A Field Trip to the Congo:
Hydroacoustic Measurements in "The River that Swallows All Rivers"

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Congo River Project

- History with AMNH
- Field verification of model predictions

  (depth, slope, stream power, roughness, Froude)—WHY??
- Acoustic and Water Quality measurement

  --Fish diversity definition

  --OSW time tests

  --Turbulence definition

  --QW field parameters and samples

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The spectacular but poorly know Lower Congo River and the biological richness it harbors, combined with the growing threats to the region make this a compelling focus for scientific exploration and biodiversity in Africa.

NATIONAL GEOGRAPHIC

NSF

Center for Biodiversity and Conservation
AMERICAN MUSEUM & NATURAL HISTORY

NASA
National Aeronautics and Space Administration

AMNH
Ichthyology Department

http://research.amnh.org/vz/ichthyology/congo/index.html

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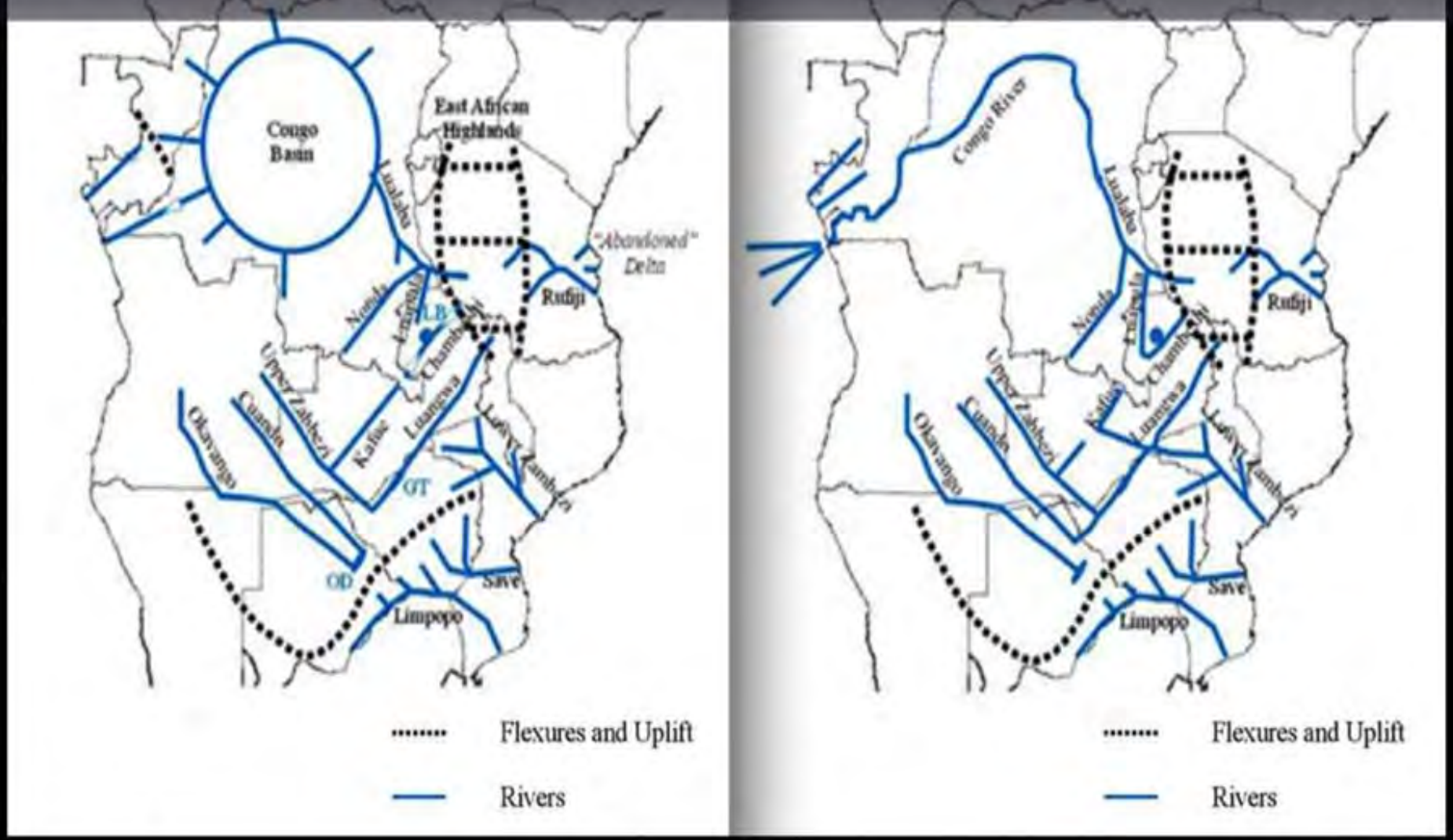
"...landlocked system was captured in the Miocene (5-15 mya) by a short river draining into the Atlantic Ocean, producing the drainage pattern of Central Africa seen today." (Stankiewicz & de Wit, 2006)



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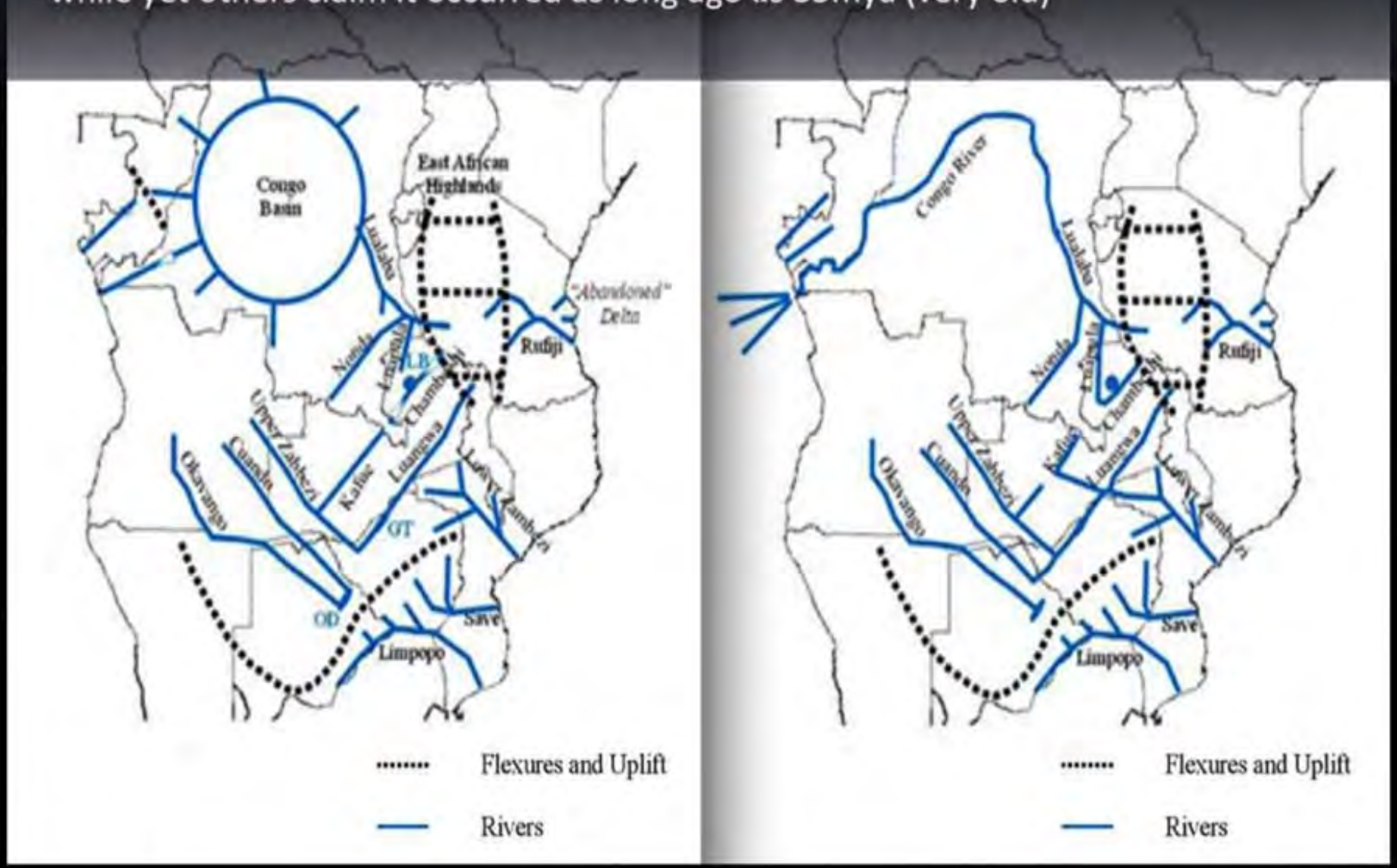
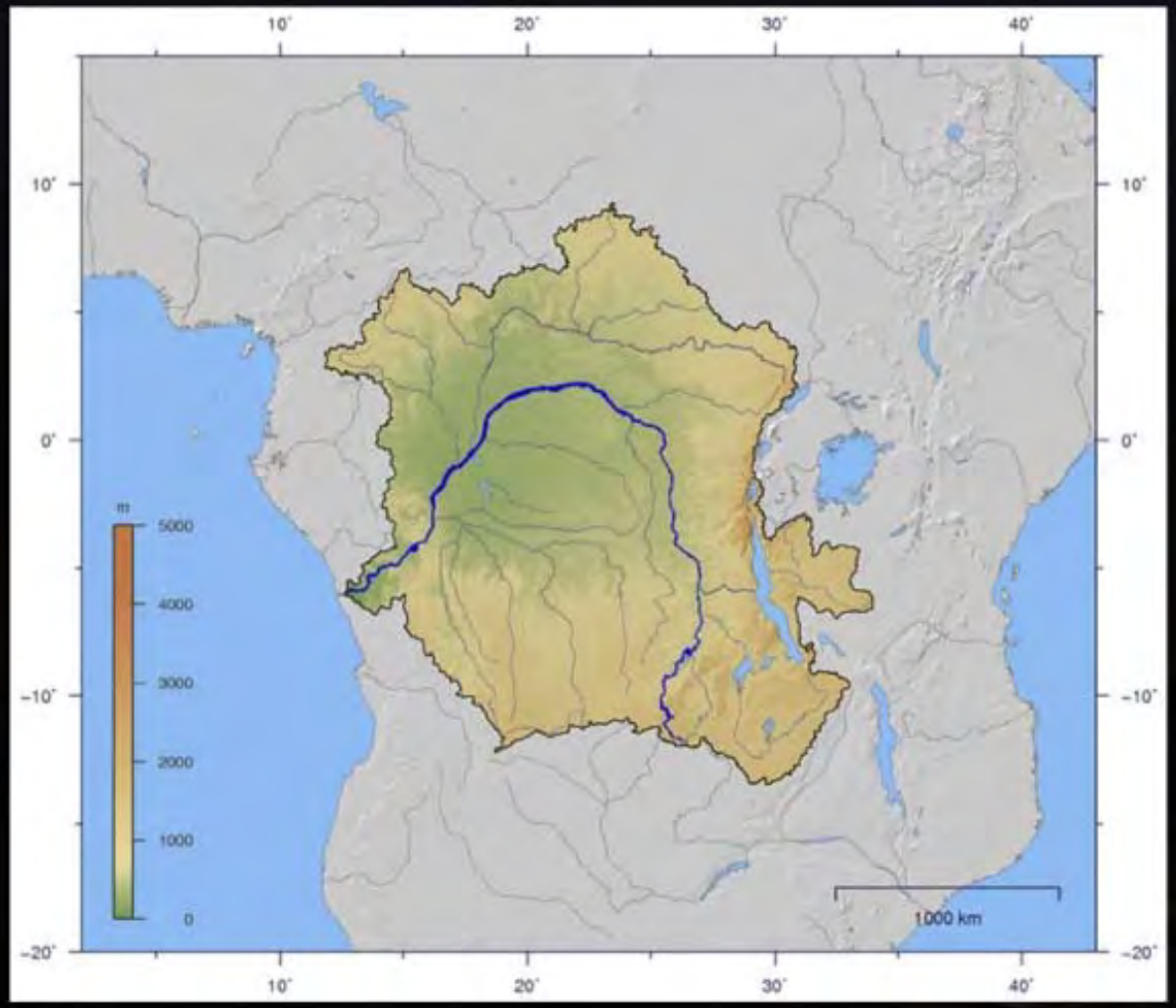
BUT others claim the capture event happened as recently as 400,000 ya (very young) while yet others claim it occurred as long ago as 35mya (very old)





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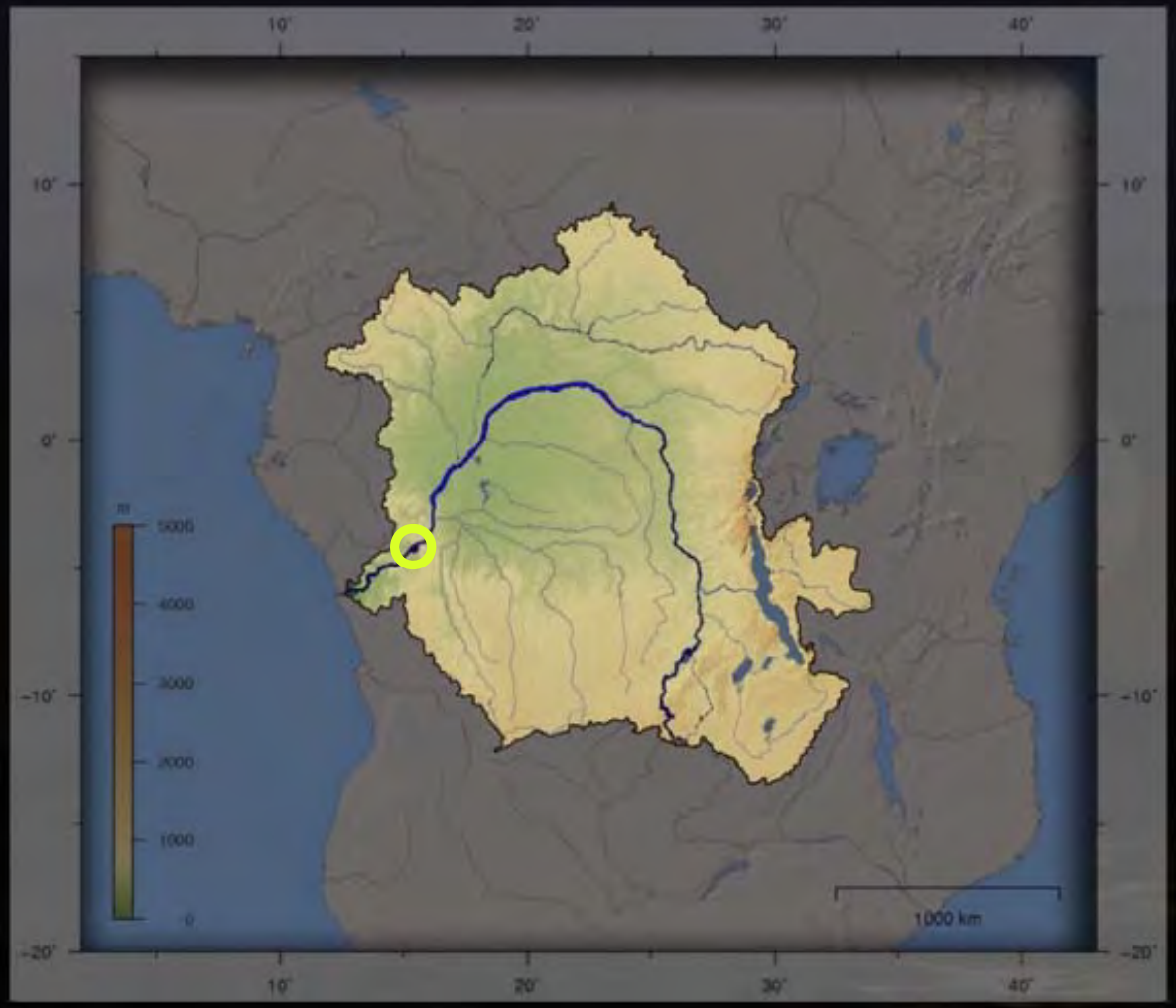

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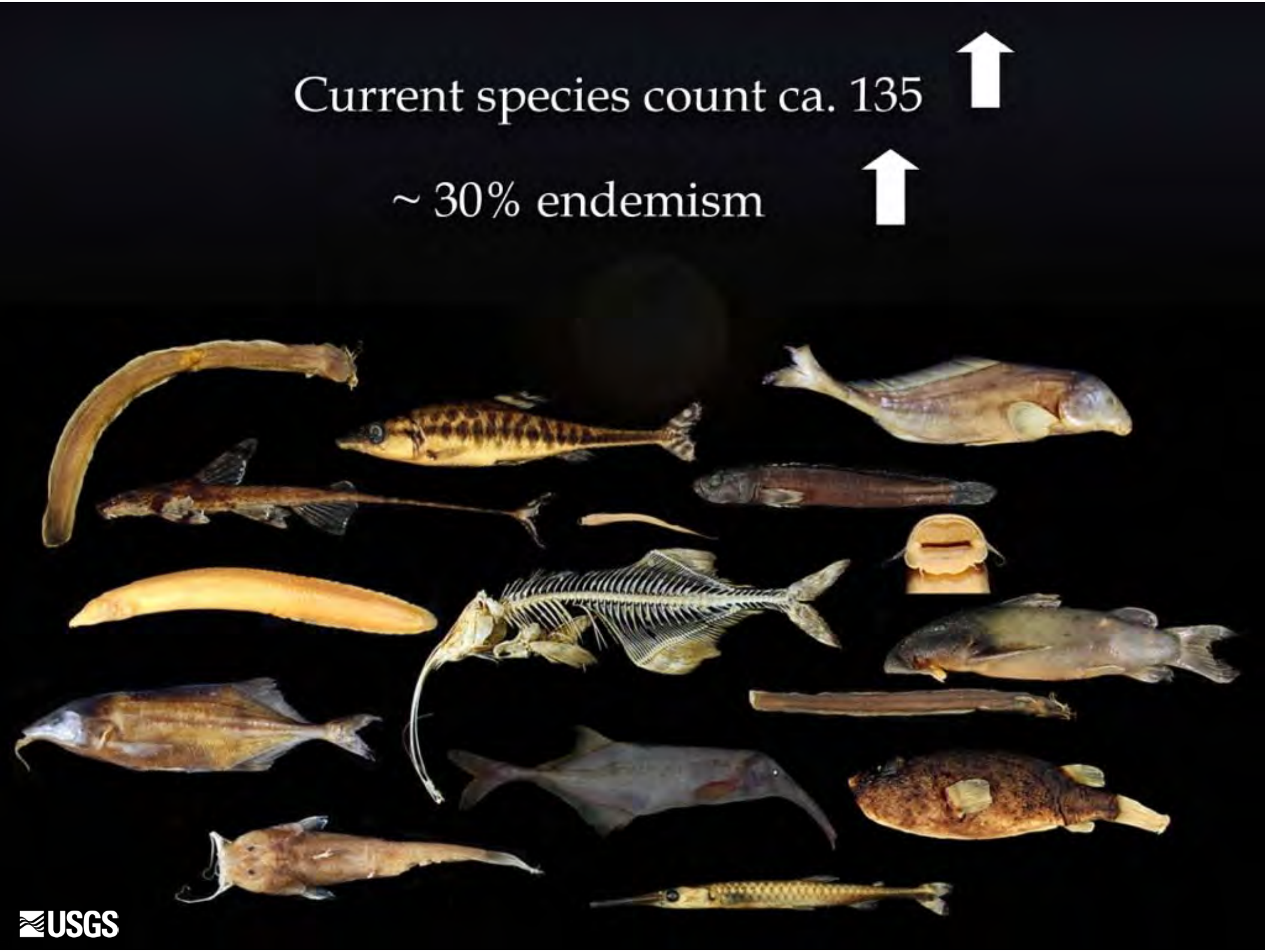
KINSHASA
ZAÏRE
Kasangulu
Madimba
NGUNGU
Luozi
Tshela
Seke-Banza
Lukula
BOMA
MATADI
Songololo
OCEAN ATLANTIQUE
ZAÏRE
Pool Malebo
300m
200m
100m
Matadi + 4m
350 km


Current species count ca. 135
~ 30% endemism
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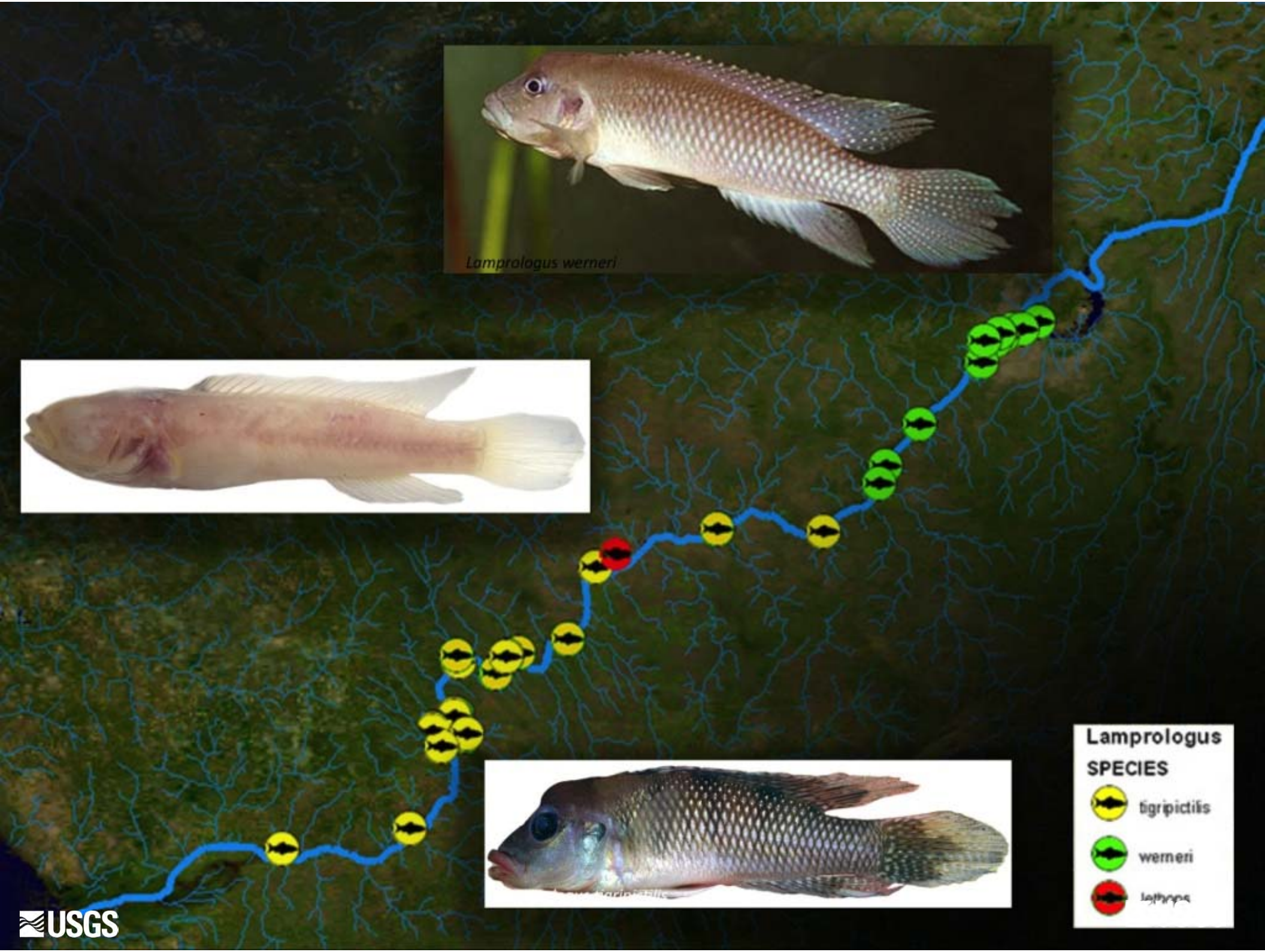
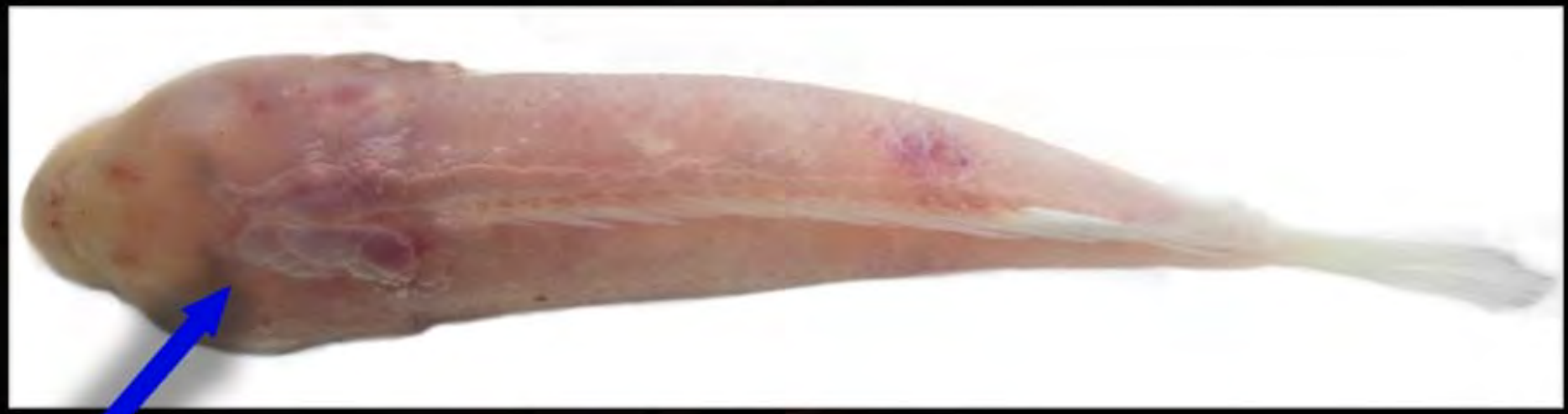

Lamprologus werneri
Lamprologus
SPECIES
tigripictilis
werneri
USGS

Lamprologus lethops



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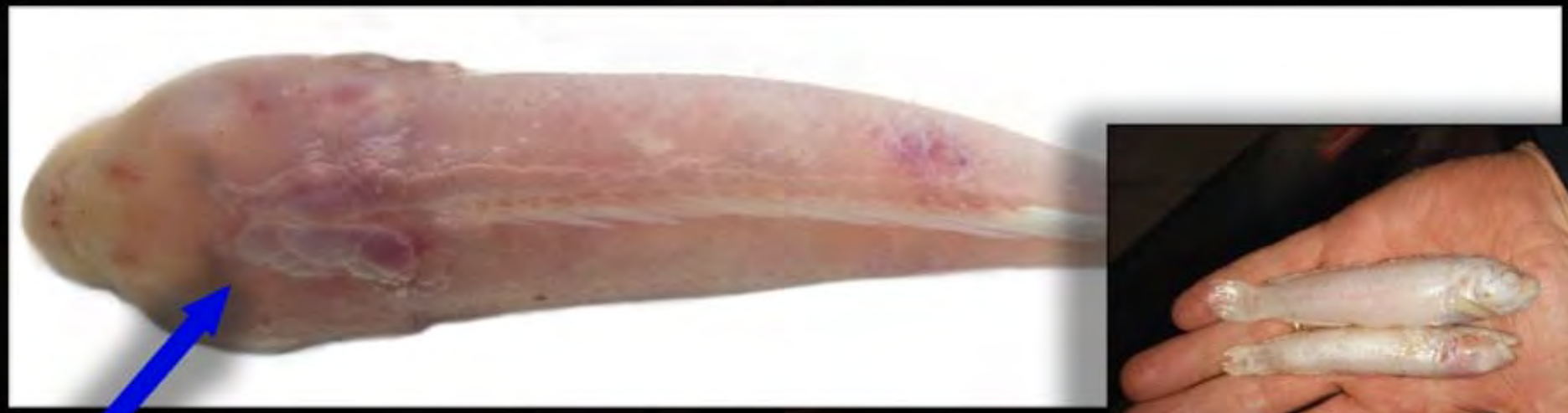
Lamprologus lethops



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Field Verification and Hydroacoustic Measurements

- 7-man kayak team
- 85 mile reach (137 km)
- NGS Photo/ videography
- Single line bathymetry

- 2-man "hydrology team"
- Velocity/bathymetry mapping

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Kayak Team

- Differential GPS
- Echo sounder
- Power supply
- Data logger
- Kayak-cam
- Helmet-cam
- QW sampling supplies

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Kayak Team

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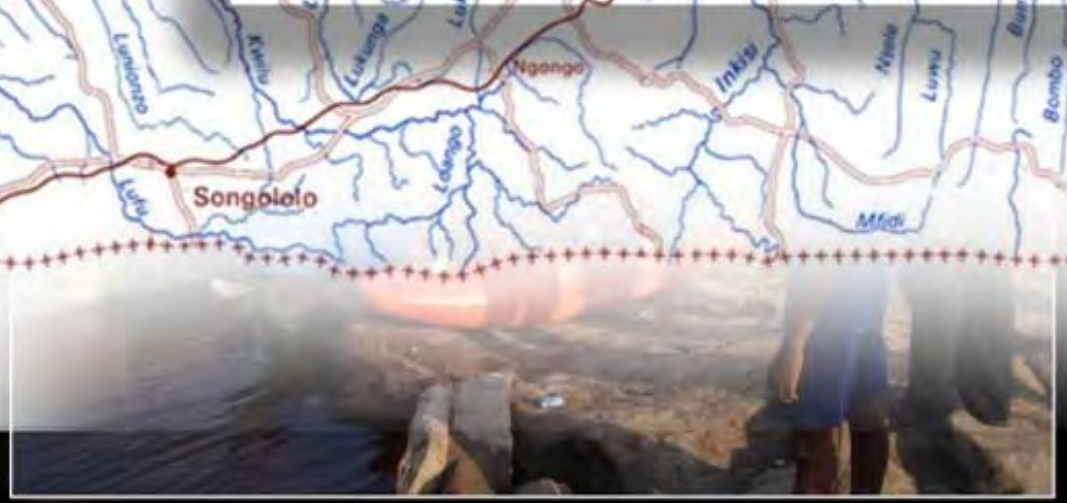
Kayak Team



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John & Ned's Excellent Adventure

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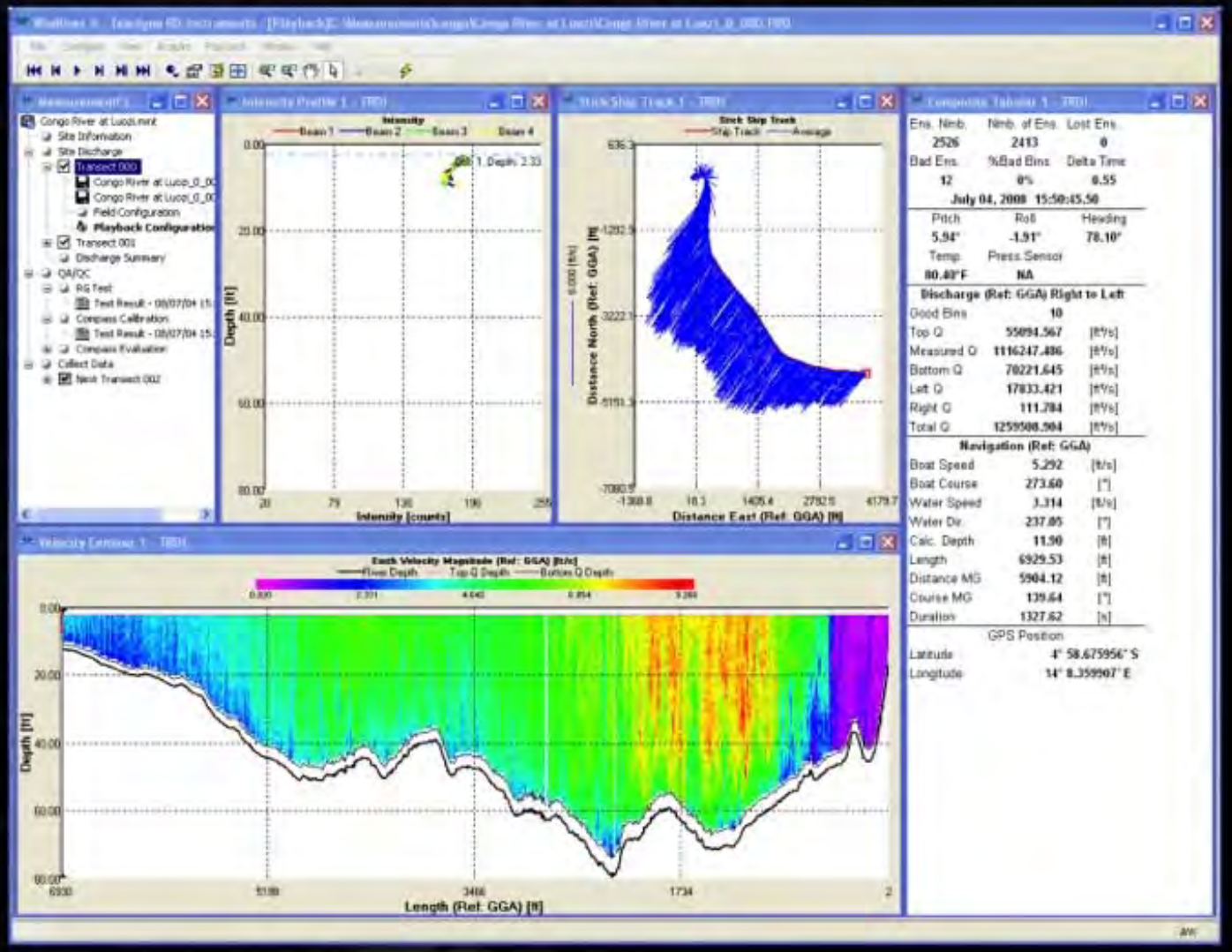
Congo River at Luozi

- 1.26 million CFS in 22 minutes
- 1.3 miles wide
- 80 feet deep



- 35,680 CMS
- 2.1 km wide
- 24.4 m deep

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…upstream to Pioka
Trimble
USGS
USGS

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Processing Issues

- Power
- Power
- Bugs

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…downstream to Bulu
ADPL
ADPL
ADPL
USGS


Water-quality monitor
Solar Panel
Differential GPS
Echo sounder transducer
300 kHz ADCP
Laptop
Echo sounder
Power supply

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What IS the deepest river??

Bottom Track Tabular

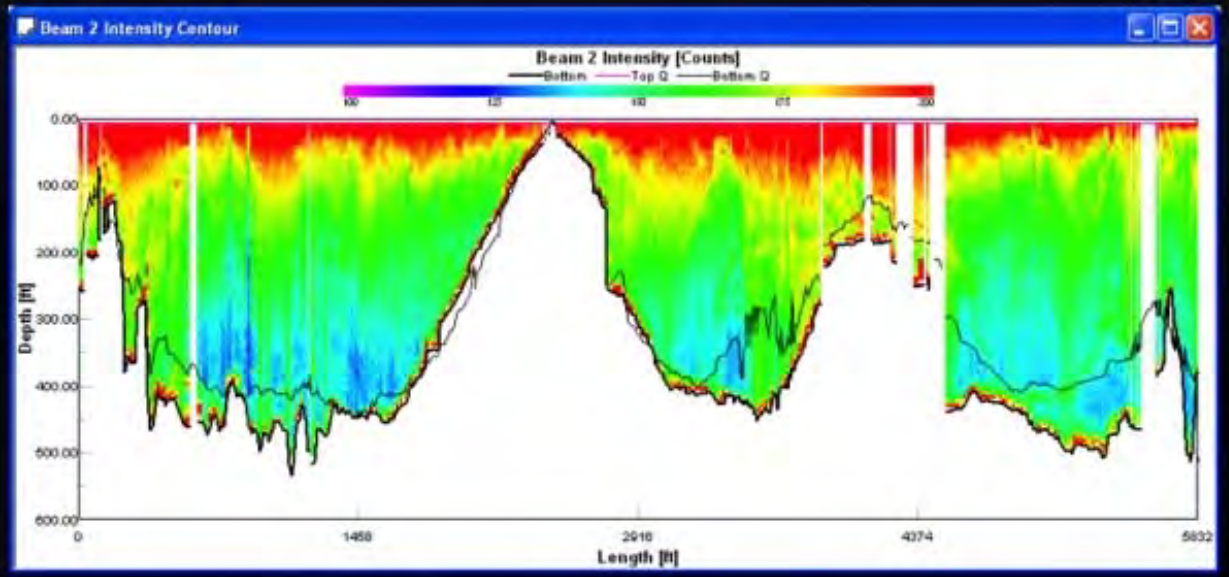
Bottom Velocity [ft/s]

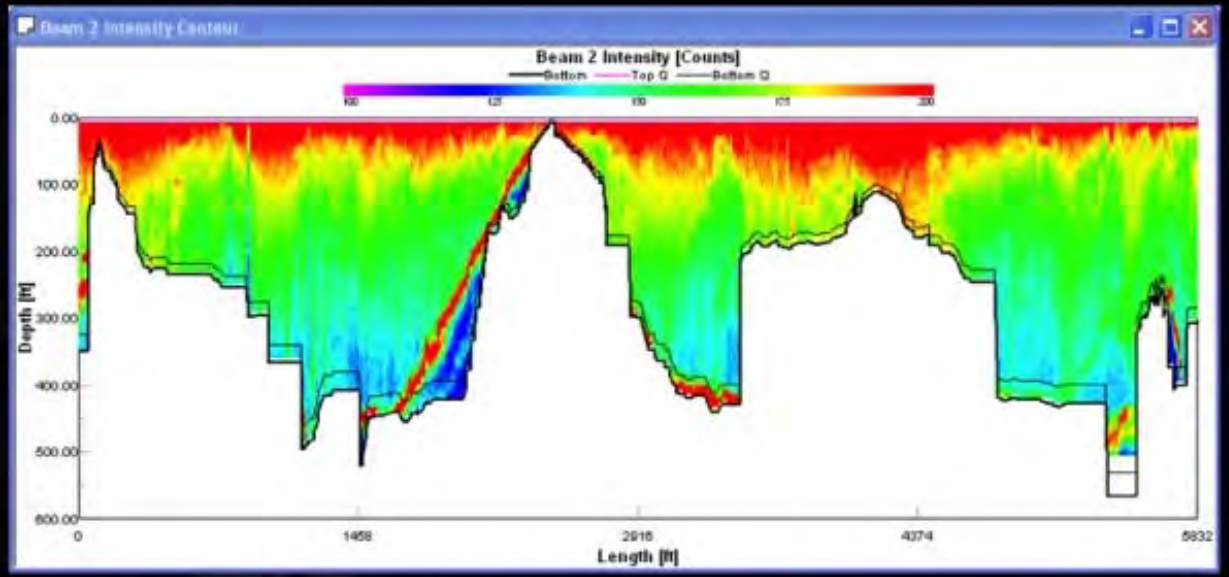
East	North	Up	Error
1.340	0.586	0.020	-0.007

Beam Depths [ft]

332.07	512.40	409.93	389.46

512 ft
156 m





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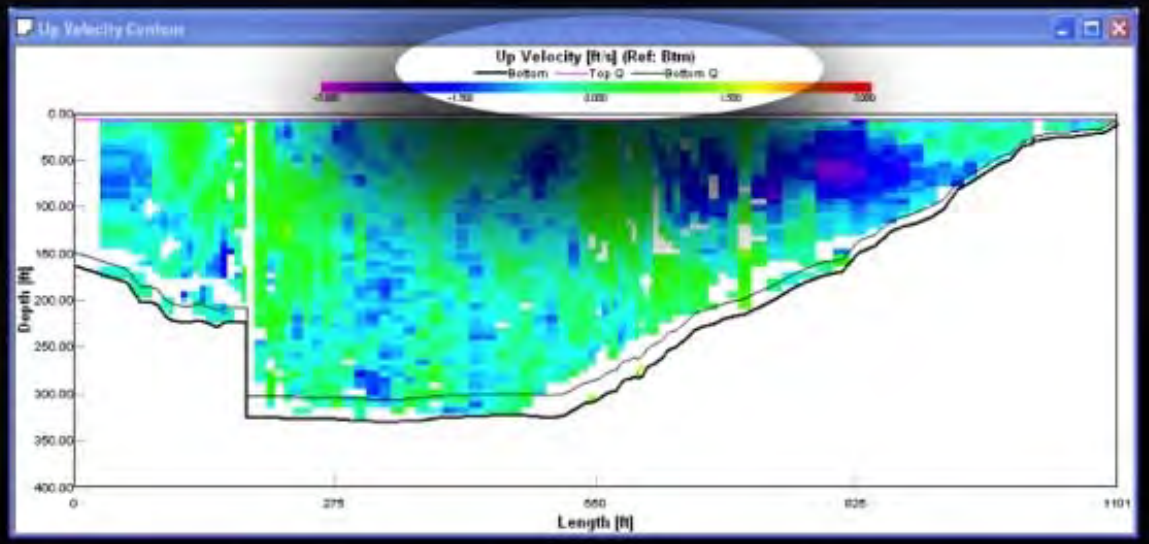
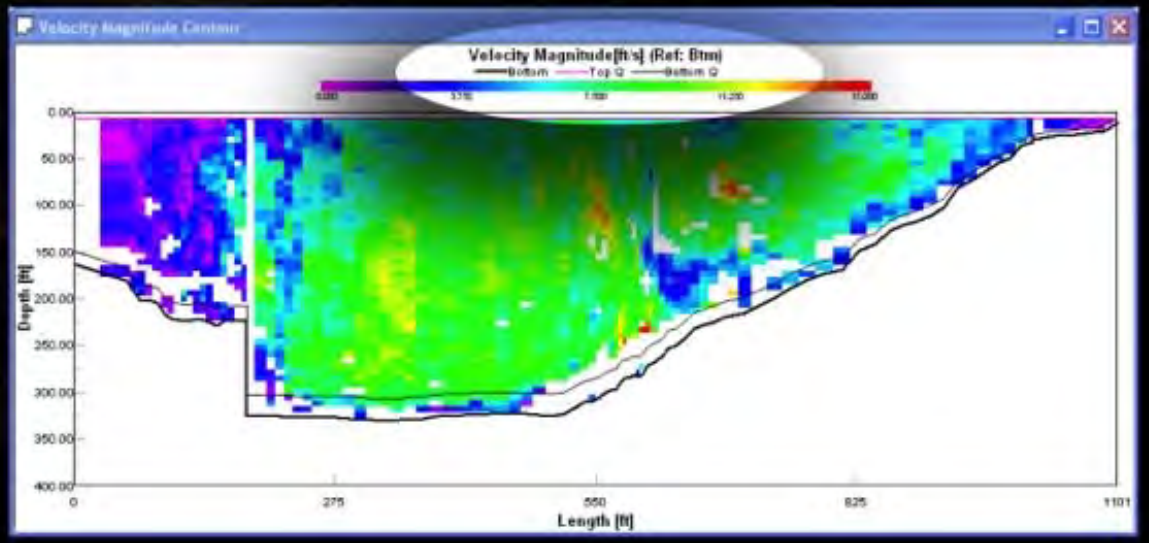
Velocity Distribution--Relearned

- Areas of significant down-welling



- Downstream "jets" at depth



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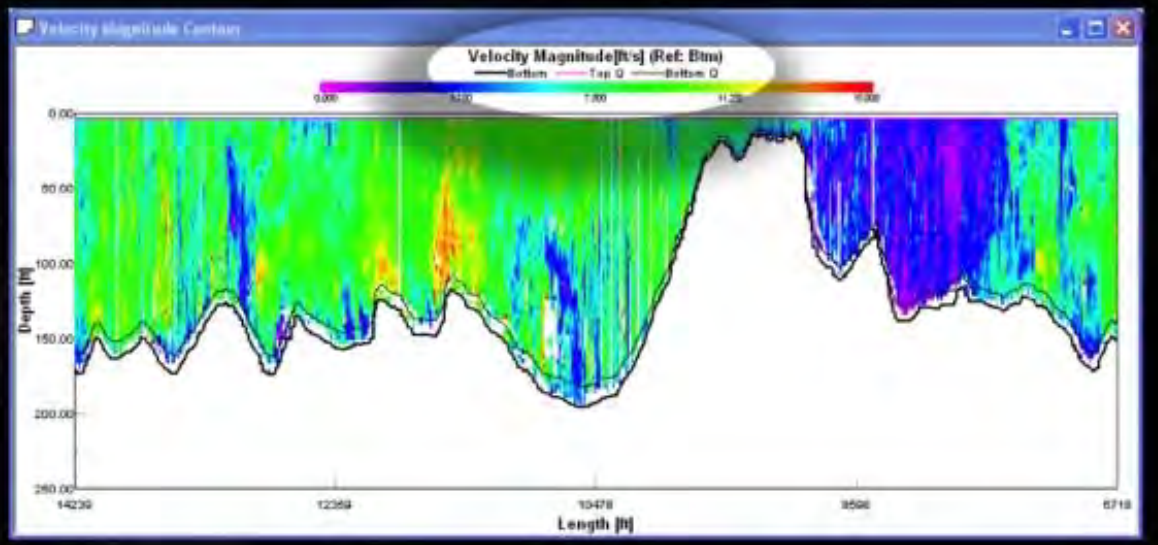
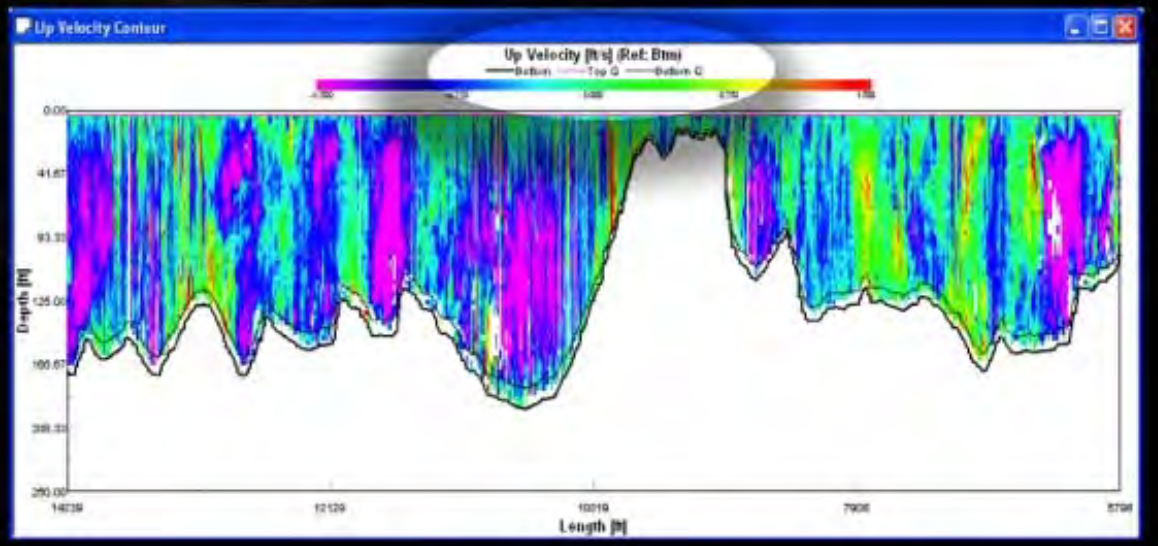
Turbulence Definition—Longitudinal transect

- Accelerations in "constricted" areas

  16 ft/s
  4.9 m/s

- Velocity "ramps" and "dives" due to bedforms





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“The Turbulence”

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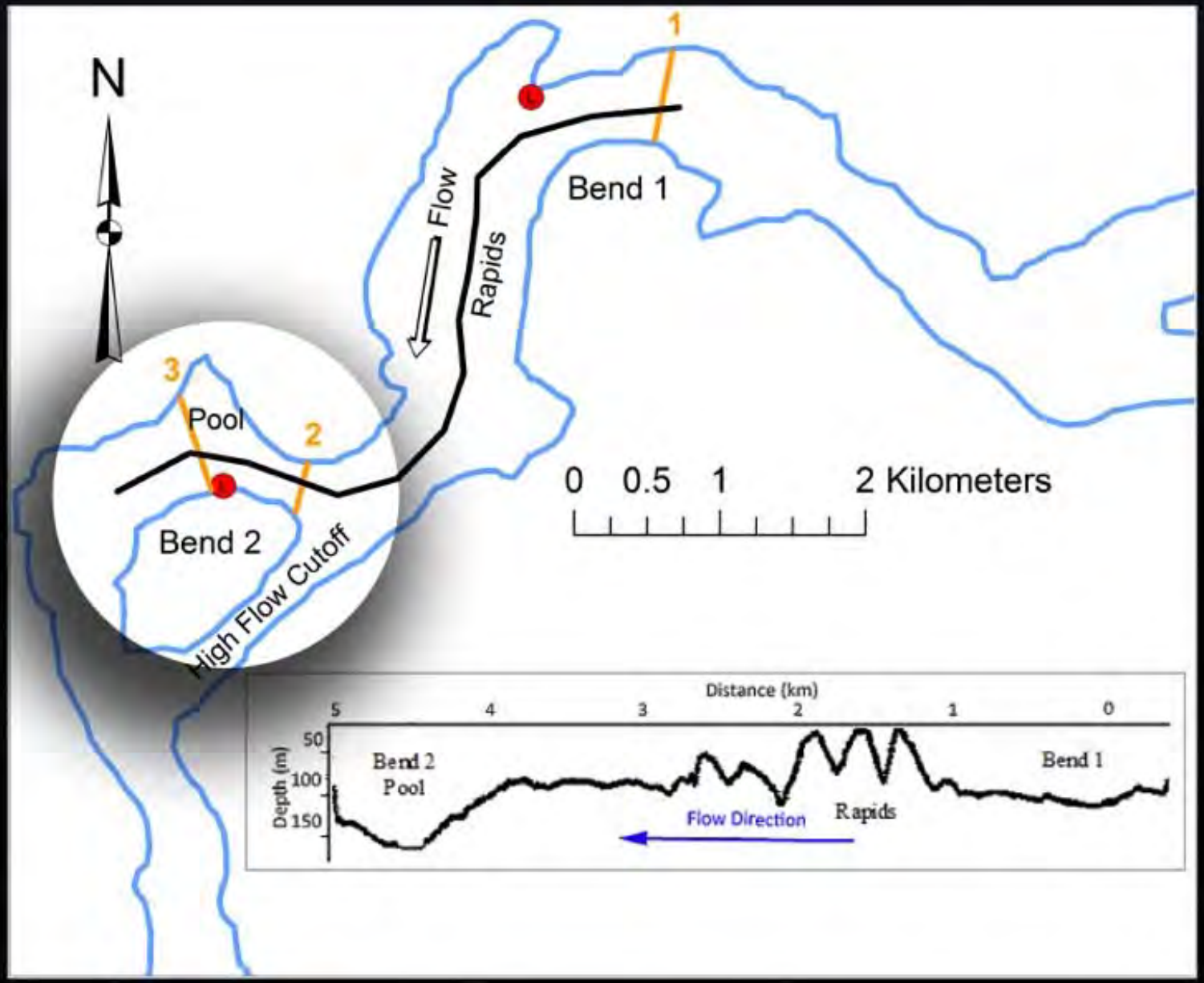

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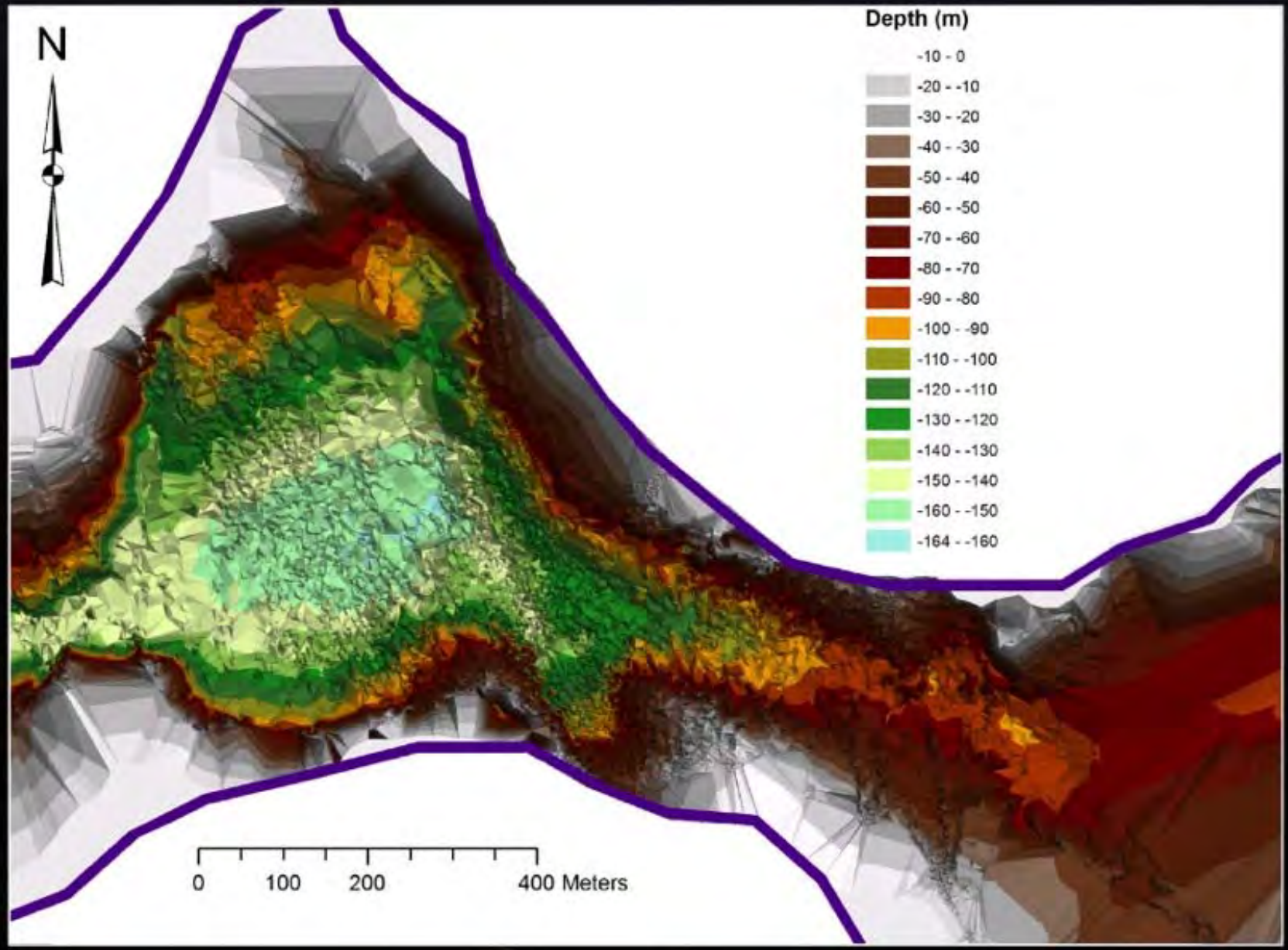

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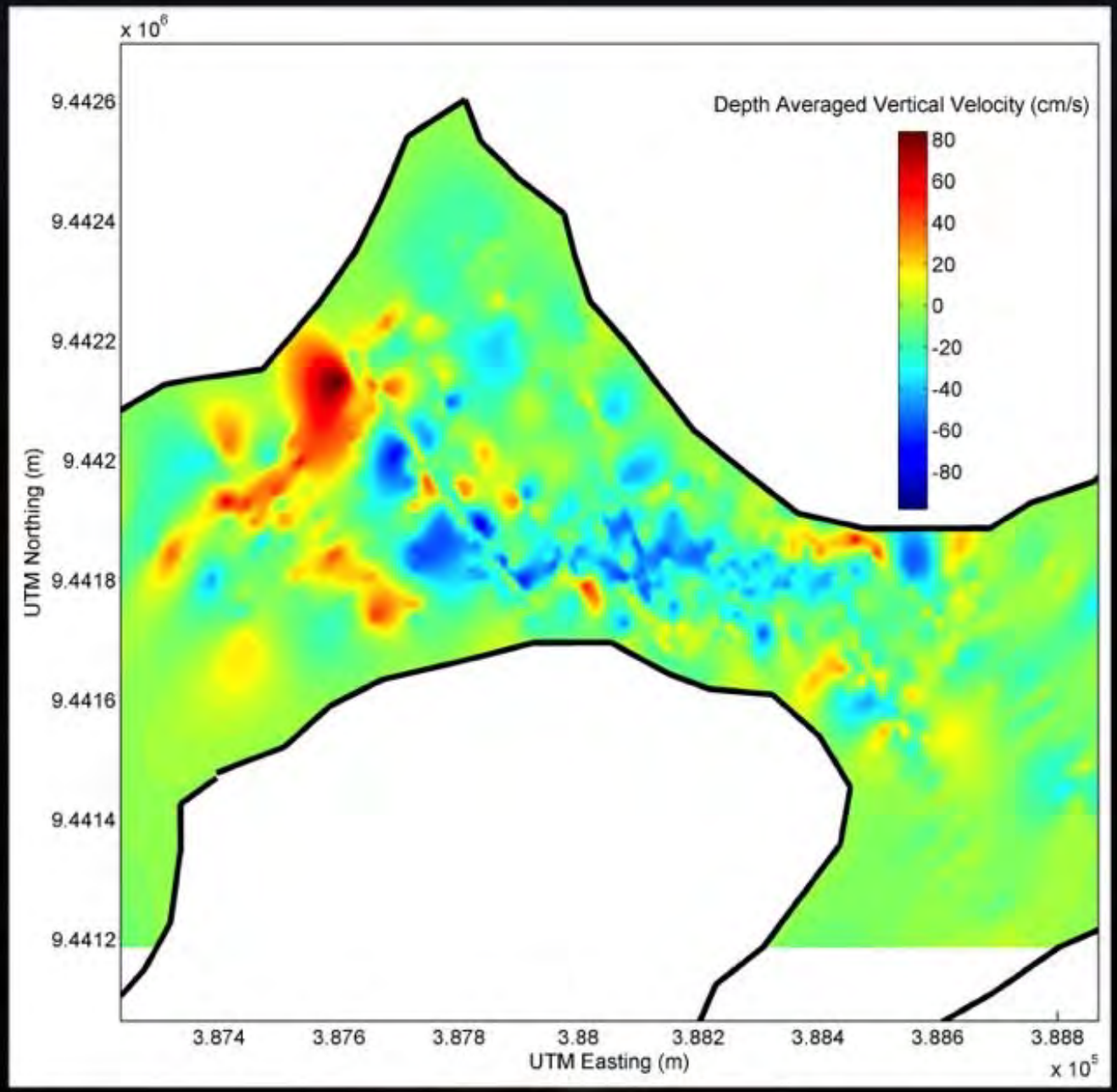

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Trimble
RECORD
DELL
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STAR
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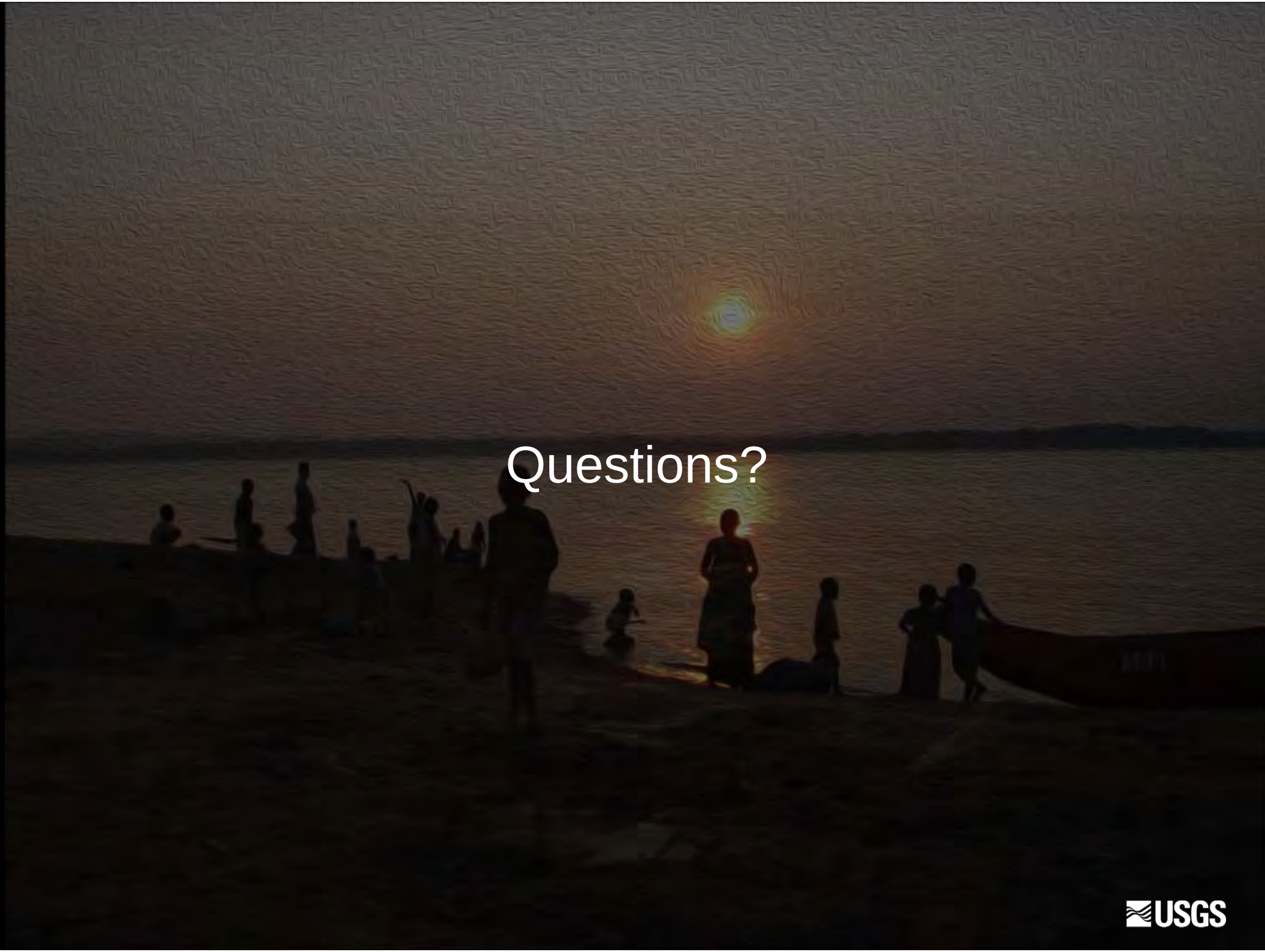
Questions?
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