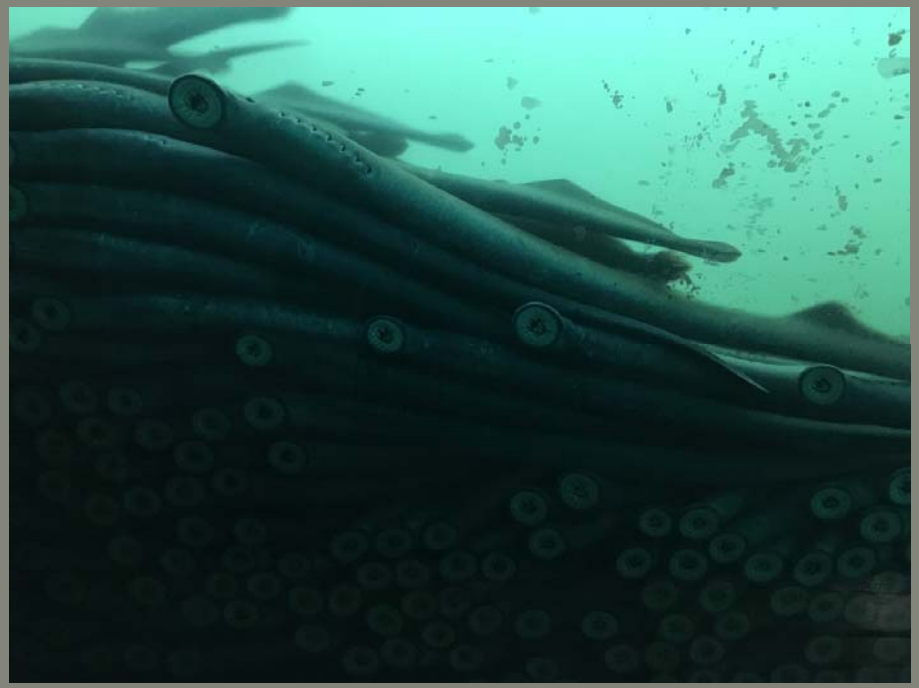
ADULT PACIFIC LAMPREY PASSAGE AT MAINSTEM COLUMBIA AND LOWER SNAKE RIVER DAMS: Approach and Lessons Learned



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Fish Passage Section, USACE Portland District

Pacific Lamprey Summit IV
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LOWER COLUMBIA AND LOWER SNAKE RIVER DAMS

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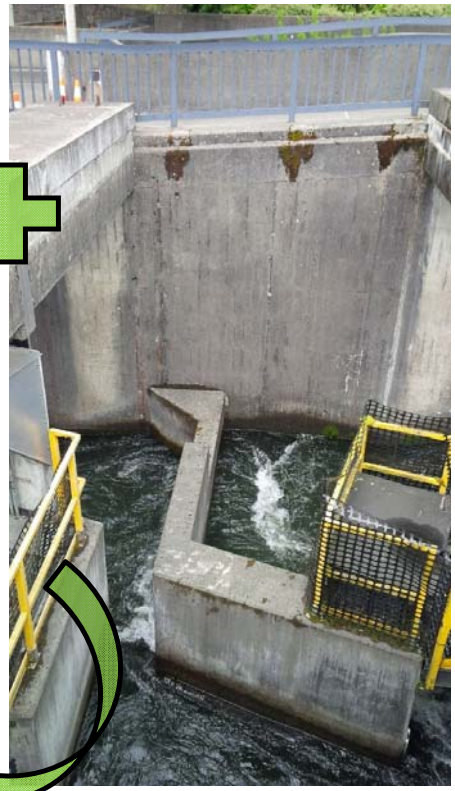
INITIAL ADULT LAMPREY PASSAGE EFFORTS (1996 – 2008)

- Low passage success (<50% total dam passage efficiency) at Bonneville Dam; similar trend at upstream dams.
- High attrition rates as fish move upstream through hydrosystem.
- Problem areas:
  - Entrances
  - Collection Channels & Transition Pools
  - Count Stations
  - Upper Ladder Flow Control Sections
- Design and installation of first Lamprey Passage Structures (LPS) at fishway dead end locations at Bonneville Dam.

Photo courtesy of Chris Peery



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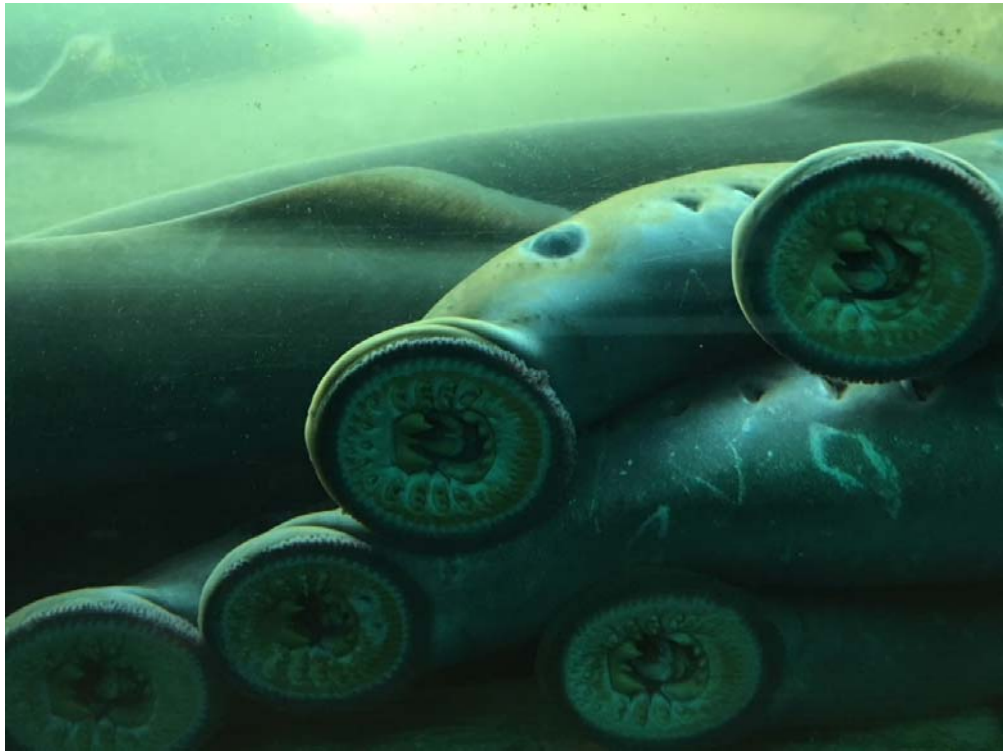
6 PRINCIPLES OF THE CORPS' APPROACH

1. Ensure that lamprey actions do not conflict with salmonid recovery efforts.
2. Acknowledge and apply what we *do* know.
3. Think strategically, focus scope, and piggy back on salmon efforts and work by others.
4. Lean forward to achieve Accords goals – More risk that we're used to.
5. Fix known problems as funding allows.
6. Focus where ***passage is worst*** and the ***greatest number*** of fish are affected.



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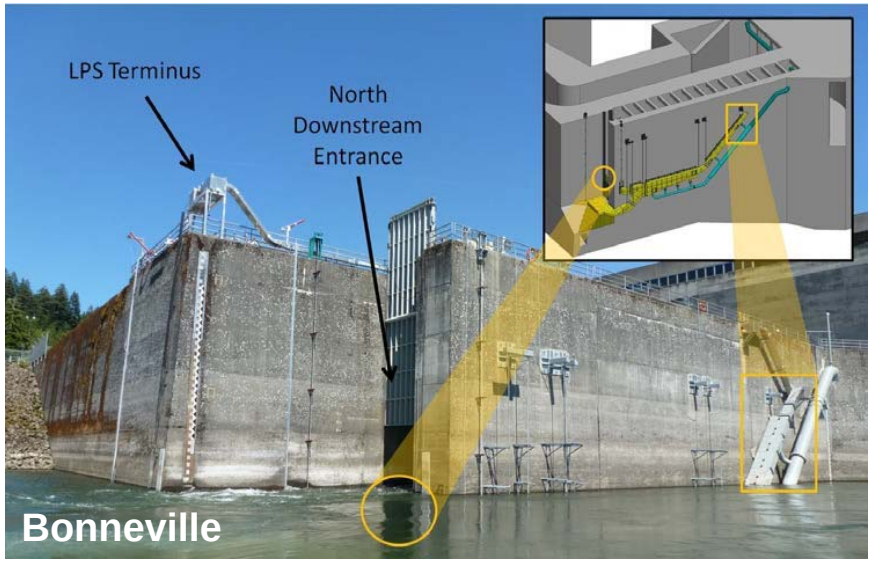
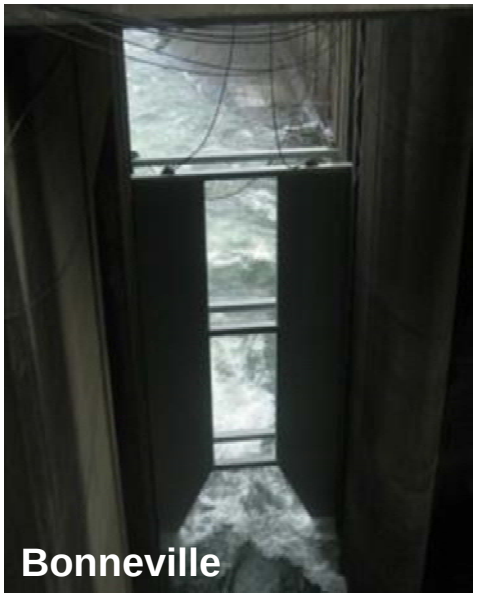
ADULT LAMPREY PASSAGE ACTIONS: FISHWAY ENTRANCES





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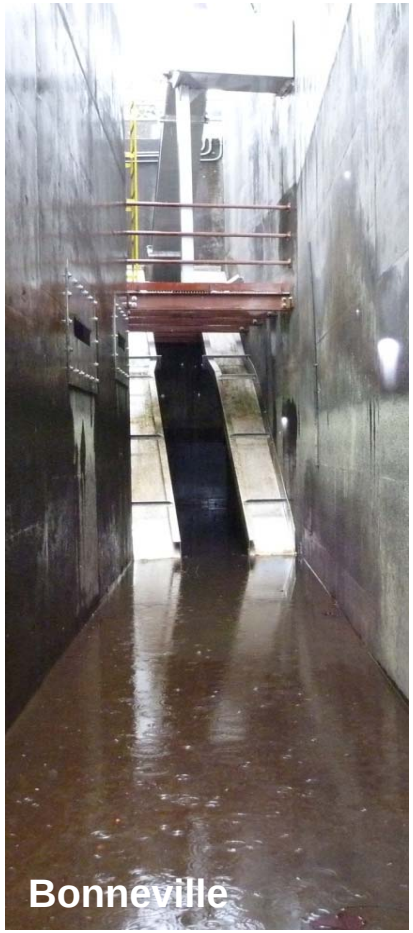
ADULT LAMPREY PASSAGE ACTIONS: LAMPREY PASSAGE STRUCTURES



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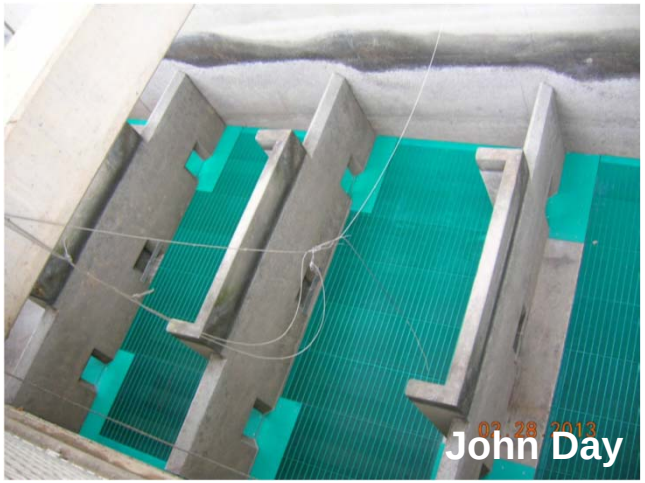
ADULT LAMPREY PASSAGE ACTIONS: FISHWAY MODIFICATIONS



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ARE WE IMPROVING PASSAGE? ITS COMPLICATED…

	2010-2013 Actions	Median Baseline Dam Passage Efficiency (1997-2010)	Dam Passage Efficiency (2014)
Bonneville	Cascades Island Entrance and LPS; Reduced nighttime entrance velocities at WA Shore Ladder; Various minor structural changes.	44% (range=31-48%, n=10 years; 3,250 fish total)	49% (n = 453)
The Dalles	Various minor structural improvements.	68% (range=55-79%, n=10 years; 665 fish total)	47% (n = 157)
John Day	Redesign of control (exit) section of ladder; Variable width entrance weir; bollards/baffles on floor at entrance; ¾" diffuser grating throughout; diffuser plating throughout; temporary LPS to tailrace deck.	46% (range=0-53%, n=6 years; 319 fish total)	83% (n = 48)

Total Dam Passage Efficiency = unique RT-tagged fish that passed / unique tagged fish that approached a fishway.

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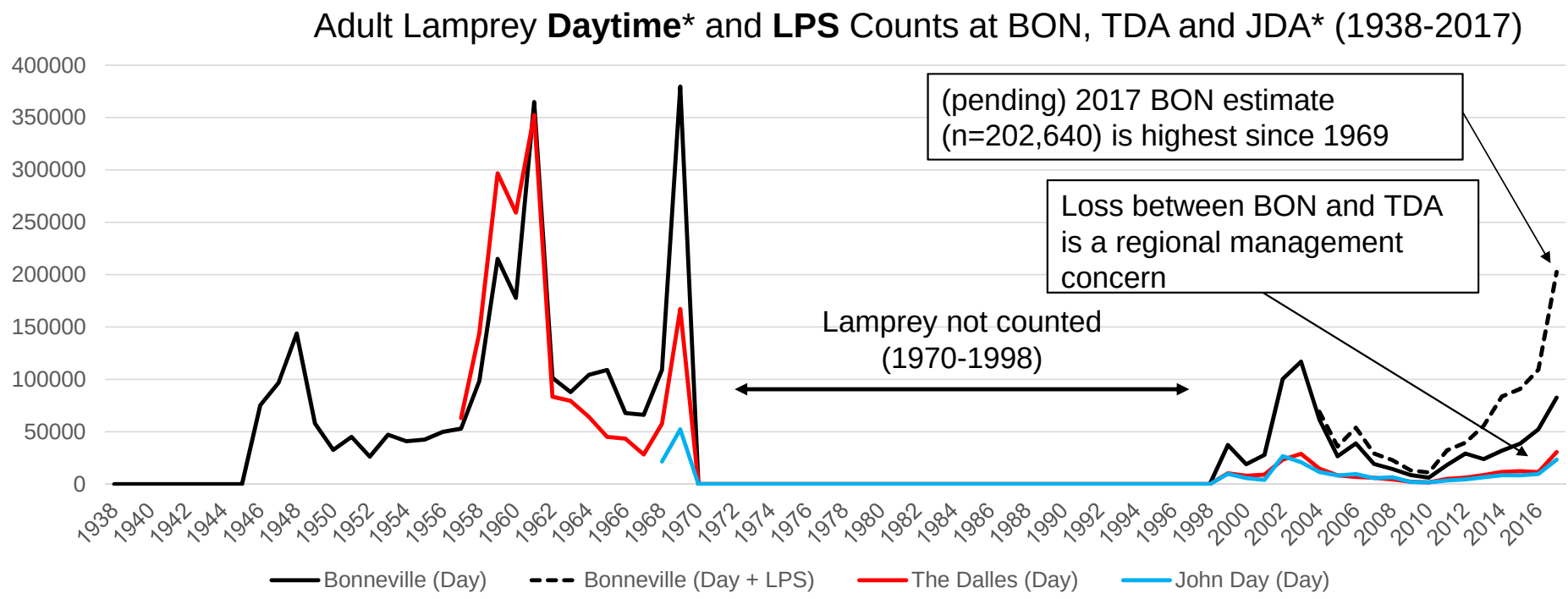
ADULT LAMPREY PASSAGE ESTIMATES (BONNEVILLE TO JOHN DAY)



**Lamprey are more active at night; daytime counts are minimum estimates. The Corps collects nighttime counts at most dams, but reliability of counts at BON is poor.*

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ADULT LAMPREY PASSAGE: TAKE-AWAYS

- **LPSs** present a relatively low cost/low impact (salmonids) solution, and not just in “dead end” areas of fishways.
- **Adaptive management** in practice…Keefer et al. (2013) data synthesis and prioritization model was a powerful tool for identifying the most problematic fishway segments and estimating benefits at monitored dams.
  - Shifted focus from improving/bypassing fishway entrances at Bonneville to boosting overall dam passage efficiency through new LPSs and modifications at control sections of ladders. Results TBD (2018-19).
- **Documentation of design** history, process and criteria is very important, whether new structures succeed or fail.
  - Dissemination of design concepts to others across the range of the species.
  - Transition of mainstem passage structures from experimental to permanent structures.
- **Long-term O&M** planning critical (counting, inspections, etc). Always keep the “O&M tail” in mind and ask whether you have the resources to keep things going.
- **2018-19 radio-telemetry and PIT** evaluation will tell us a lot!

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ADULT LAMPREY PASSAGE: PERSISTENT CHALLENGES

- Defining “success” and biologically relevant passage metrics or interim targets at multiple scales (reach > dam > fishway).
  - How does life history strategy affect migration behavior at mainstem barriers, particularly for naïve fish?
  - What does this mean for interpreting passage behavior at dams or poor dam-to-dam conversion, particularly between Bonneville and The Dalles?
  - Tougher to evaluate at McNary and at Lower Snake River dams (sample size).
  - 2018-2019 radio-telemetry and PIT studies should tell us more about efficacy of Accords era actions at Bonneville, The Dalles, and John Day.
- Lamprey counting and timely reporting is difficult, particularly at Bonneville Dam (an important index site). Improvements to nighttime and LPS counting are ongoing.
- Balancing lamprey passage needs with salmon passage criteria can be challenging and costly, but is necessary.

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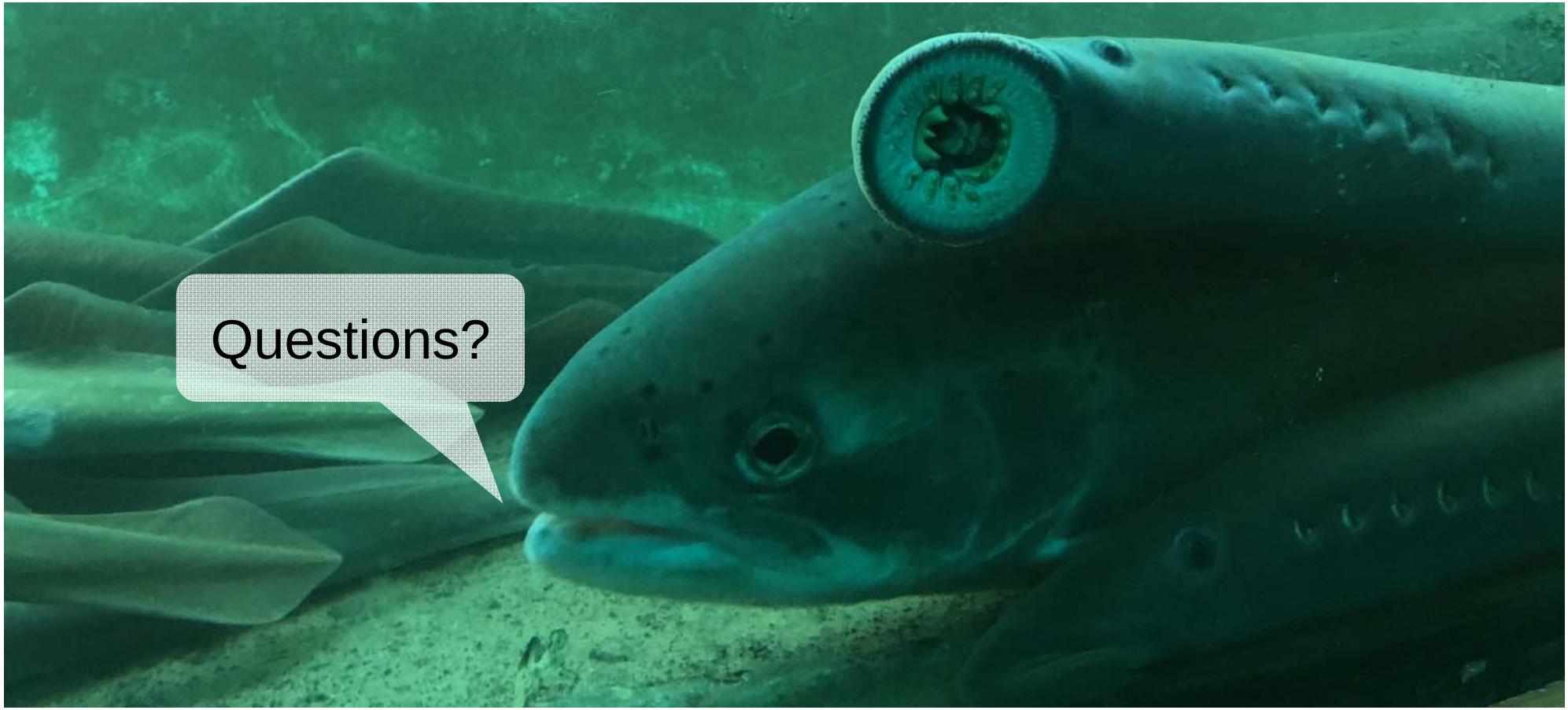

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