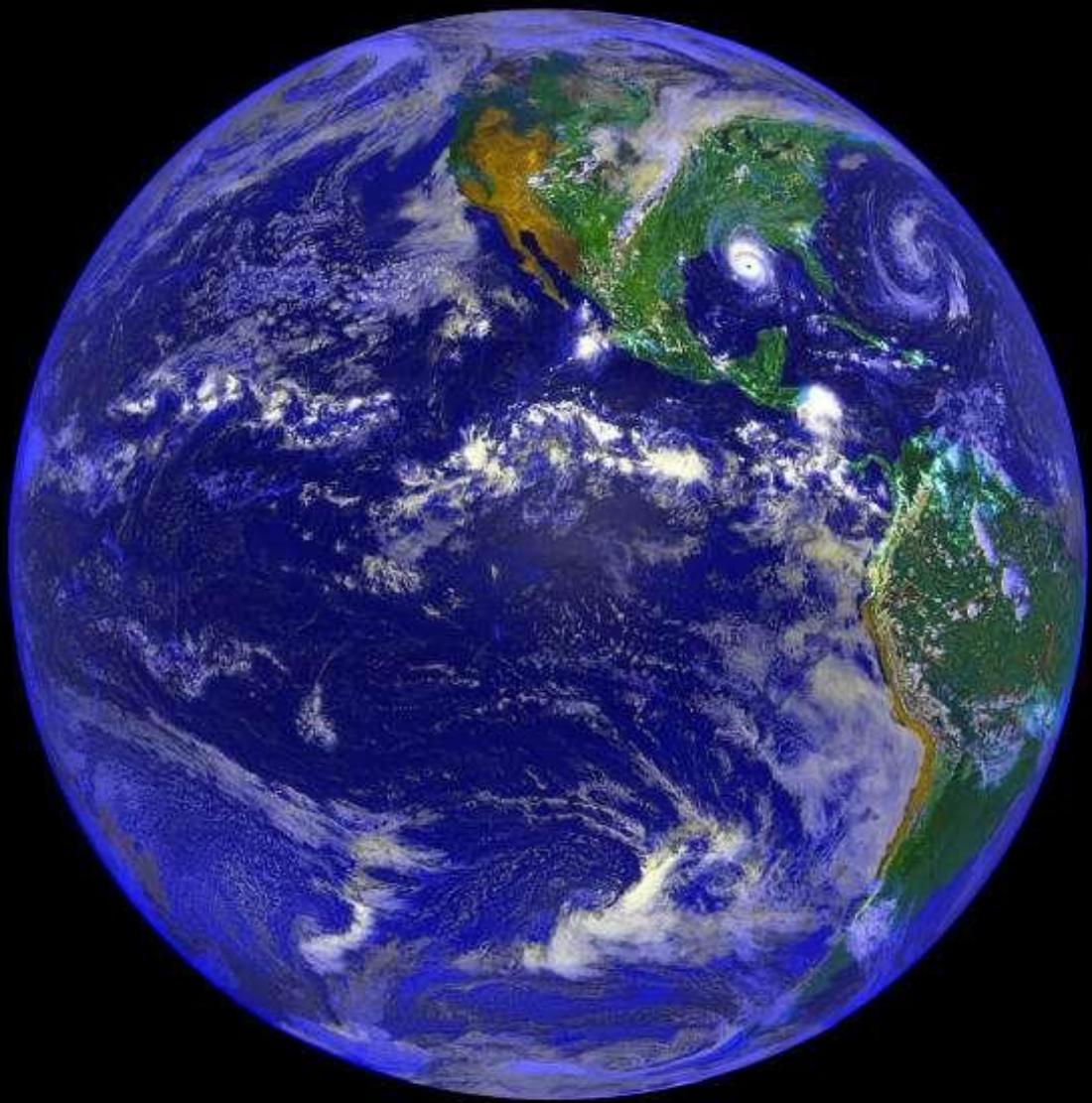
Secret Lights in the Sea



**Edie A. Widder, Ph.D.
President & Senior Scientist
Ocean Research & Conservation Association
Fort Pierce, Florida**

www.oceanrecon.org











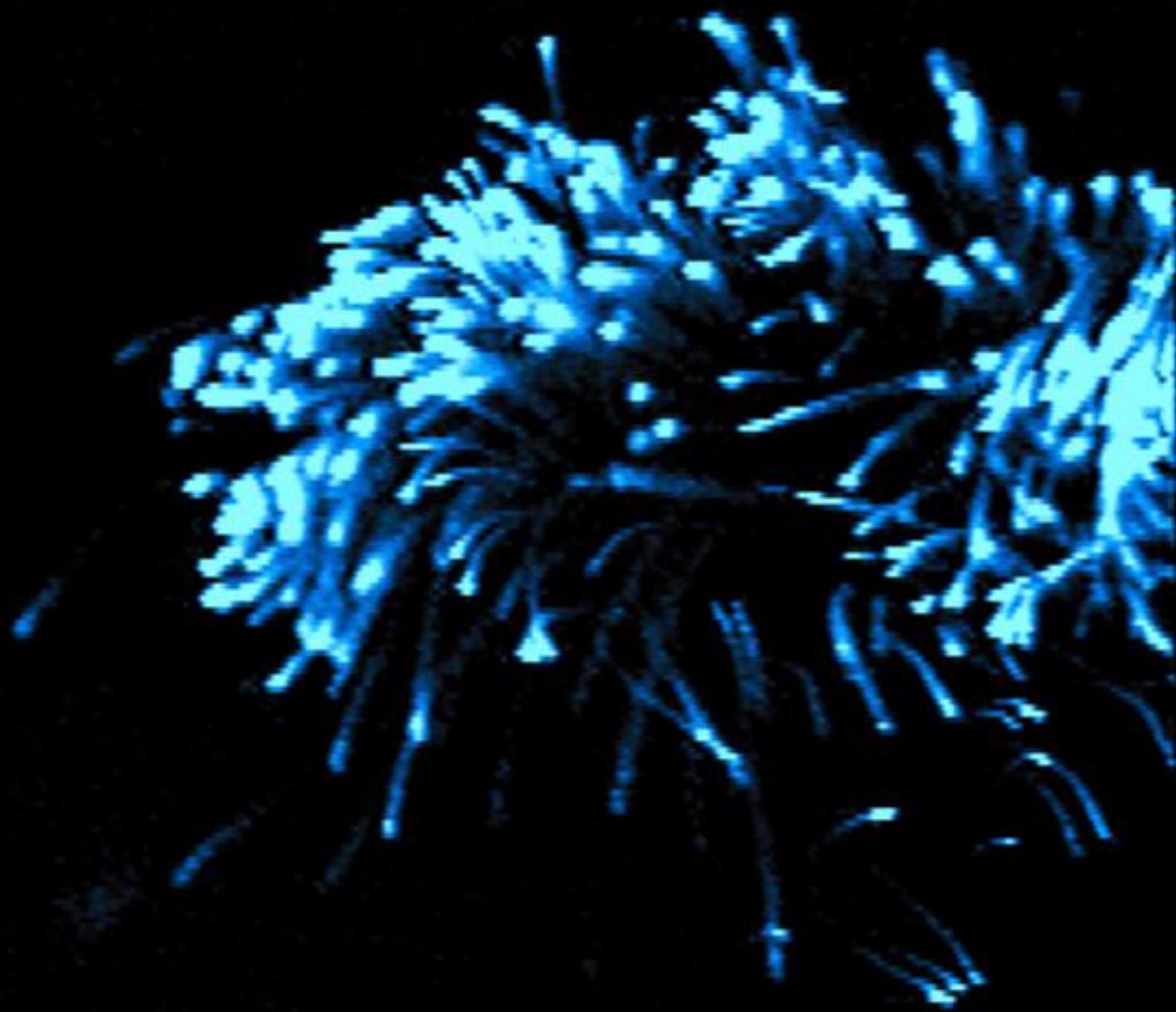




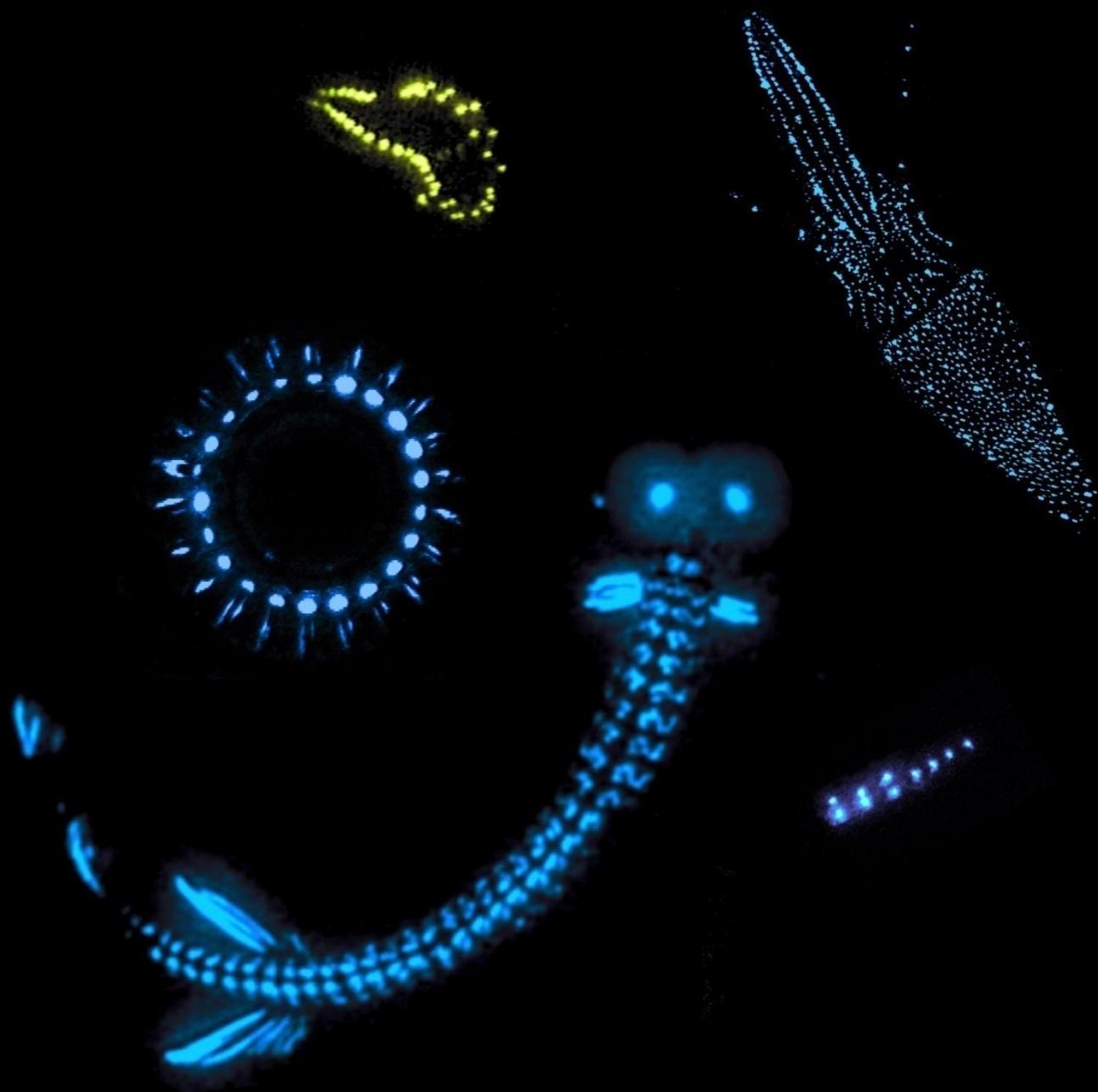




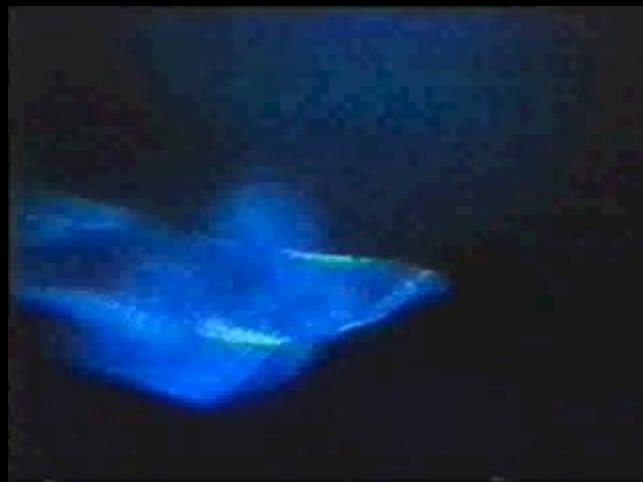






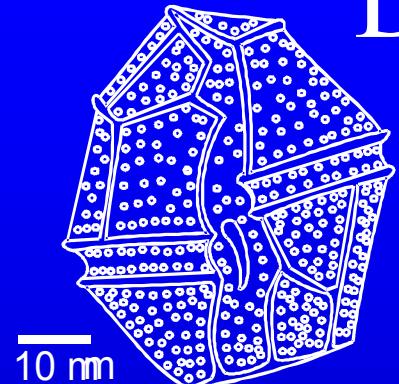


Dolphin swimming through bioluminescent plankton

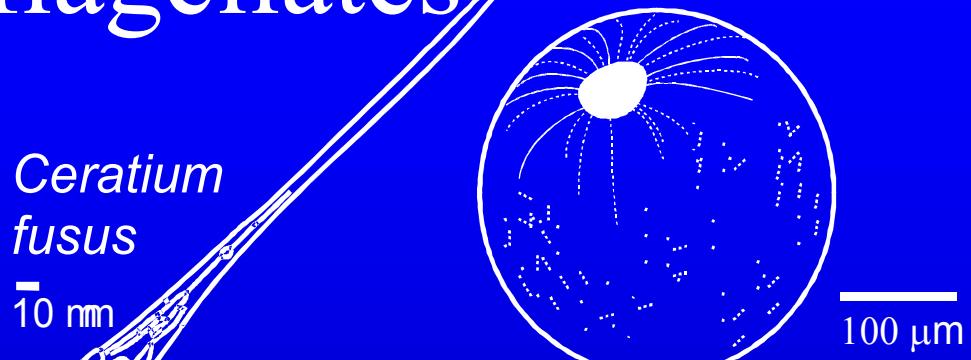


© M. Latz

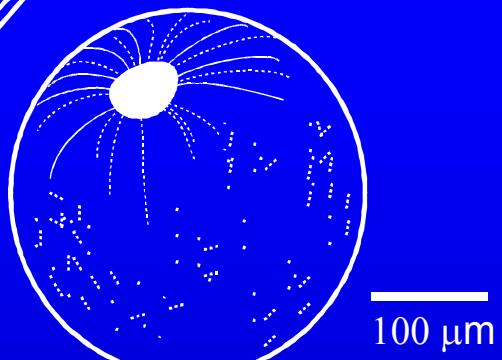
Dinoflagellates



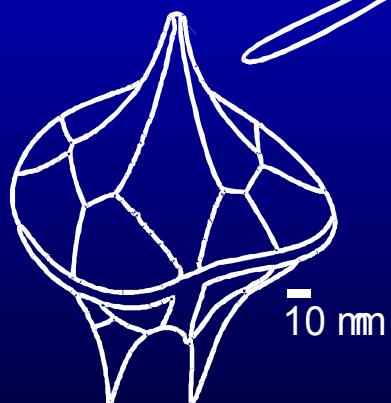
*Lingulodinium
polyedrum*



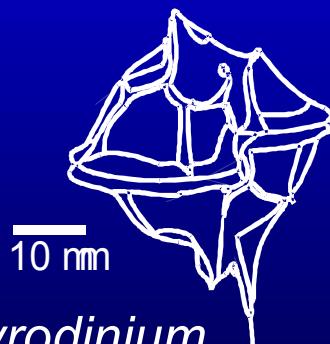
*Ceratium
fusus*
10 nm



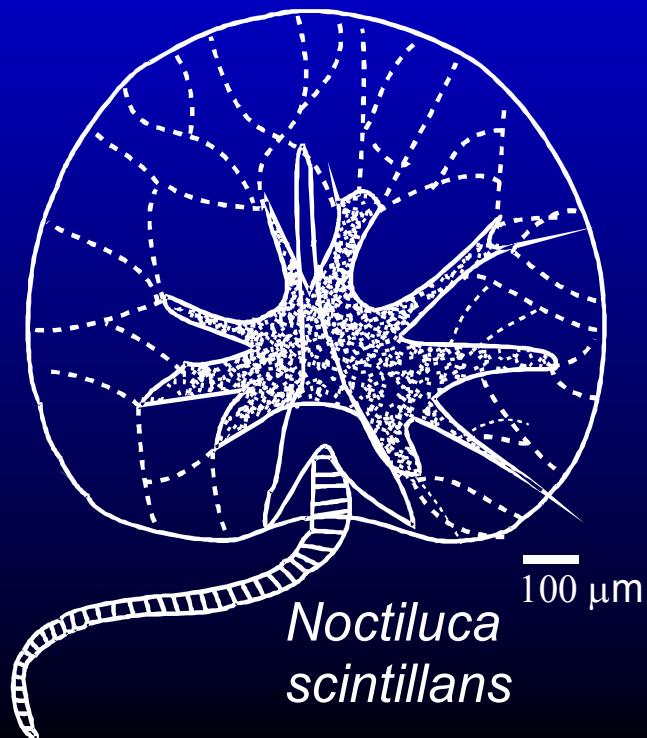
*Pyrocystis
noctiluca*
100 µm



*Protoperidinium
depressum*
10 nm



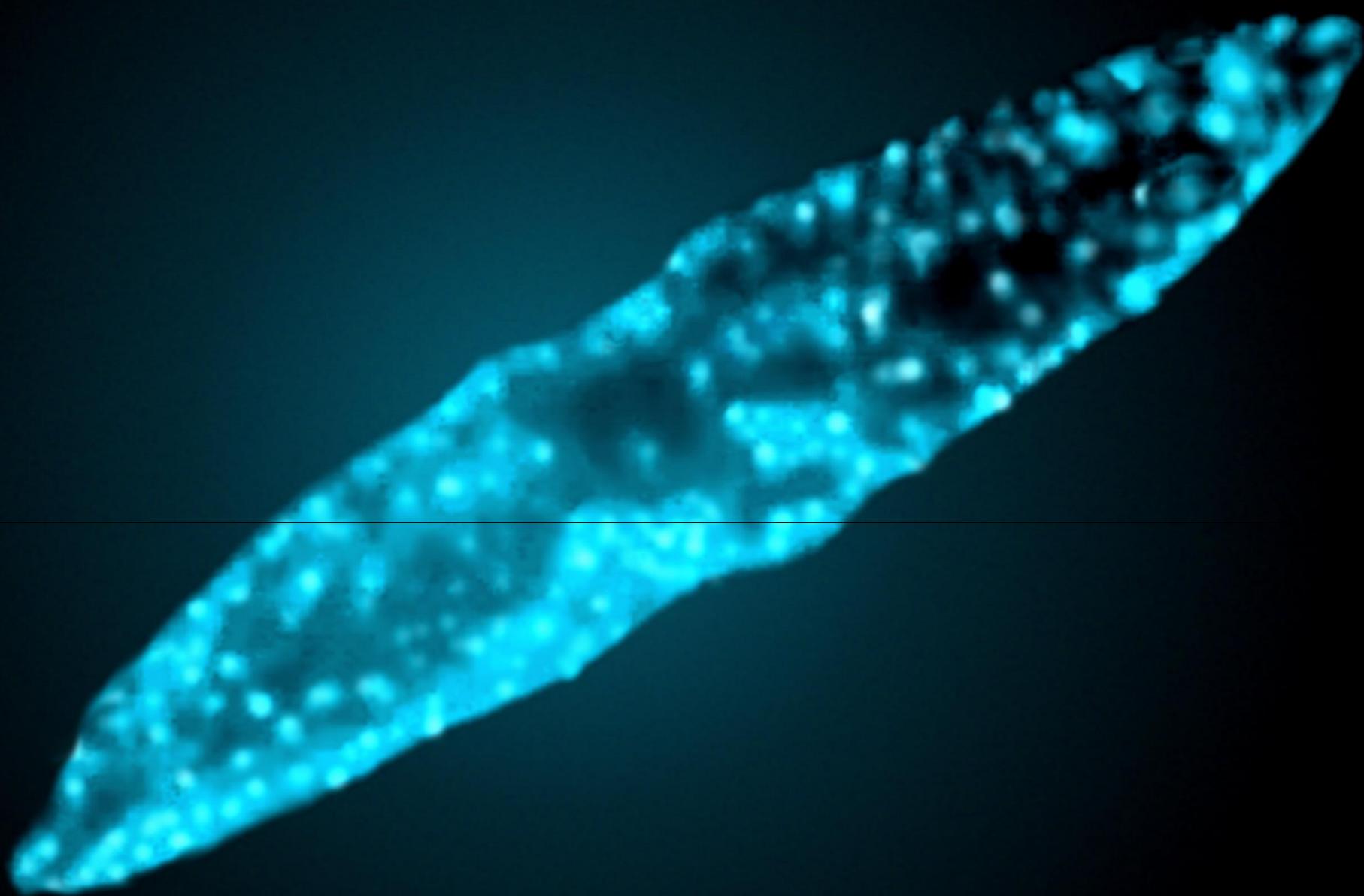
*Pyrodinium
bahamense*
10 nm



*Noctiluca
scintillans*
100 µm



© E. Widder



© E. Widder

Functions of Bioluminescence:

- Finding food
- Attracting mates
- Defense



www.divernet.com/biolog/0900flash.htm



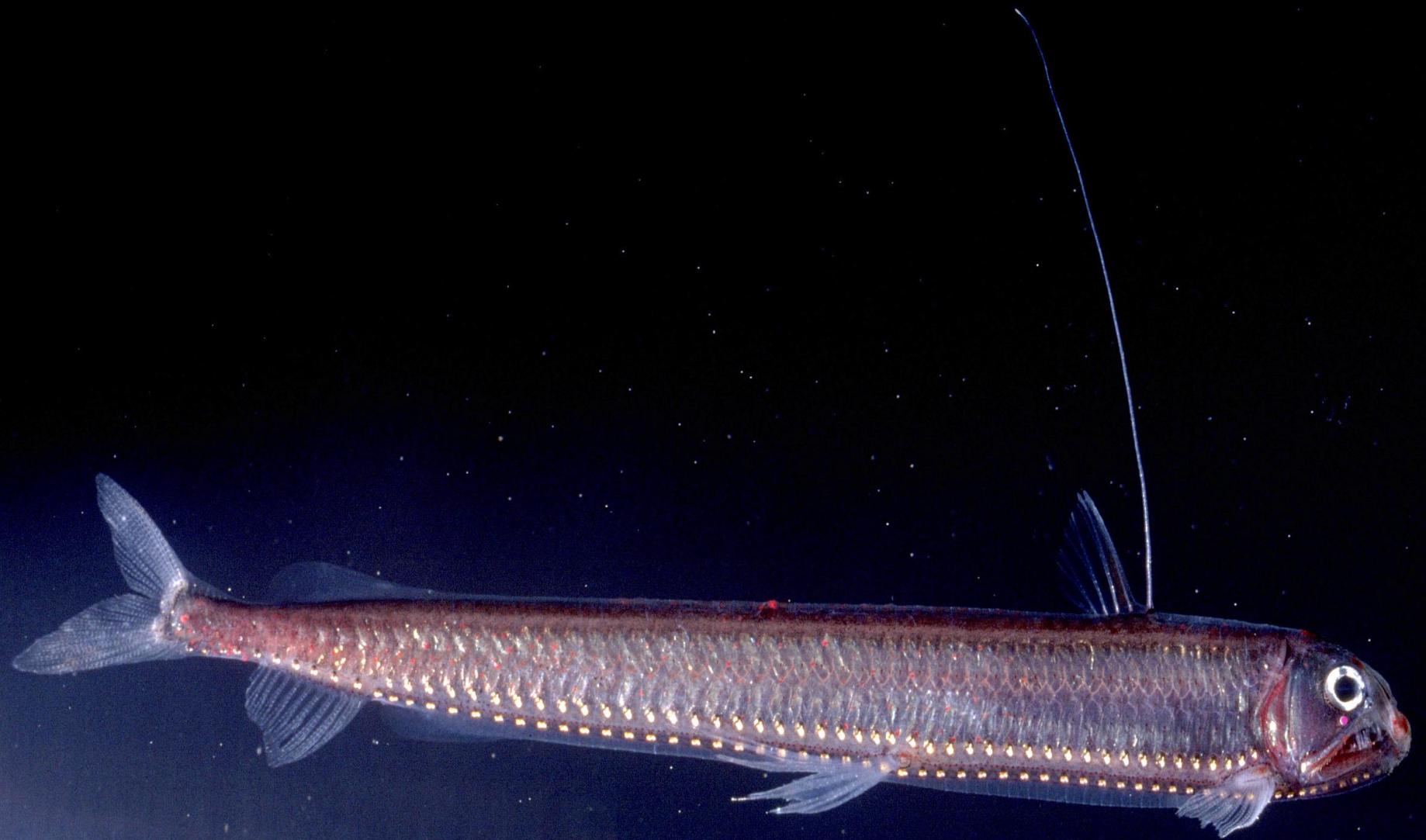
© E. Widder



© E. Widder



© E. Widder



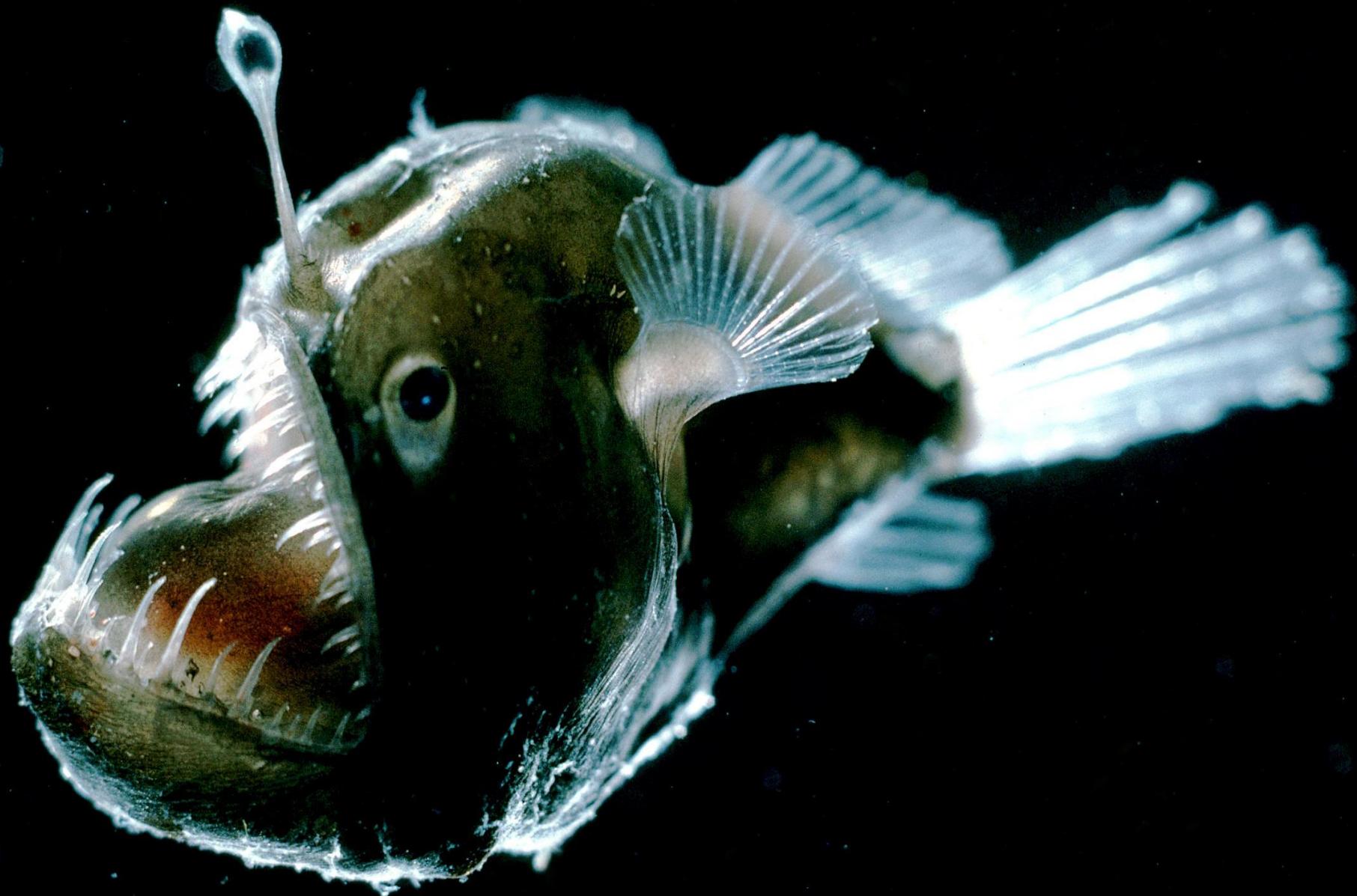
© E. Widder



© E. Widder



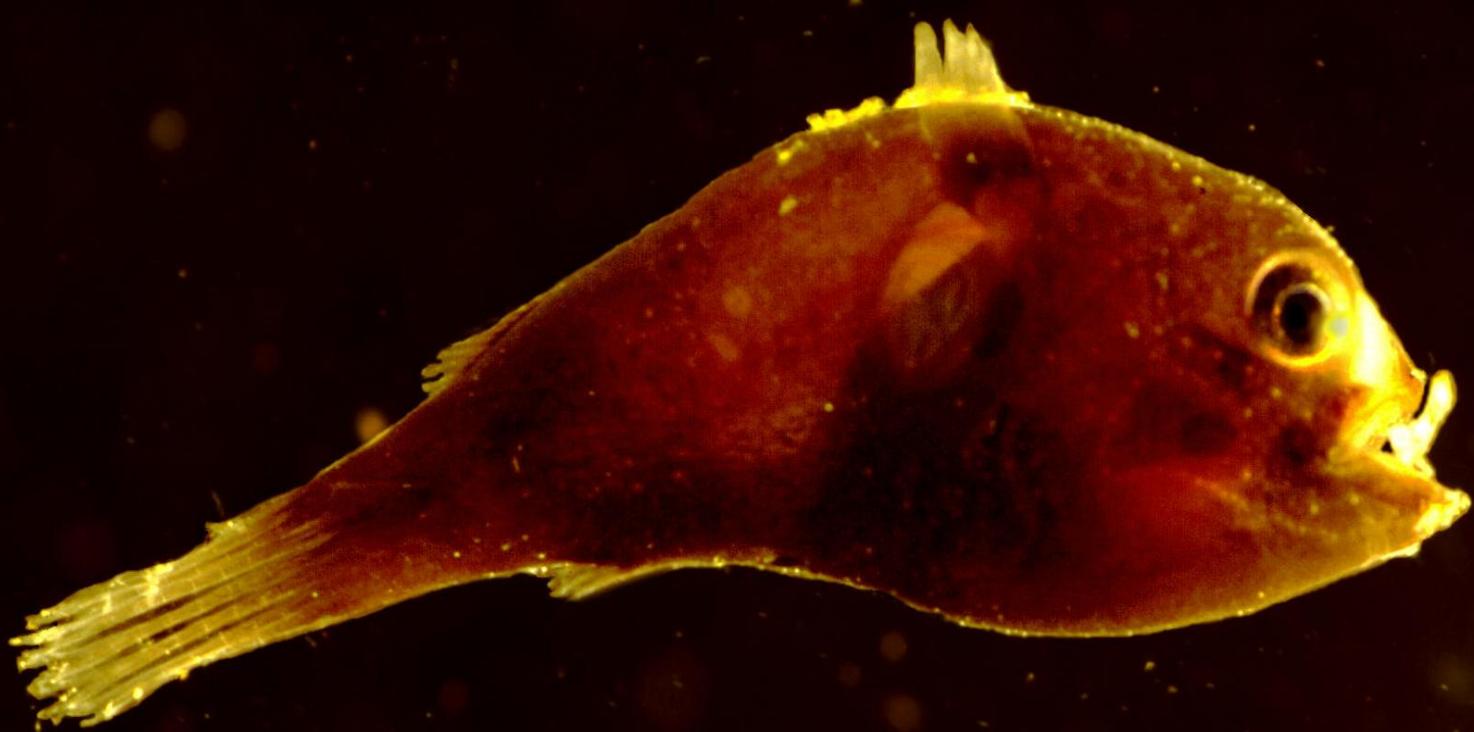
© PIXAR



© E. Widder



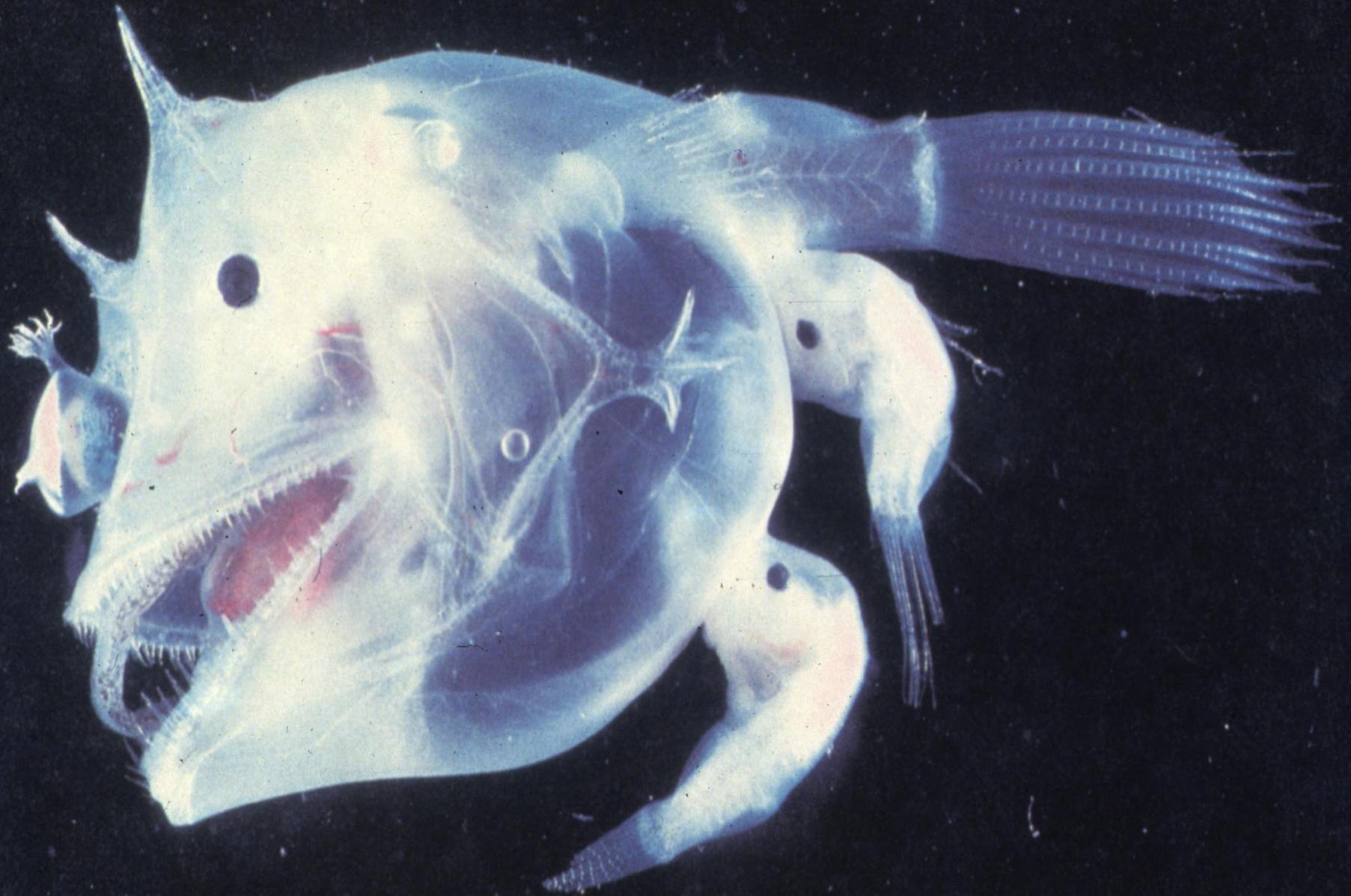
© E. Widder



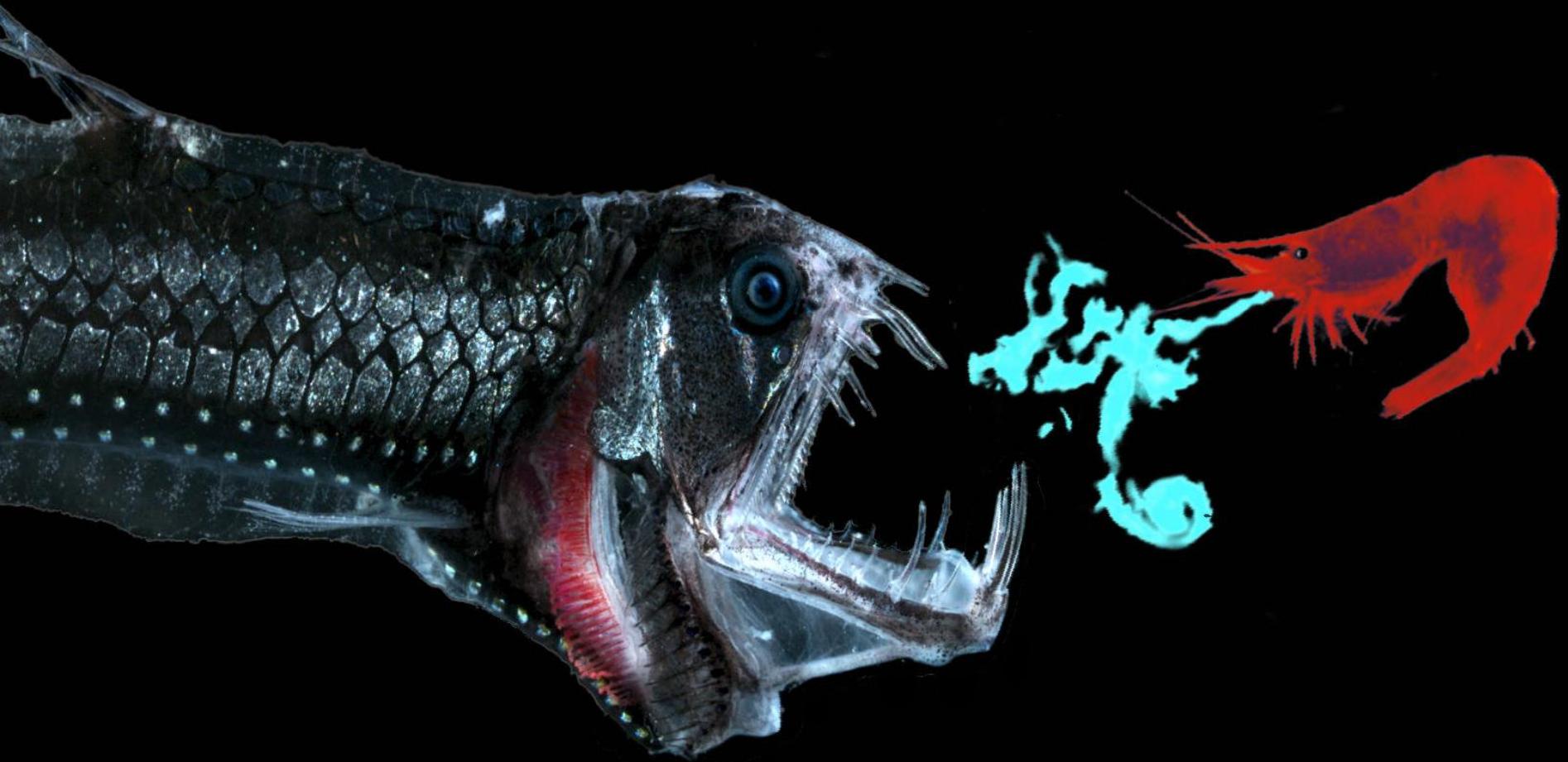
© T. Frank



© E. Widder



© P. David



© E. Widder



© E. Widder

Shining tubeshoulder: *Searsia koefoedi*



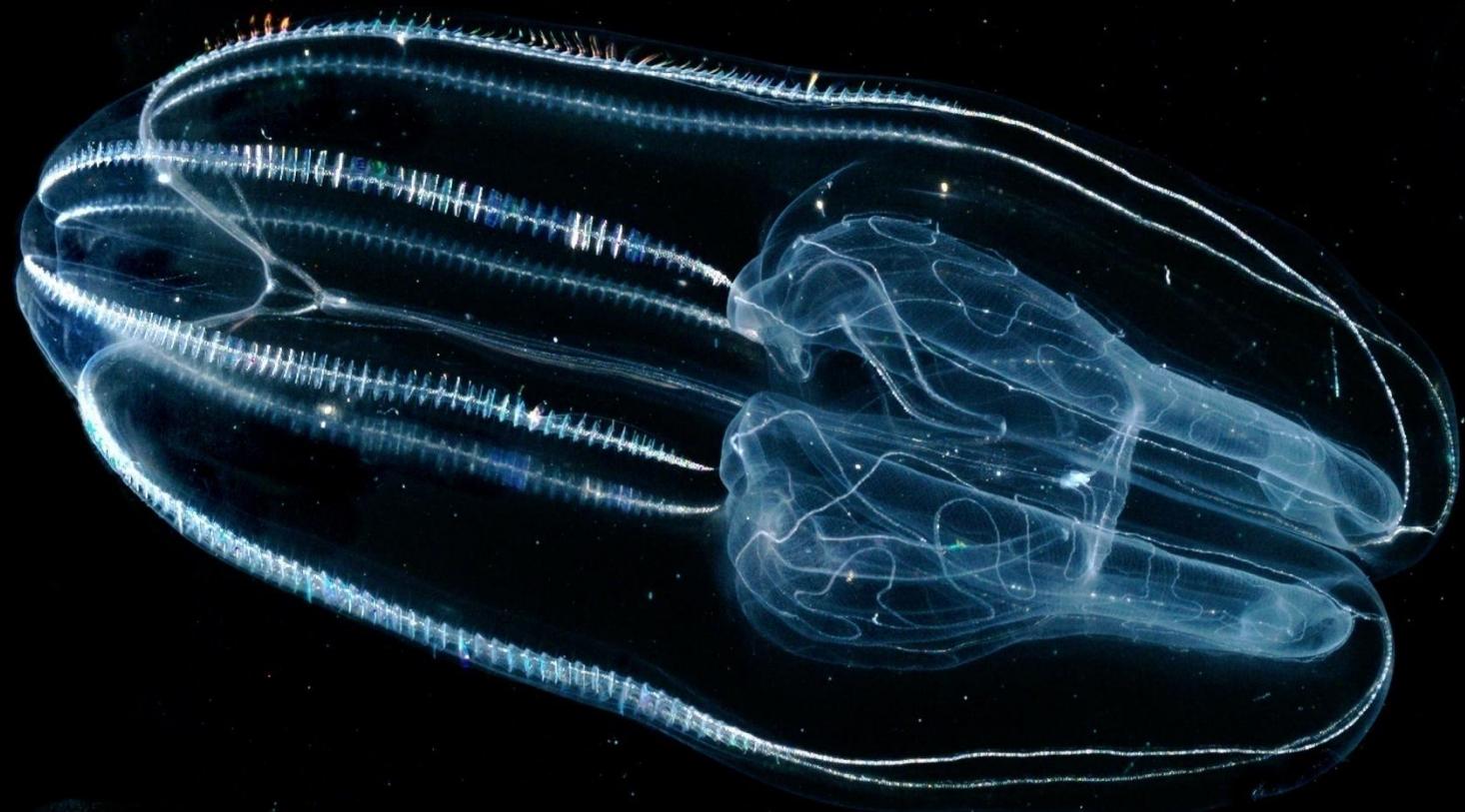


© E. Widder

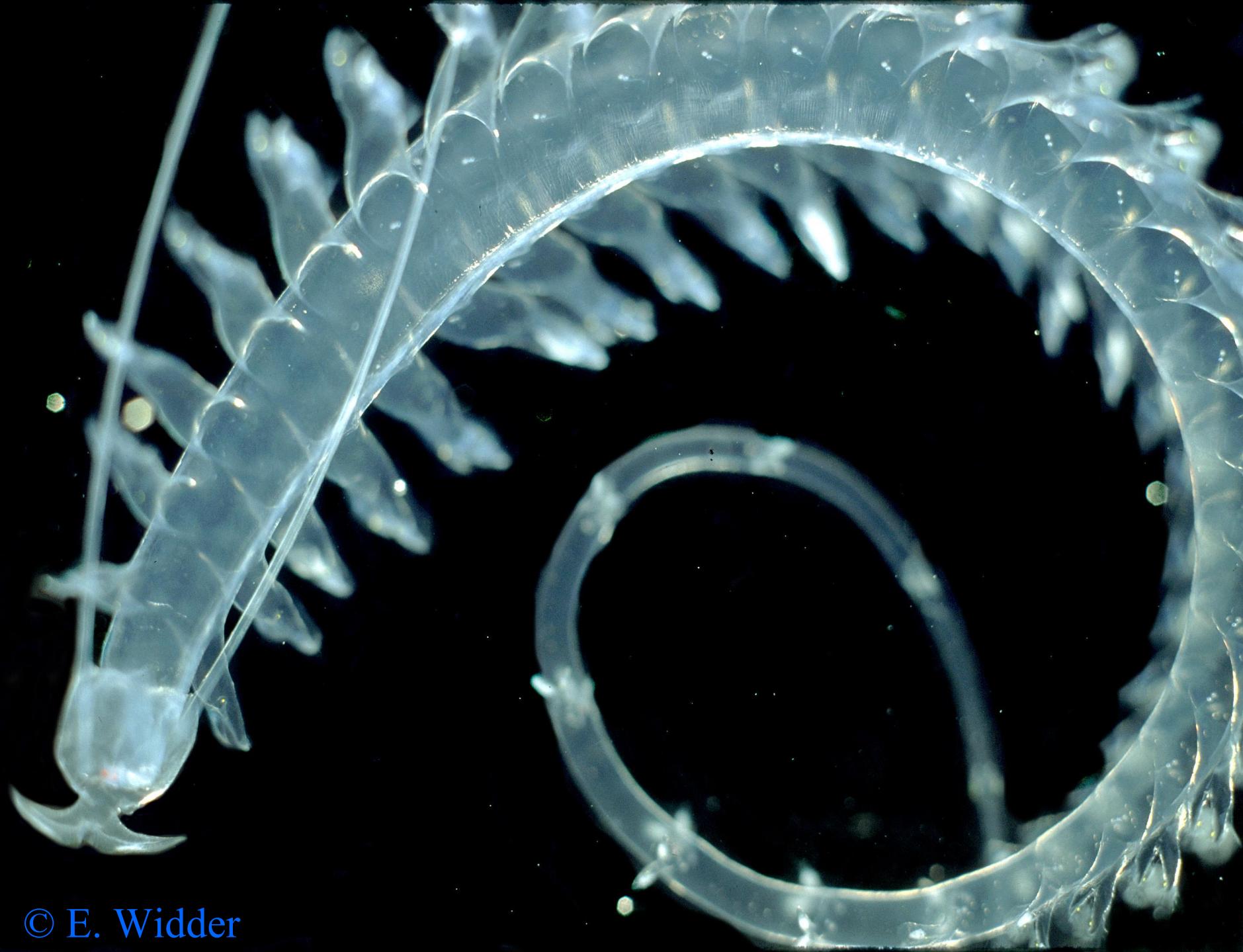


Functions of Bioluminescence:

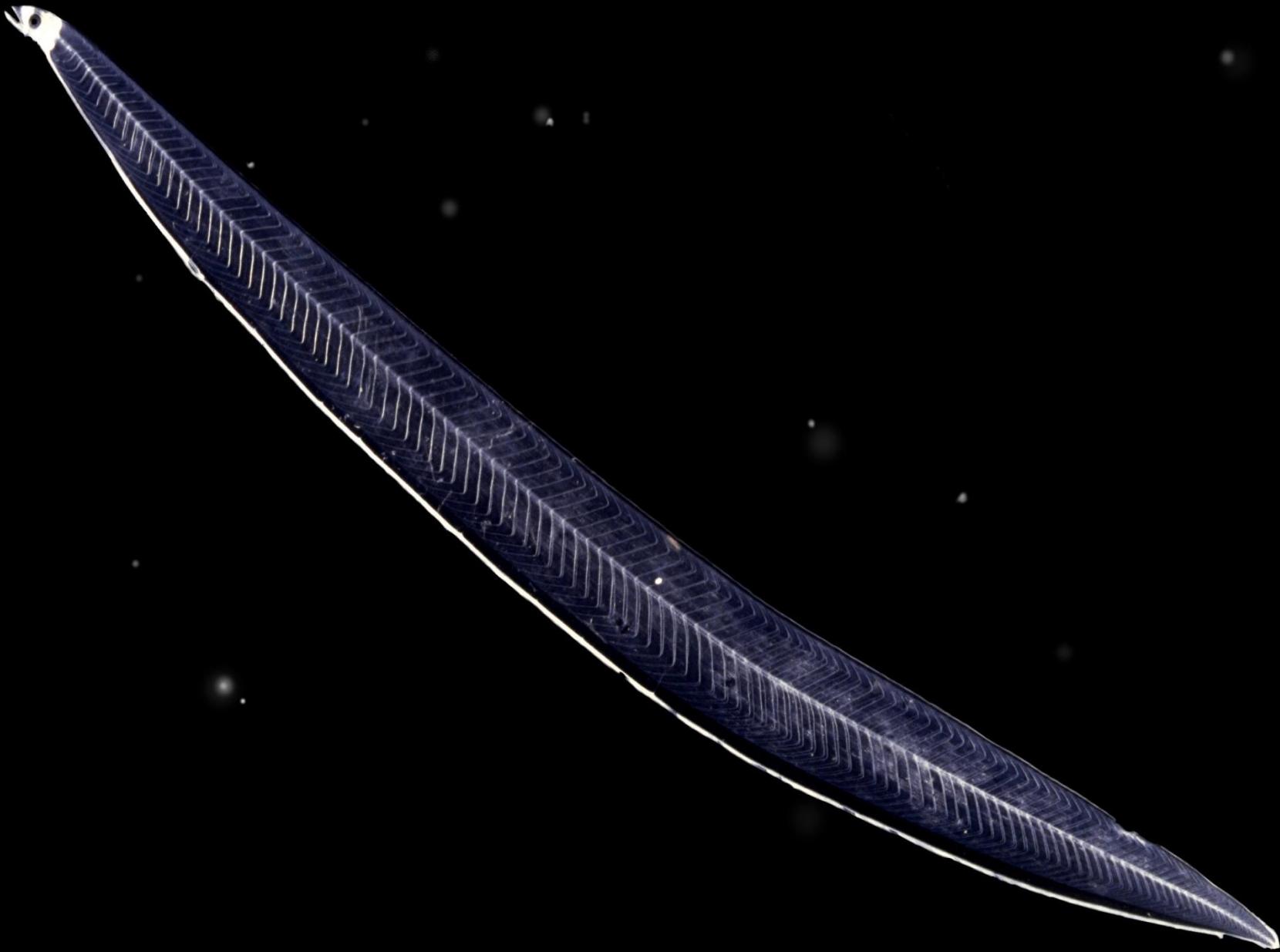
- Finding food
- Attracting mates
- Defense
 - Blinding and distraction
 - Camouflage



© E. Widder



© E. Widder



© E. Widder

A photograph of a scuba diver in deep blue water. The diver is positioned horizontally across the frame, facing right. They are wearing a dark wetsuit and fins. A bright light source, possibly a camera flash or a diver's light, is visible near their head, creating a strong glow and illuminating nearby bubbles. The water is filled with numerous small, glowing bubbles of various sizes.

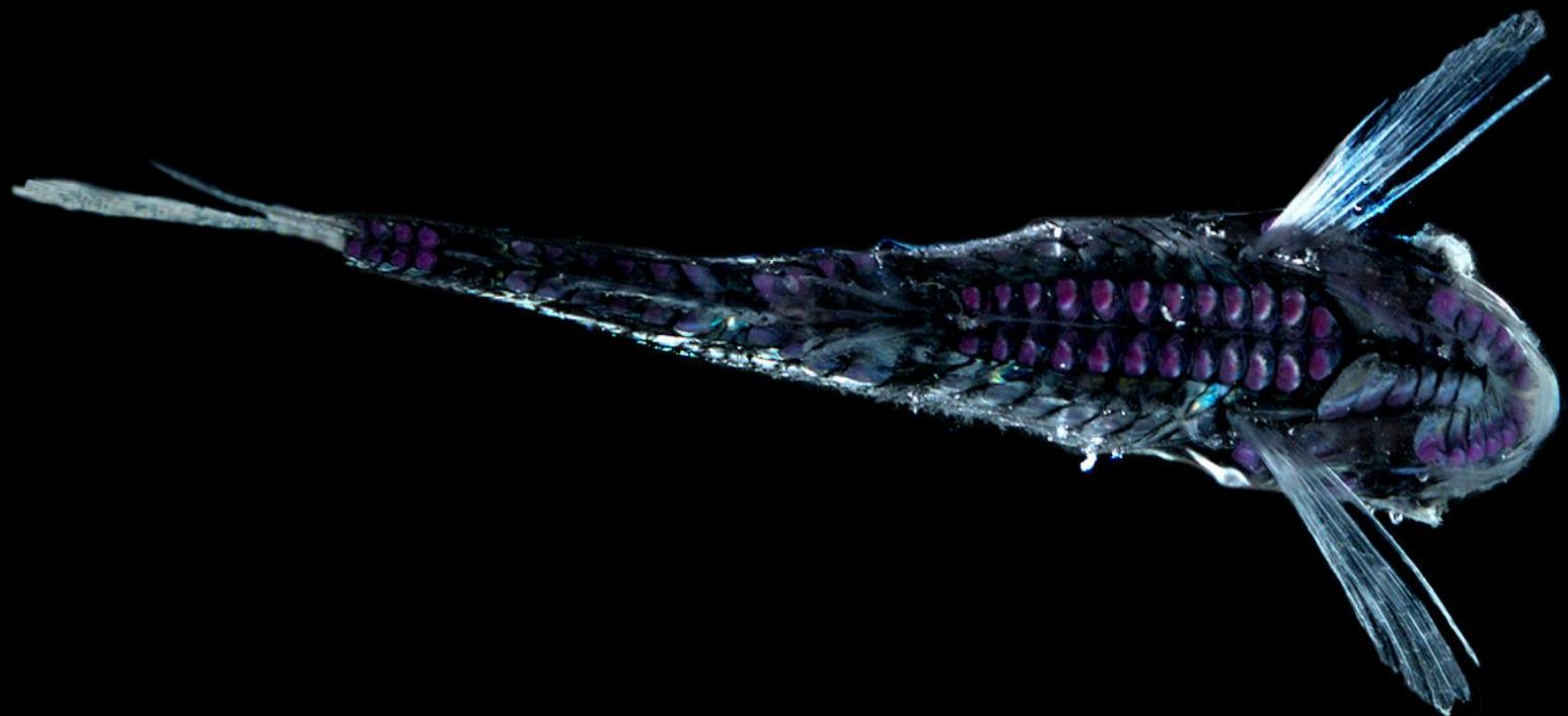
© T. Smoyer/HBOI



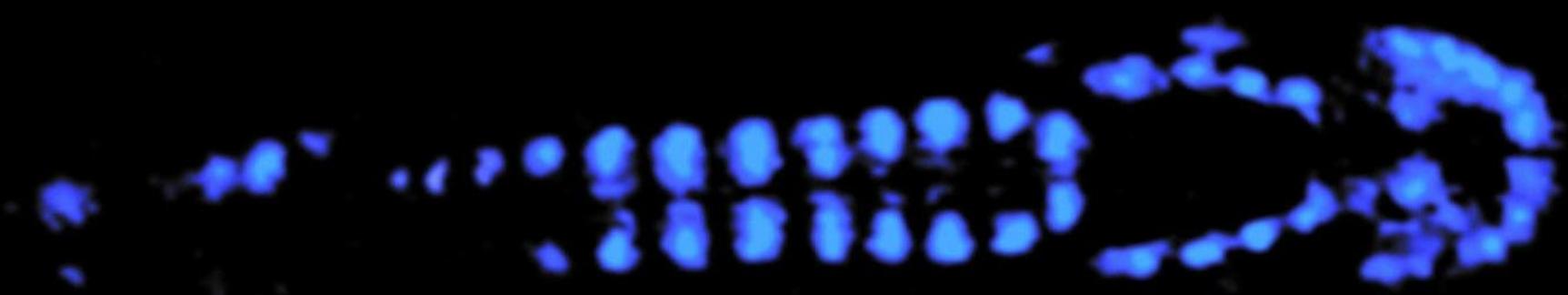
© T. Smoyer



© E. Widder

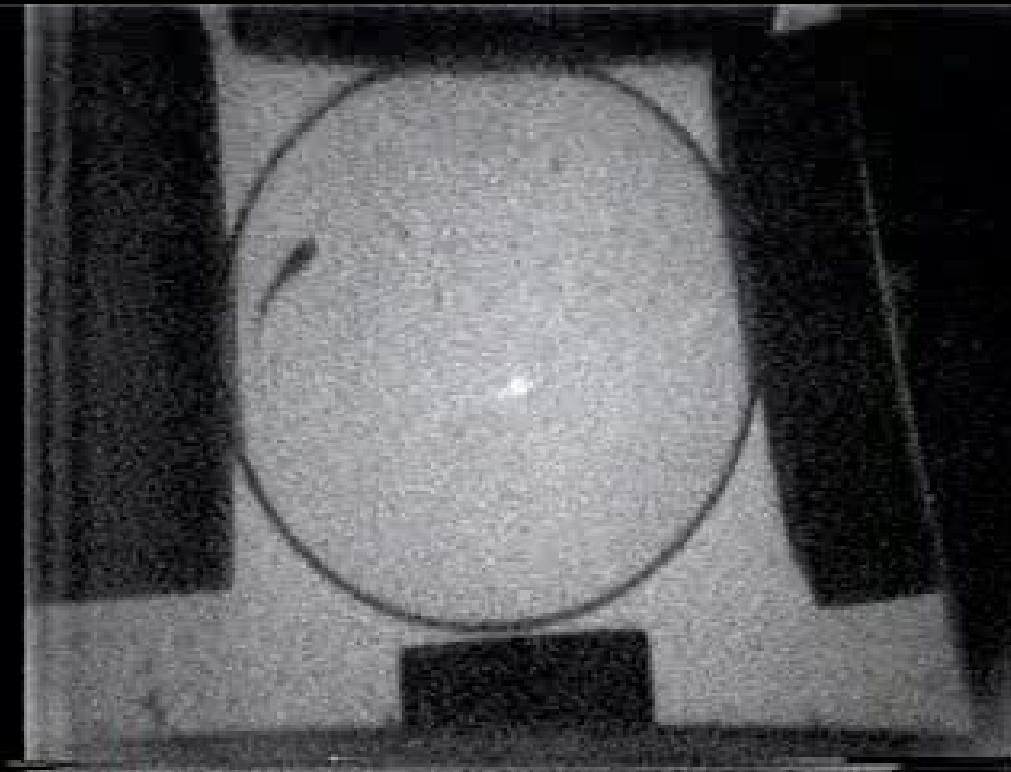


© E. Widder



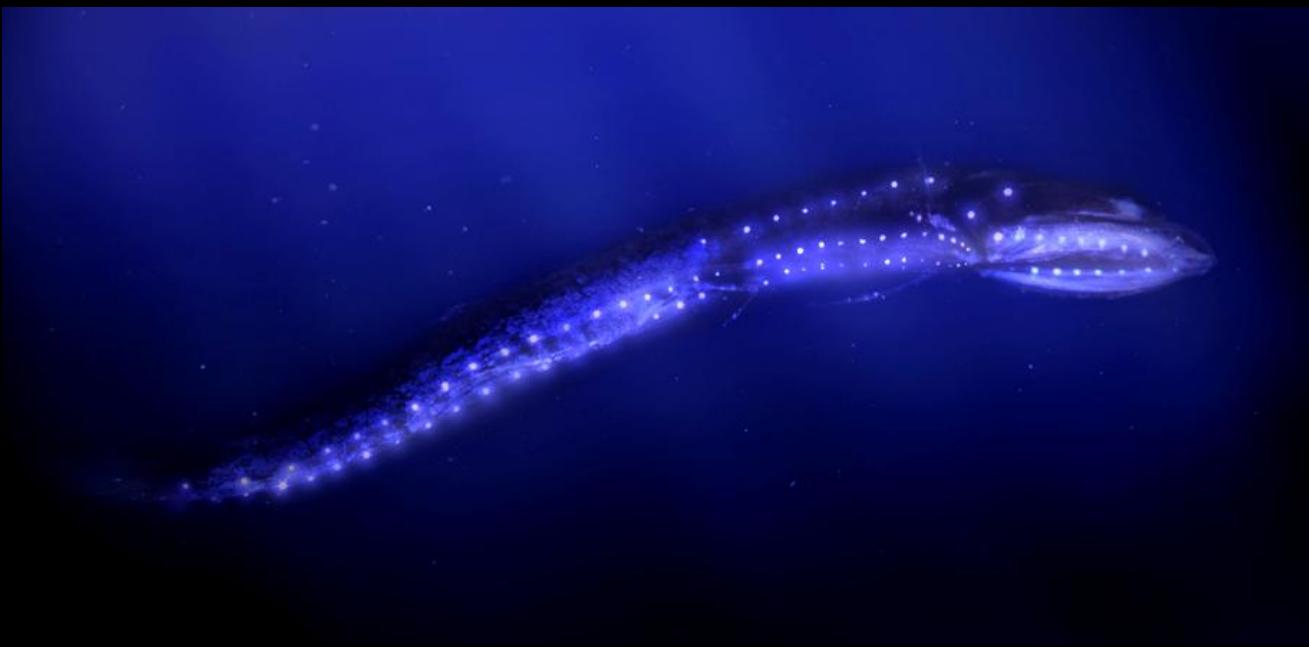
© E. Widder

Counterillumination





© E. Widder



© P. Batson



bioRxiv preprint doi: <https://doi.org/10.1101/2023.09.21.553233>; this version posted September 21, 2023. The copyright holder for this preprint (which was not certified by peer review) is the author/funder, who has granted bioRxiv a license to display the preprint in perpetuity. It is made available under a [CC-BY-ND 4.0 International license](https://creativecommons.org/licenses/by-nd/4.0/).

© E. Widder

Abralia veranyi



Functions of Bioluminescence:

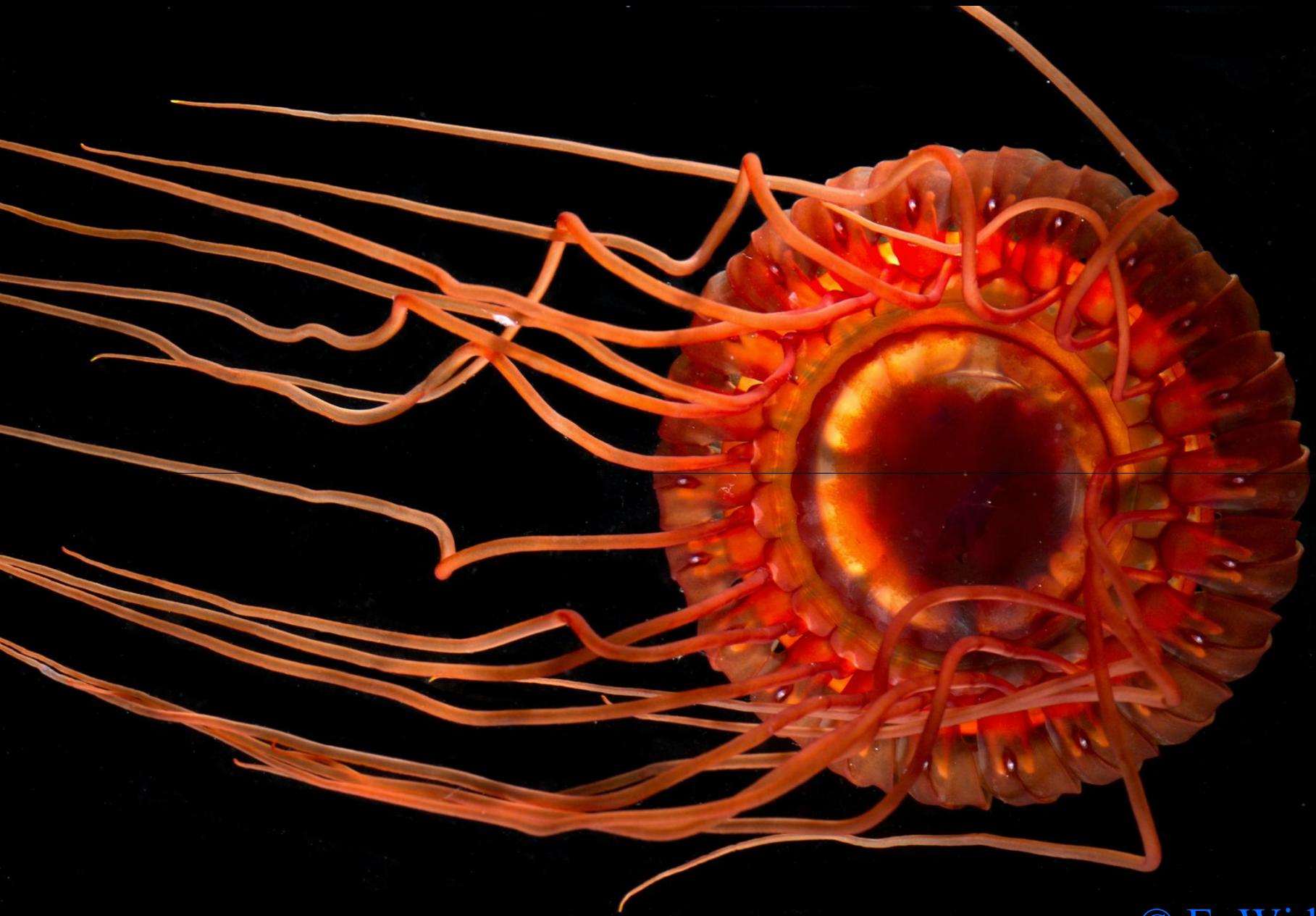
- Finding food
- Attracting mates
- Defense
 - Blinding and distraction
 - Camouflage
 - Burglar Alarms



© T. Smoyer/HBOI

Black dragonfish: *Melanostomias bartonbeani*





© E. Widder

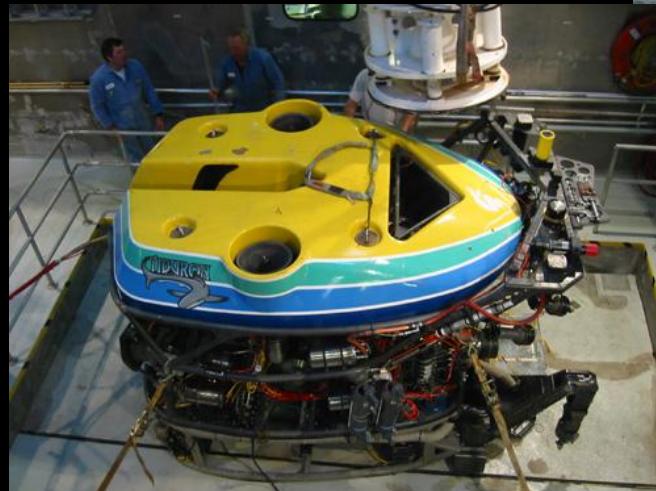
Deep-sea jellyfish: *Atolla wyvillei*



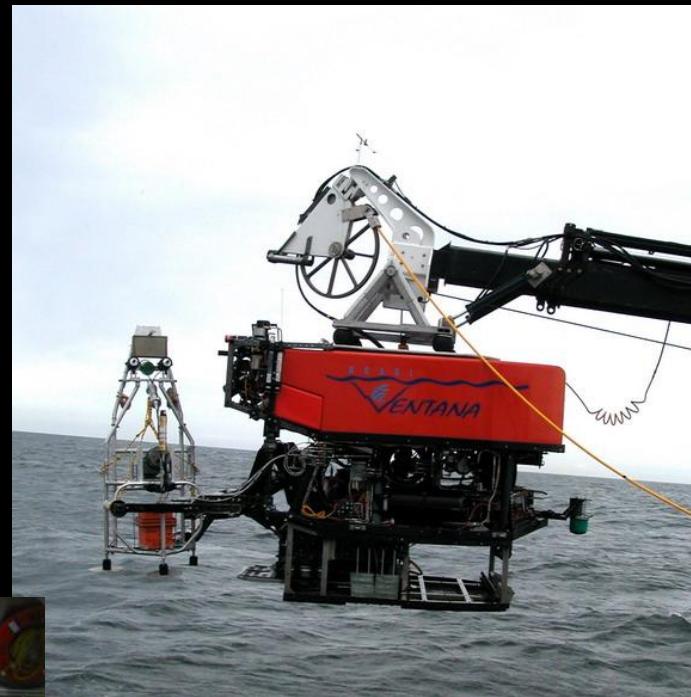
Deep-sea exploration platforms are noisy and use bright lights



JSL submersible – electric
w/ hydraulic capabilities

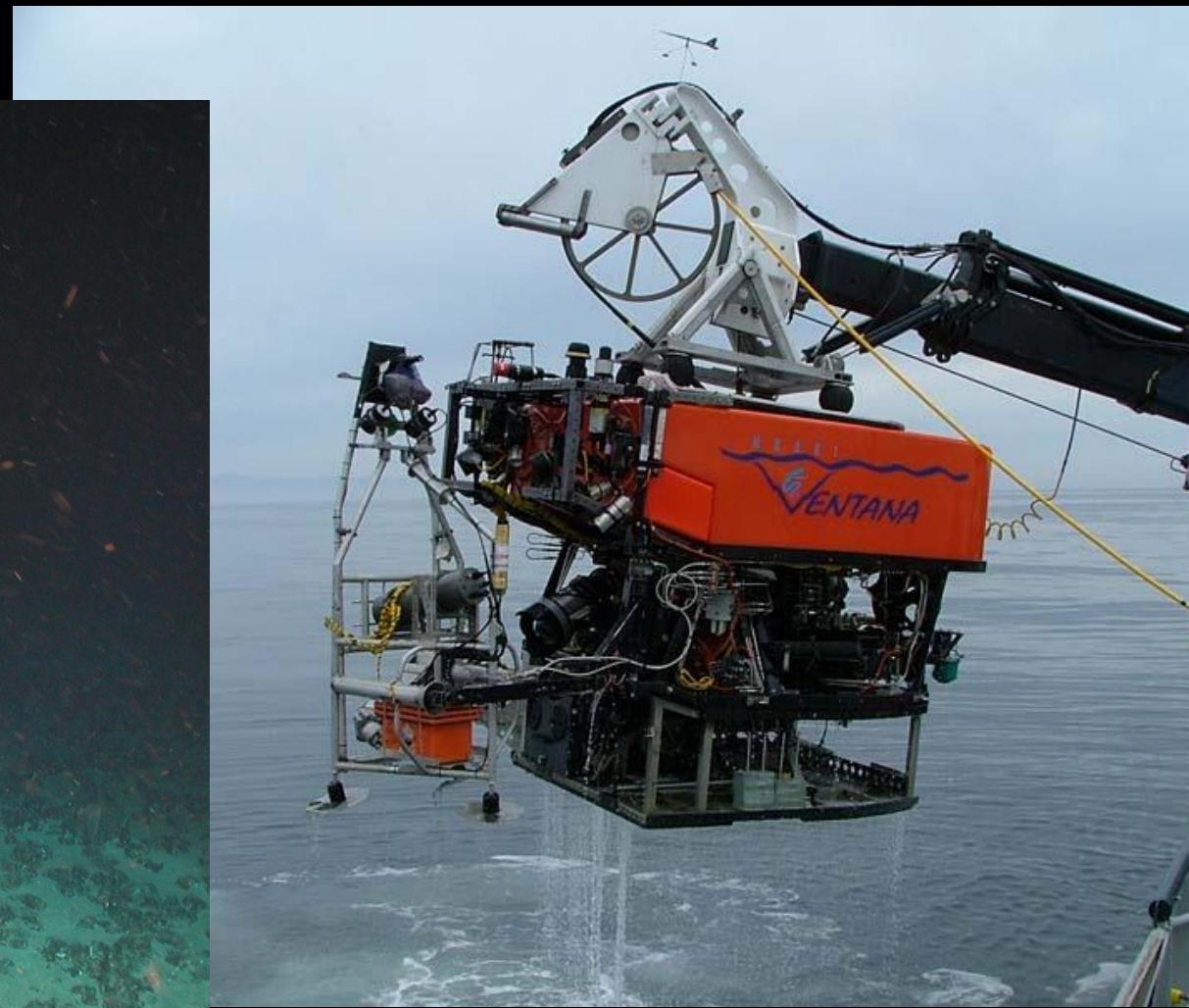
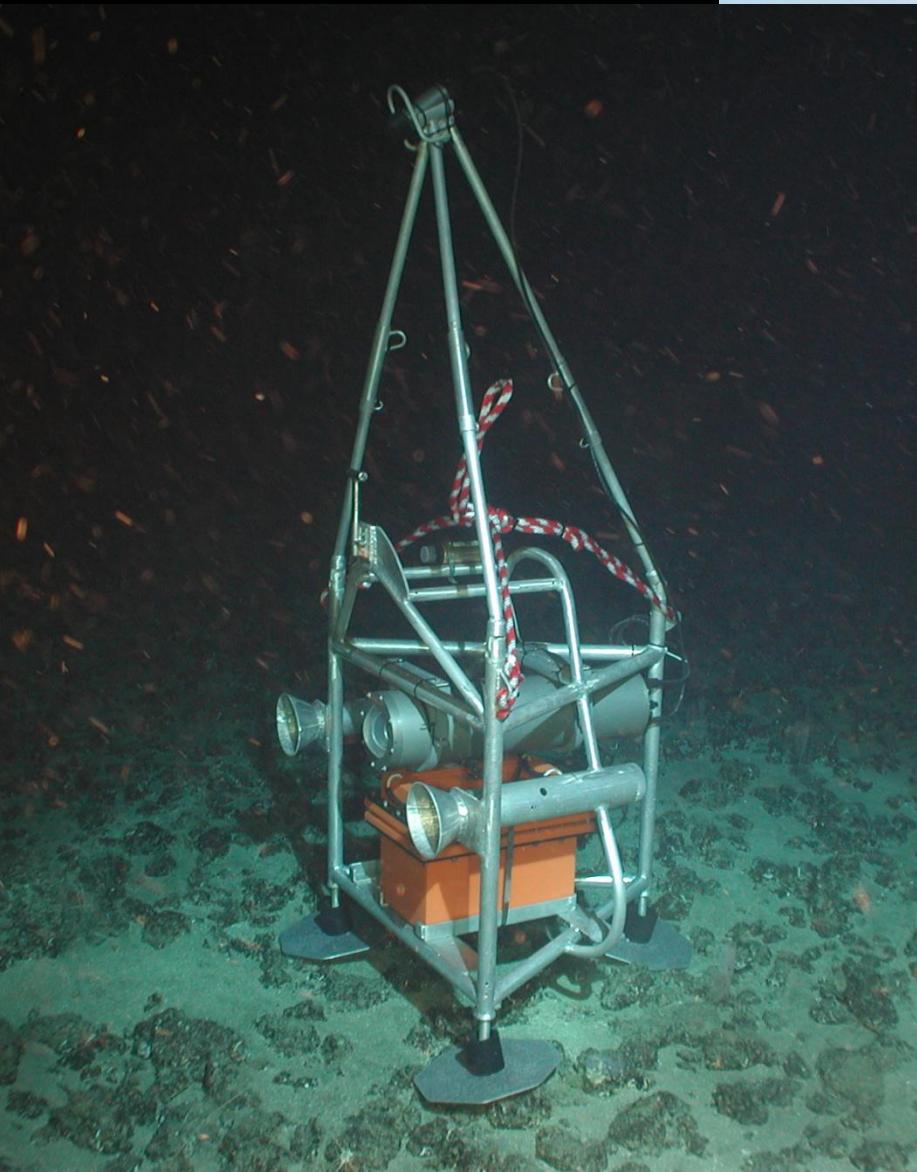


ROV Tiburon – electric
w/ hydraulic capabilities



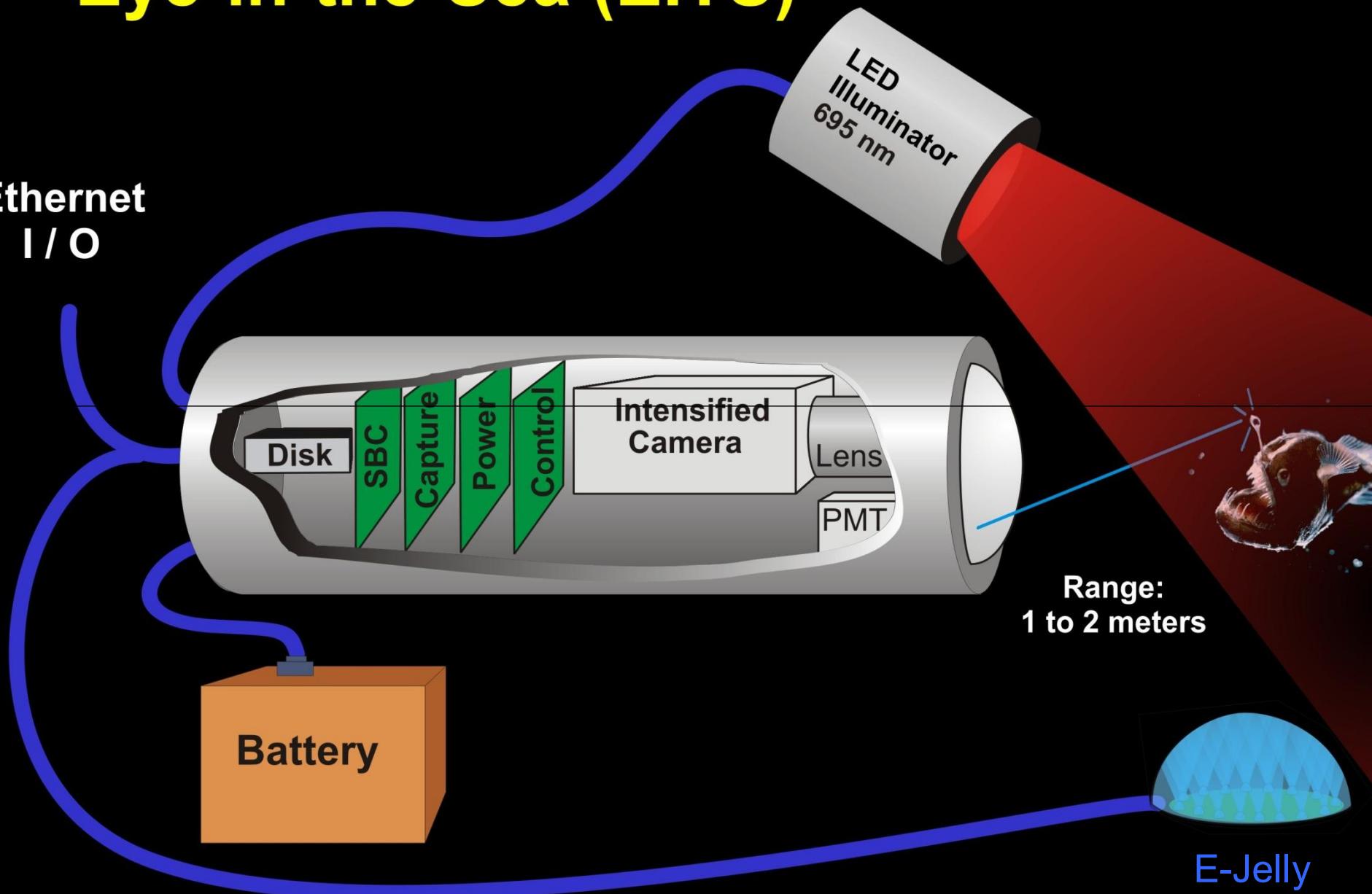
ROV Ventana – hydraulic

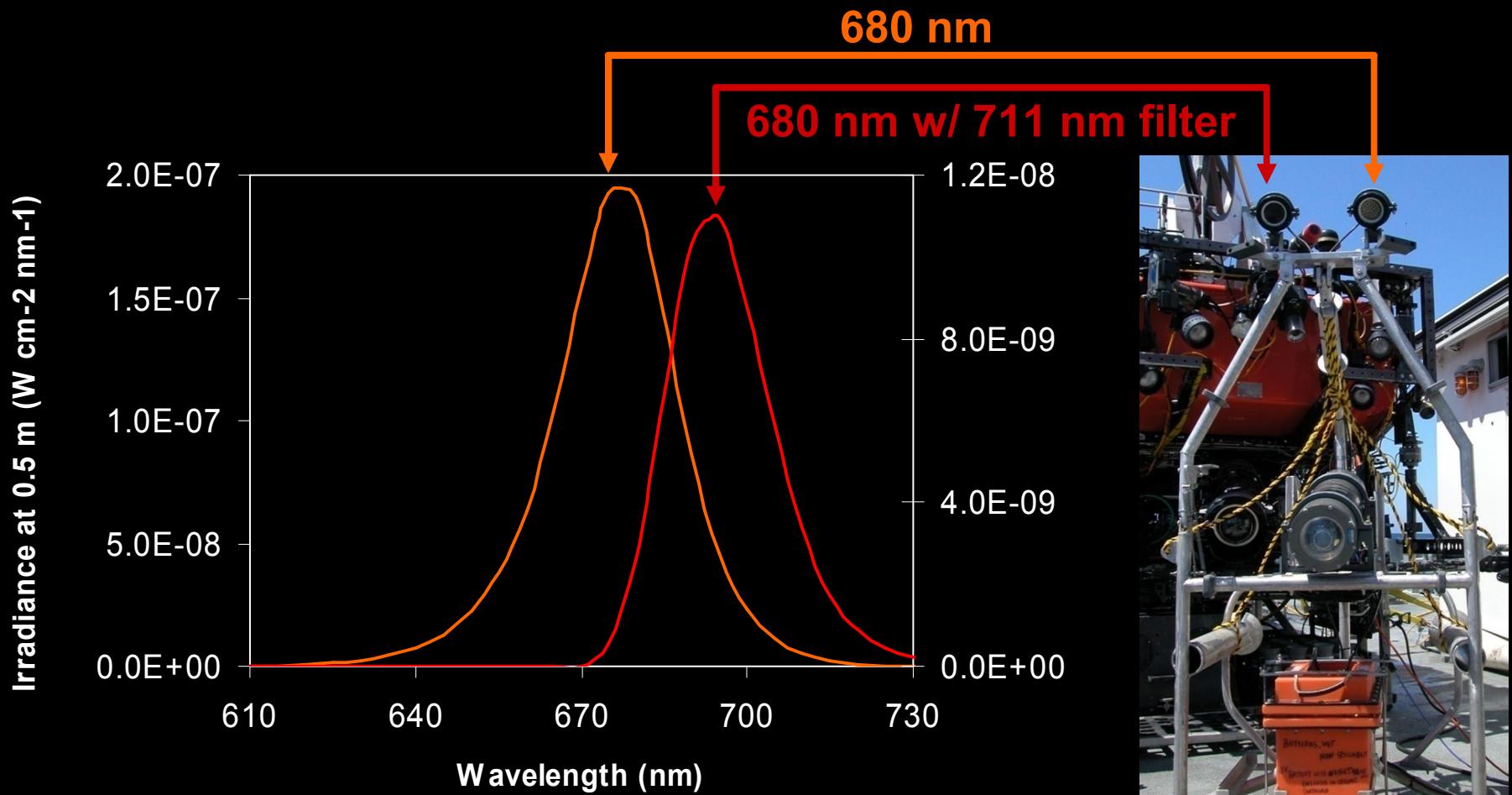
Eye-in-the-Sea



Eye-in-the-Sea (EITS)

Ethernet
I / O





Optical Lure

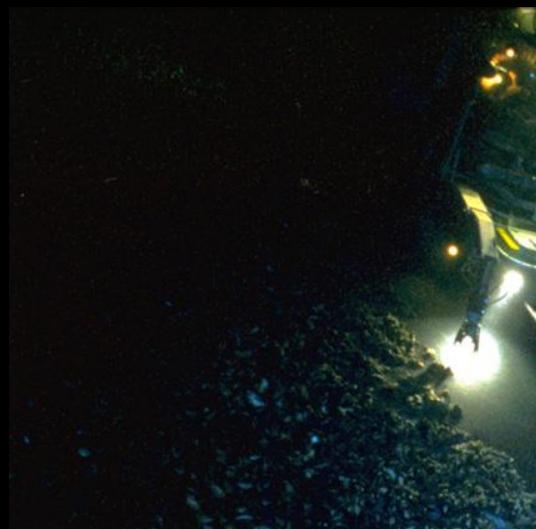
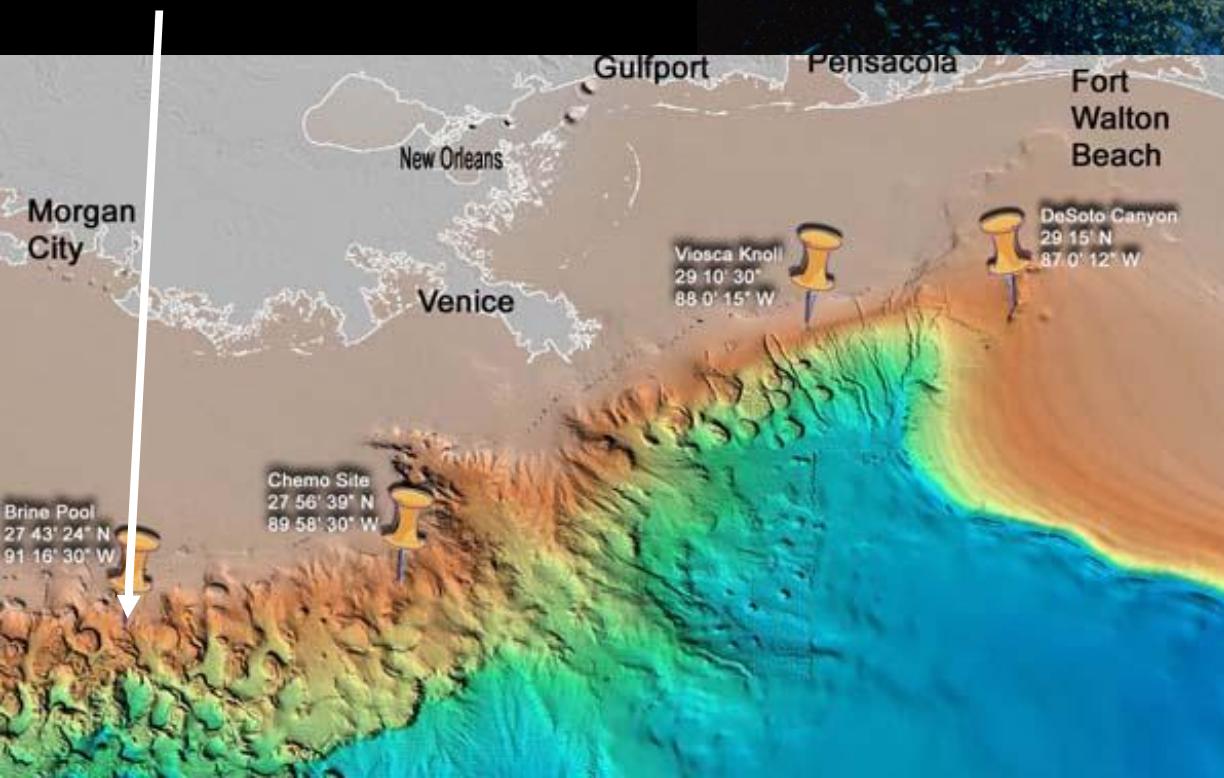
E-Jelly

- 5 Display Modes
 - Single Dim LED Glow
 - Single Bright LED GLOW
 - All LEDs Flash
 - All LEDs Pinwheel
 - Programmable Flash

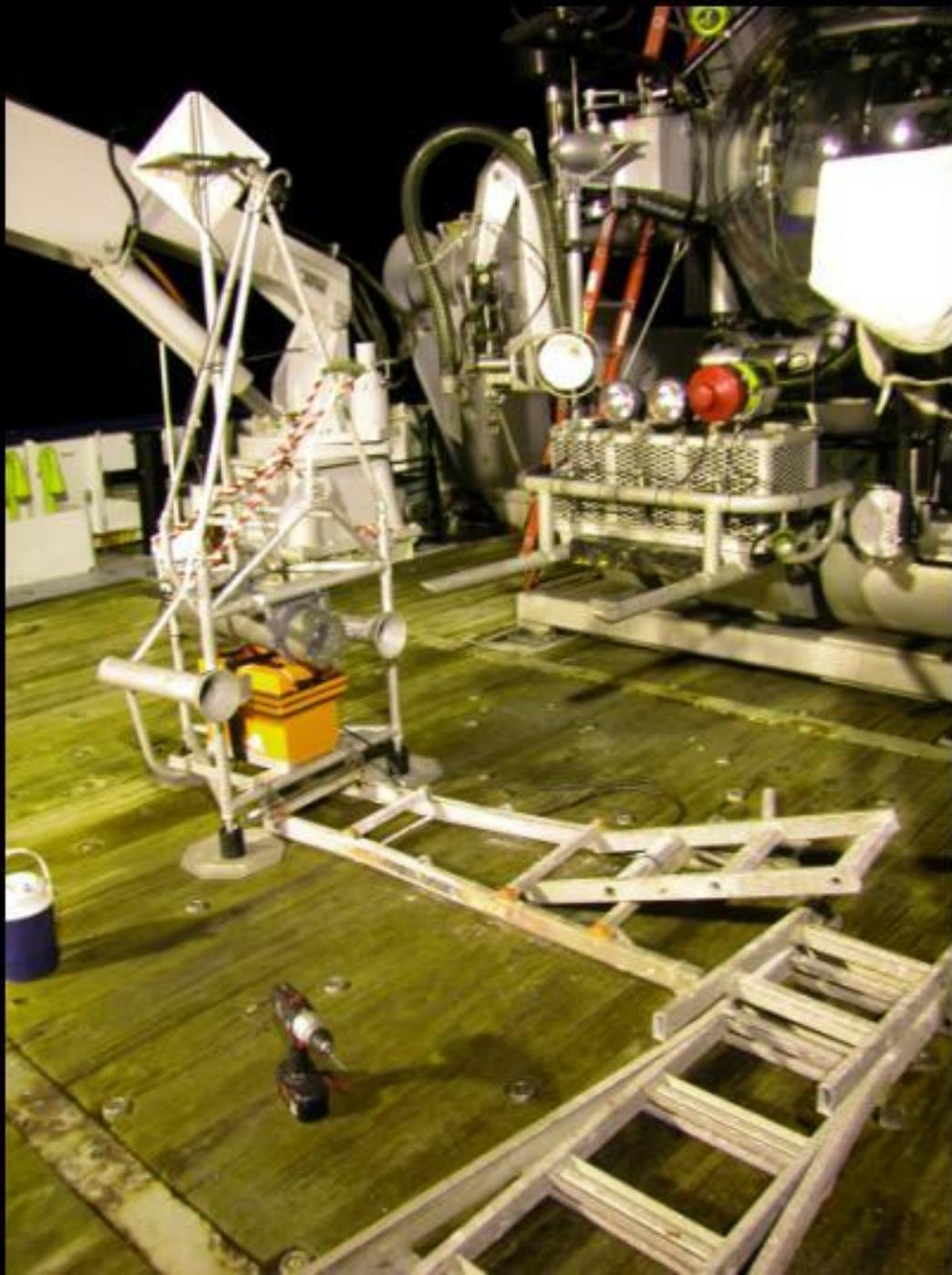


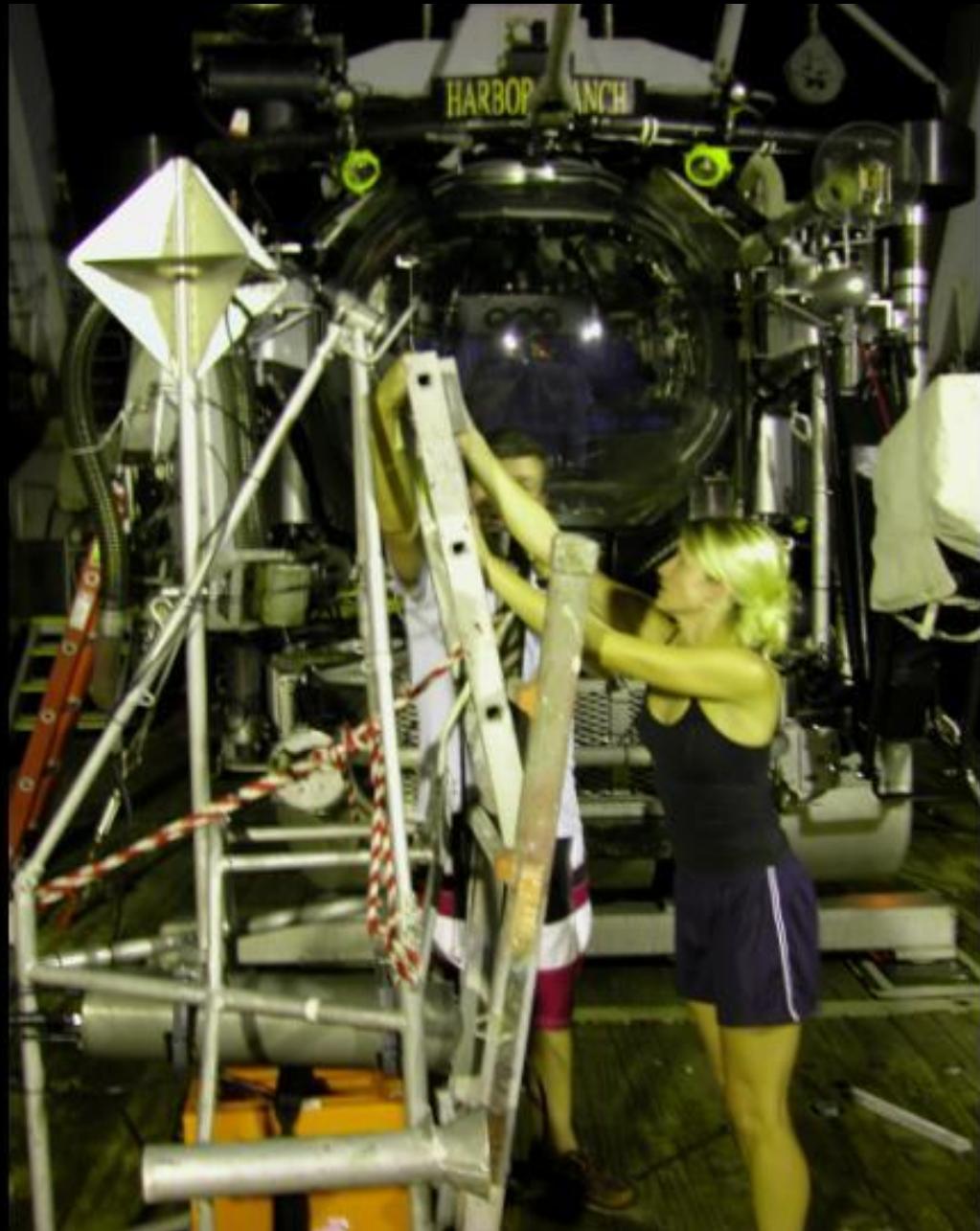
Gulf of Mexico

Brine Pool



©Jonathan Blair





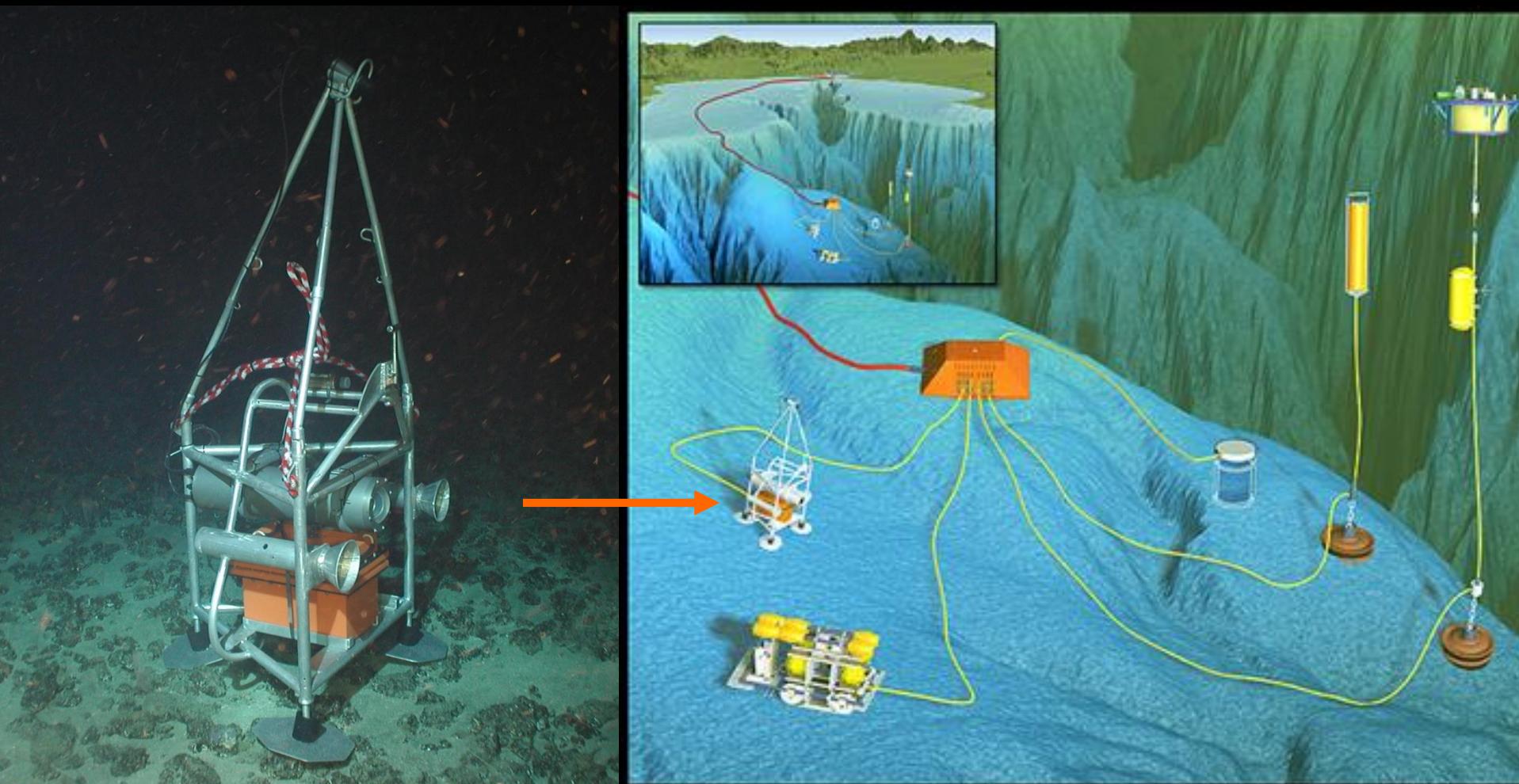
CLAM

Cannibalized Ladder Alignment Mechanism



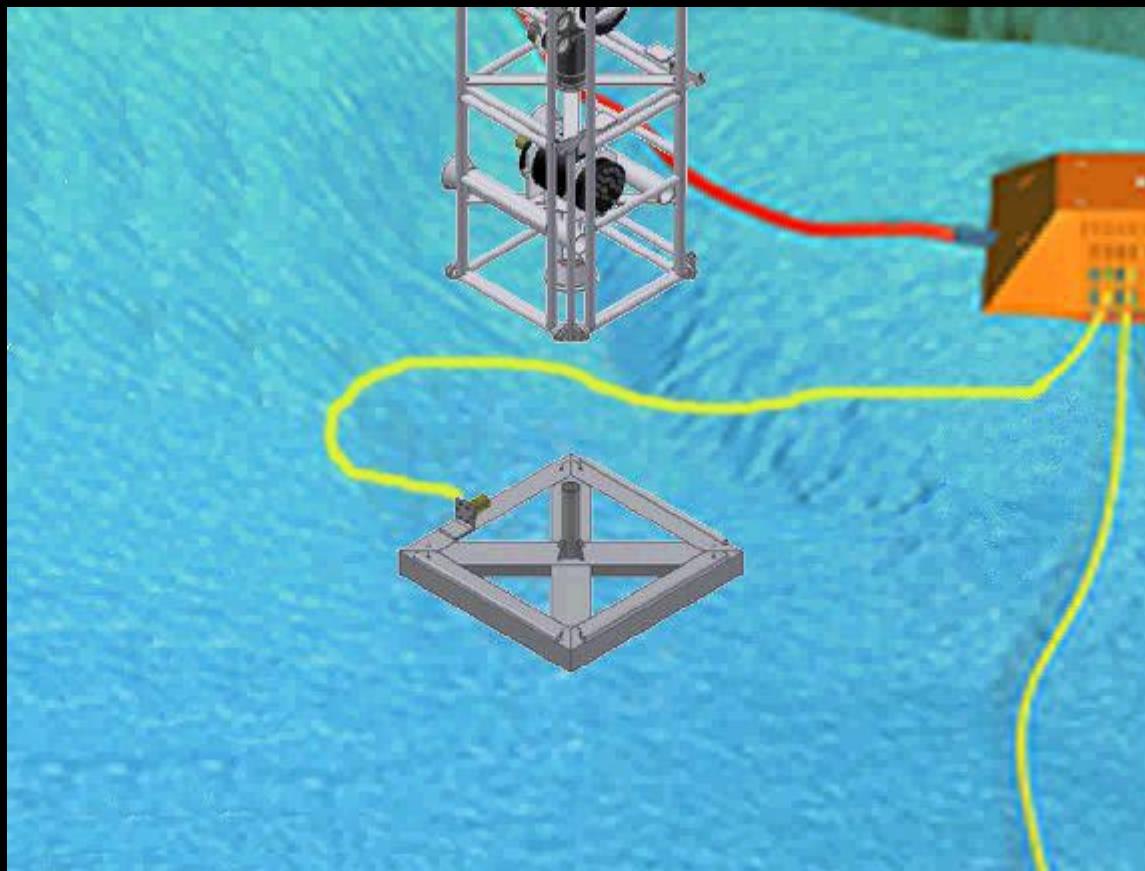




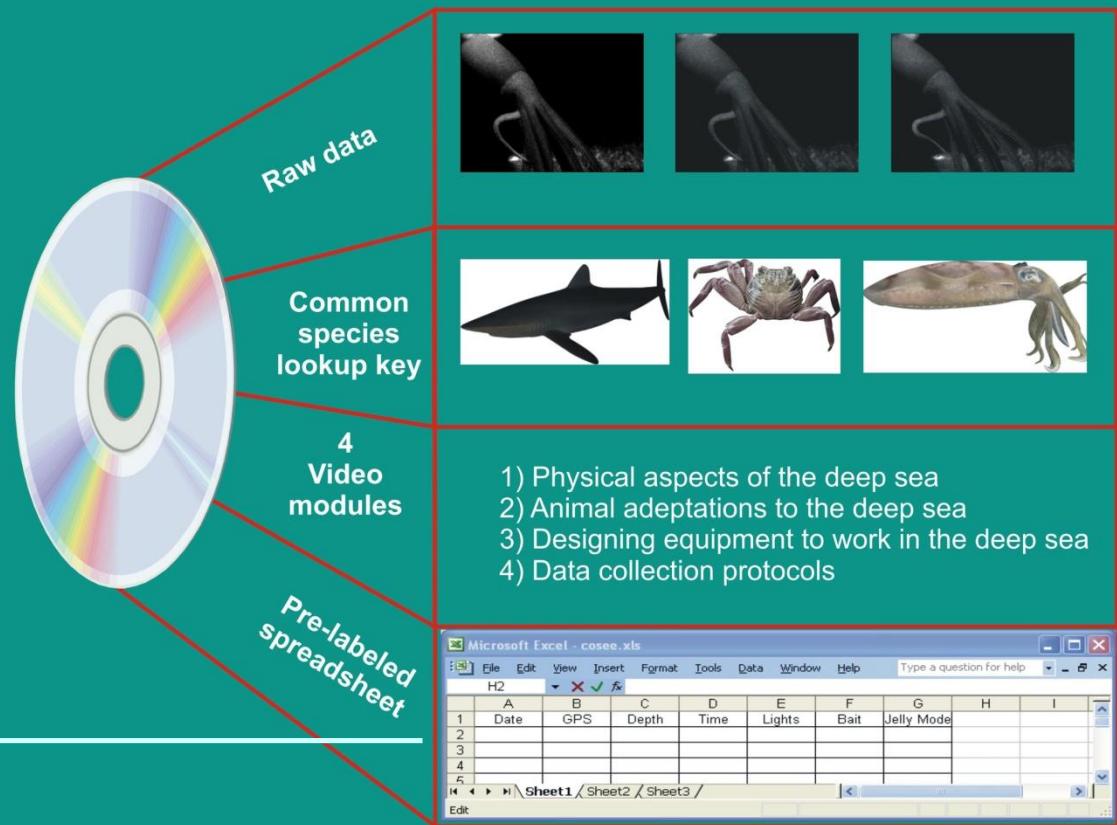


www.mbari.org/mars

Moored Eye-in-the-Sea



Eye-in-the-Sea



Web-based
E-journal,
student chat rooms
and
“ask-a-scientist”
bulletin board

ORCA