



A newfangled reconstruction of
the ancient, giant, sexually
dimorphic Pacific salmon,
†*Oncorhynchus rastrosus*
(SALMONINAE: SALMONINI)

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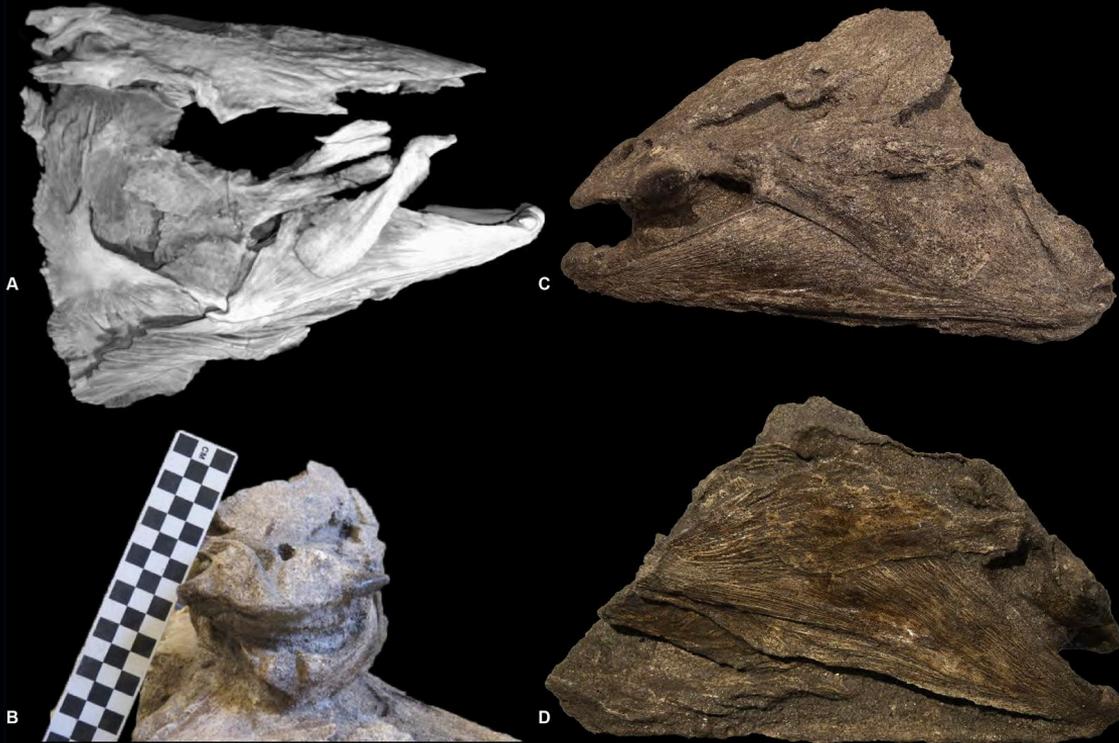
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What can we see in the newer fossils that wasn't obvious in the holotype?

What a difference an articulated premaxilla makes



†*Oncorhynchus rastrosus*.

- A. Holotype (UO 26799) in right lateral view
- B. Recently collected specimen UO_A in anterior view
- C. Same specimen in left lateral view
- D. and in right lateral view

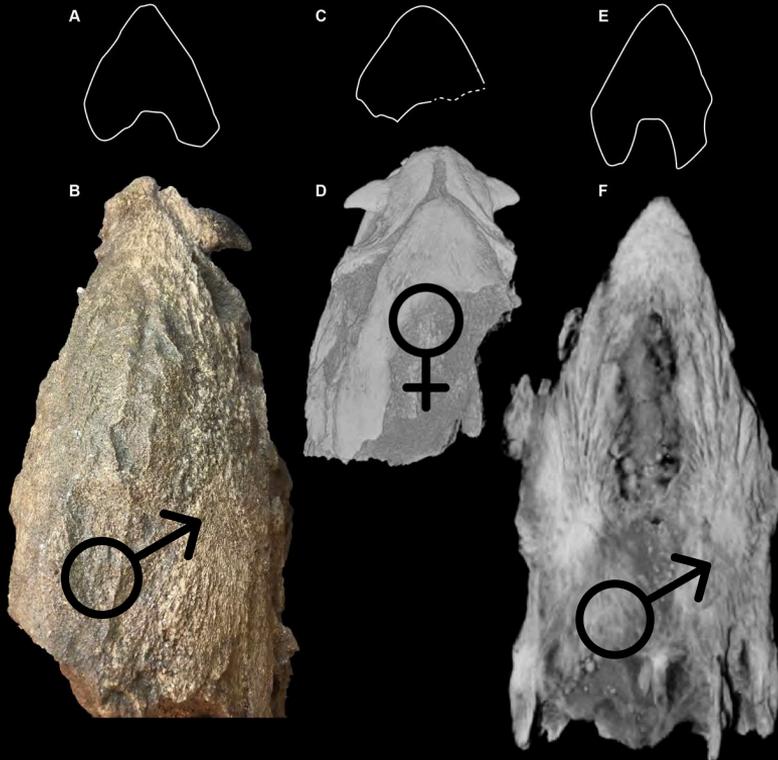
Note missing premaxilla in holotype, and prominent laterally directed premaxillary tooth clearly visible in the recently collected specimens

Males and females both had the enlarged teeth



Another recently collected specimen of †*Oncorhynchus rastrosus* (UO_B) in left (A) and right lateral views (B) displaying prominent laterally-directed premaxillary tooth on right side, and laterally directed tooth socket on left. Specimen presumably female.

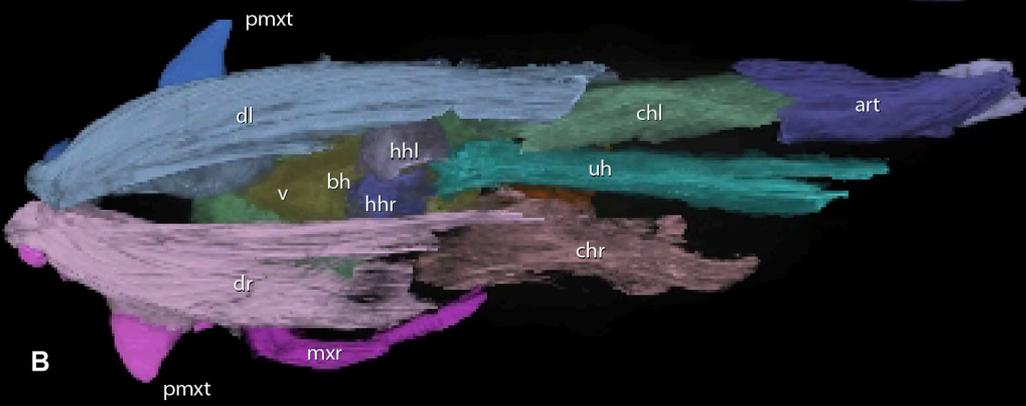
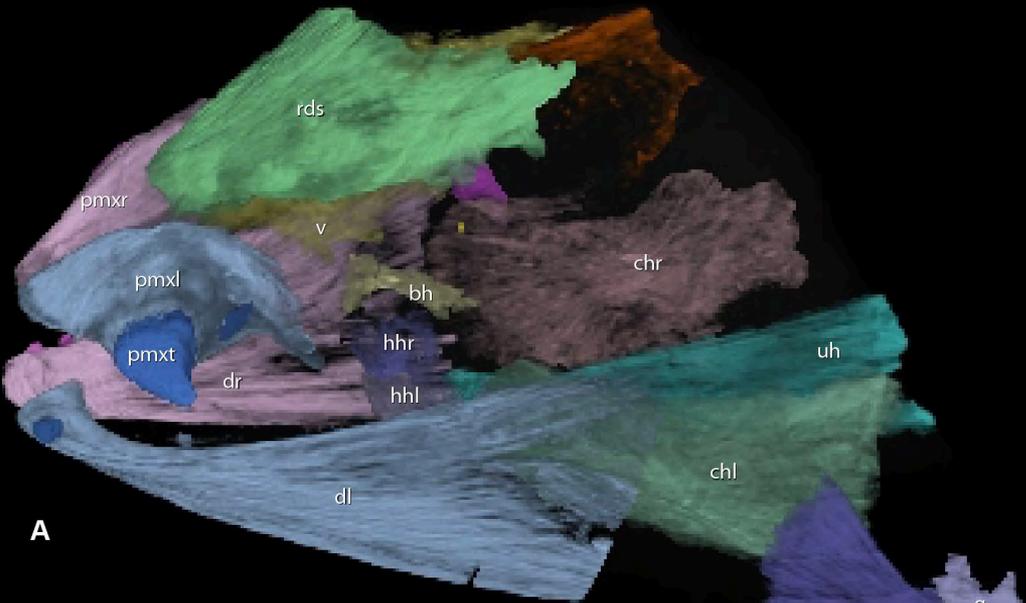
Apparent sexual dimorphism in skull shape



Apparent sexually dimorphic rostrum-dermethmoid-supraethmoid (rds) in †*Oncorhynchus rastrosus* in dorsal view, similar to that observed in living *O. nerka*. Anterior to top of page.

Full segmentation of CT scans

Segmented skull of †*Oncorhynchus rastrosus*, UO_A in left oblique view (A) and ventral view (B).

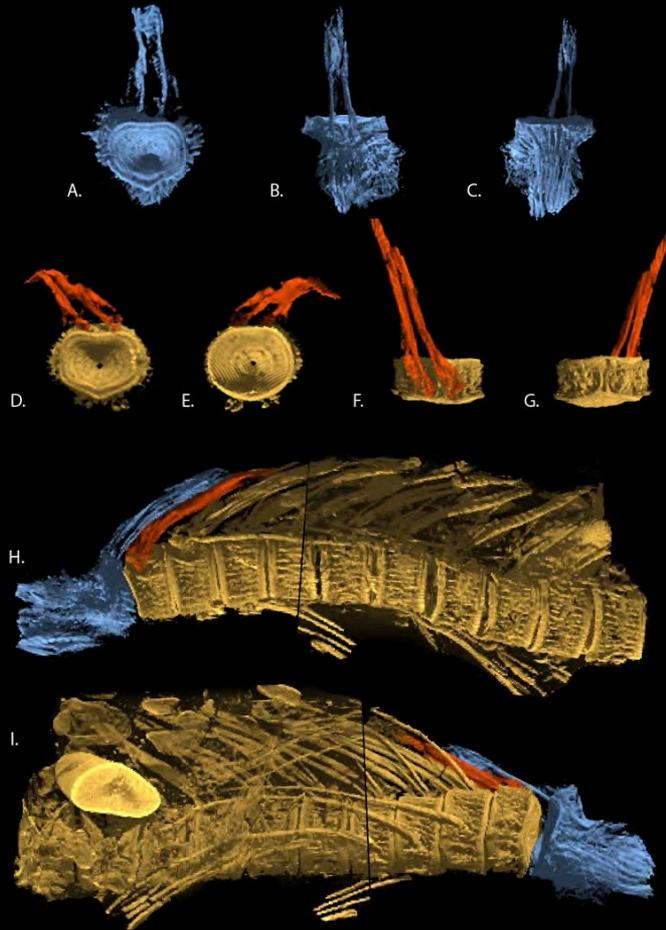




One of the newer specimens
has an intact pectoral girdle

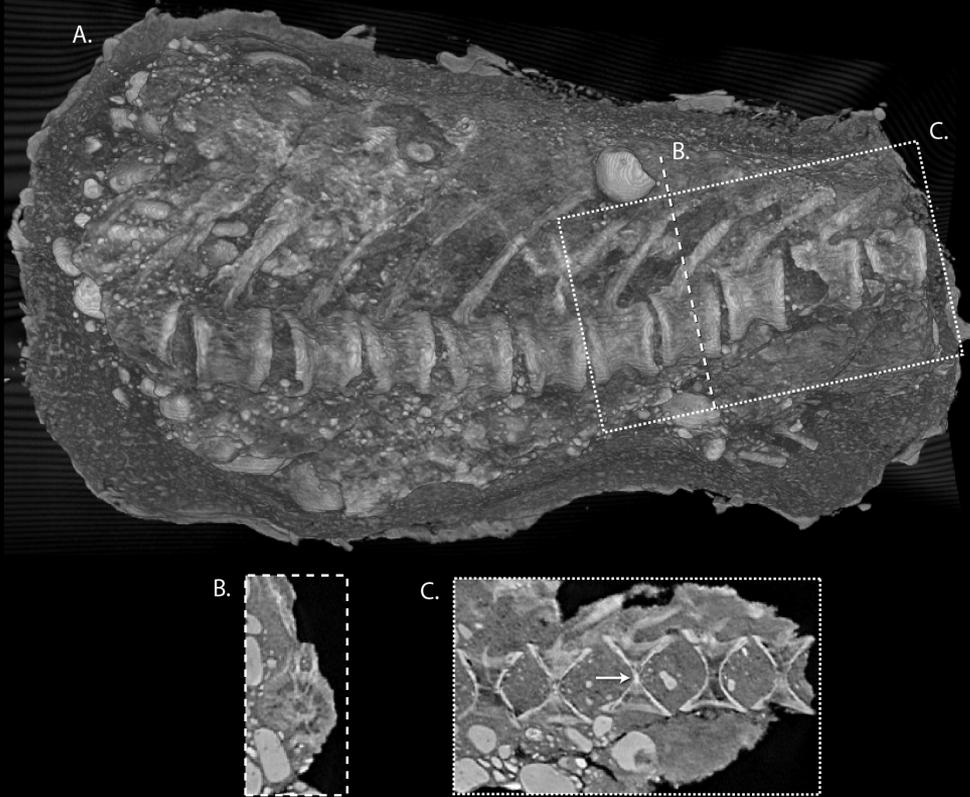
Figure 5. Pectoral girdle of †*Oncorhynchus rastrosus*, UO_C.

Great views of the anterior axial skeleton



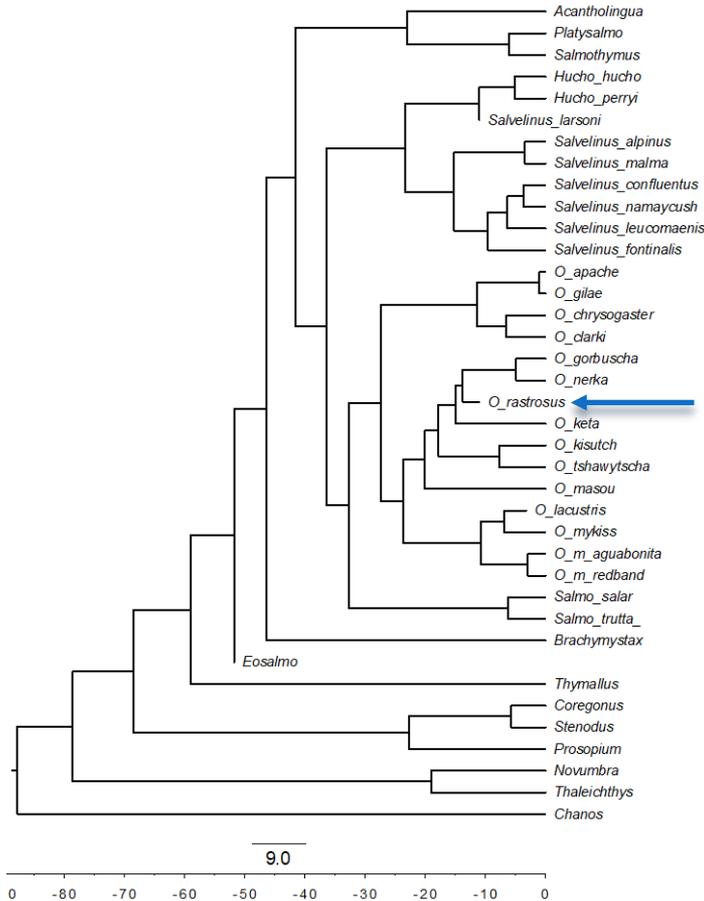
- A. Posterior view of proatlas
- B. Dorsal view of proatlas
- C. Ventral view of proatlas
- D. Anterior view of first free centrum
- E. Posterior view of first free centrum
- F. Dorsal view of first free centrum
- G. Ventral view of first free centrum
- H. Left lateral view of cranio-vertebral and anterior abdominal axial skeleton
- I. Right lateral view of cranio-vertebral and anterior abdominal axial skeleton

And the posterior

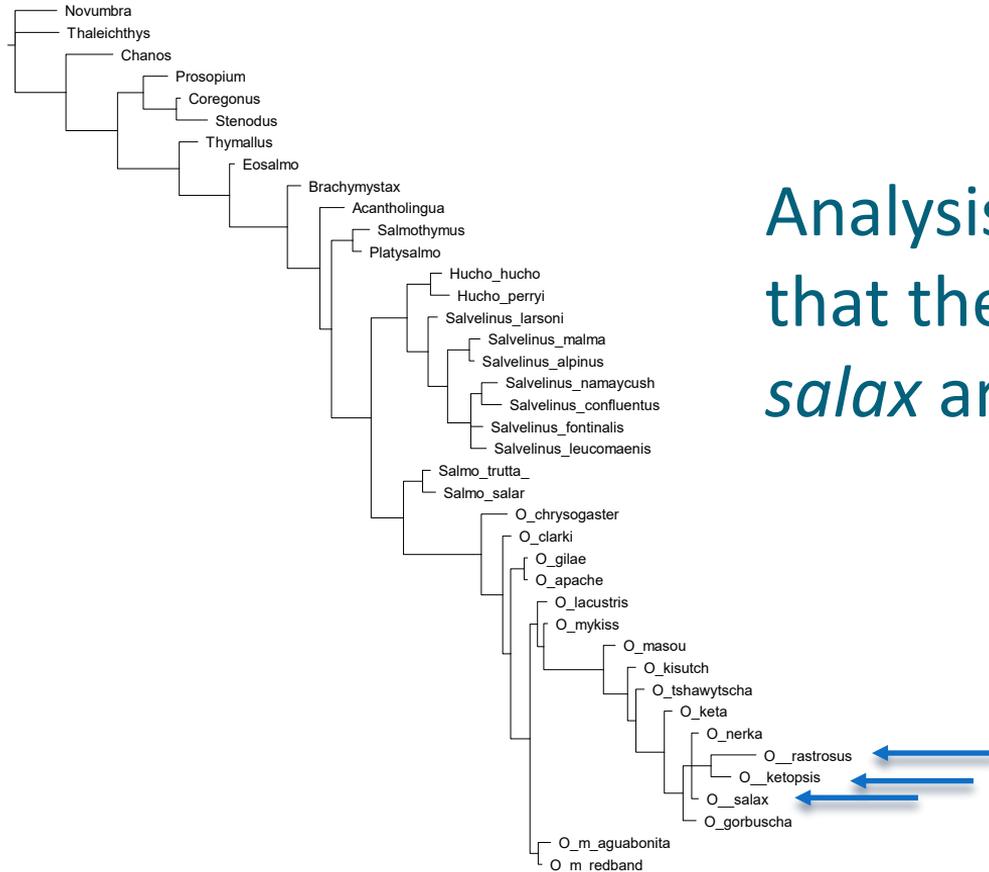


Posterior abdominal series of †*Oncorhynchus rastrosus*, UO_D. Left lateral view of articulated vertebrae (A) with axial (B) and sagittal (C) cross sections.

Phylogenetic placement and dating



- We have enough morphological information to update *O. rastrosus* in the phylogenetic dataset of Stearley and Smith (1993)
- Tip-dating in BEAST2 suggests that *O. rastrosus* split from the lineage leading to *O. nerka* (Sockeye Salmon) and *O. gorbuscha* (Pink Salmon) about 14 million years ago.



Analysis in Mr. Bayes suggests that the fossils *O. ketopsis* and *O. salax* are part of the same clade

What does all this tell us about the fish's biology?

Spikes, not Sabres



Meaning that we can probably rule out functions like these

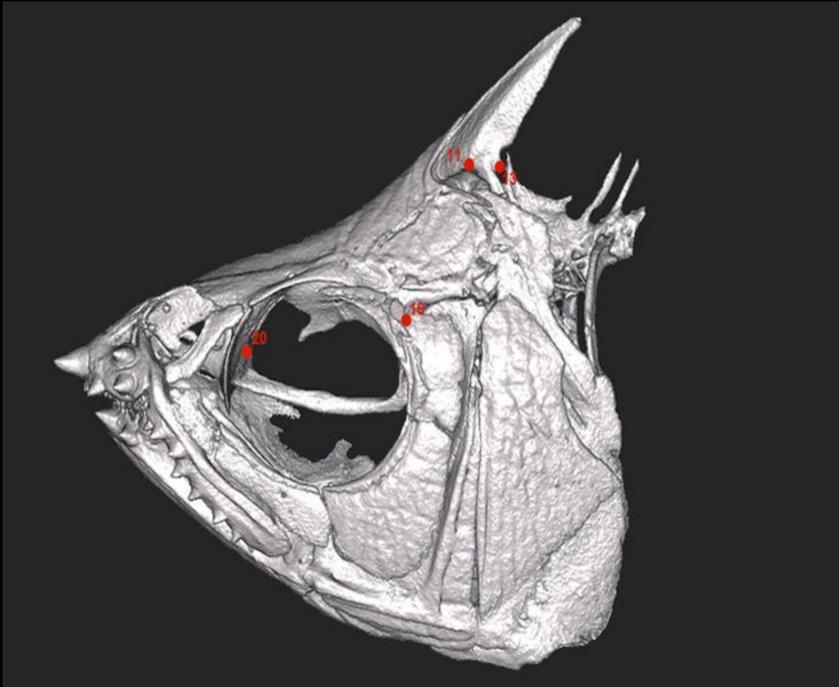


Anoplogaster - caging



Alepisaurus - slashing

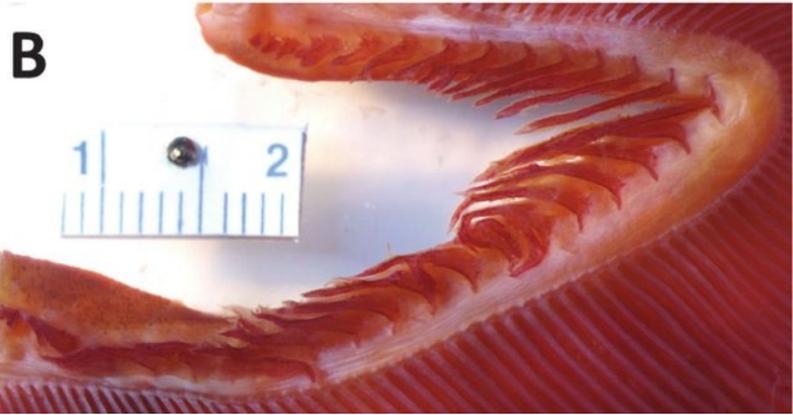
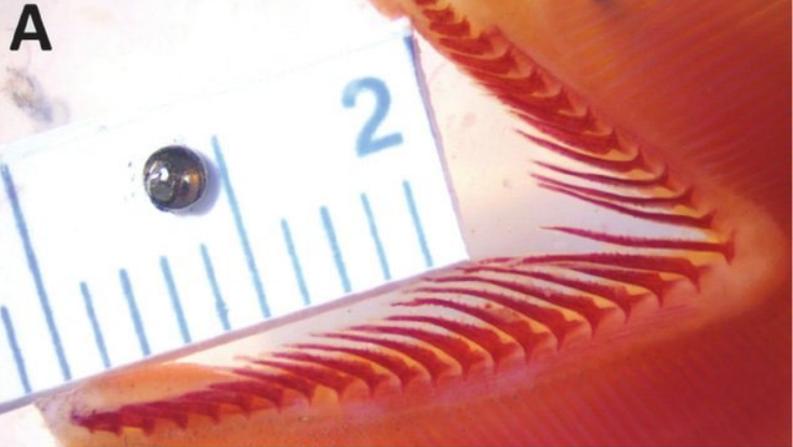
Laterally directed teeth are rare among fishes



Roeboides – scale eater (image C. Souza)



Platytroctidae – tooth function unknown
(species is zooplanktivorous) (image D. Fenolio)



O. rastrosus was likely a planktivore

- *O. rastrosus* has even longer and more numerous gill rakers than those present in *O. nerka* (pictured here) which is the most planktivorous of the living congeners.
- Image from Shedd et al. (2015). Ecological release leads to novel ontogenetic diet shift in kokanee (*Oncorhynchus nerka*)



But of course, not all
animal weapons aid
predation

Ankole-Watusi cattle. Image: Barbara Epstein

How did *O. rastrosus* use those teeth?

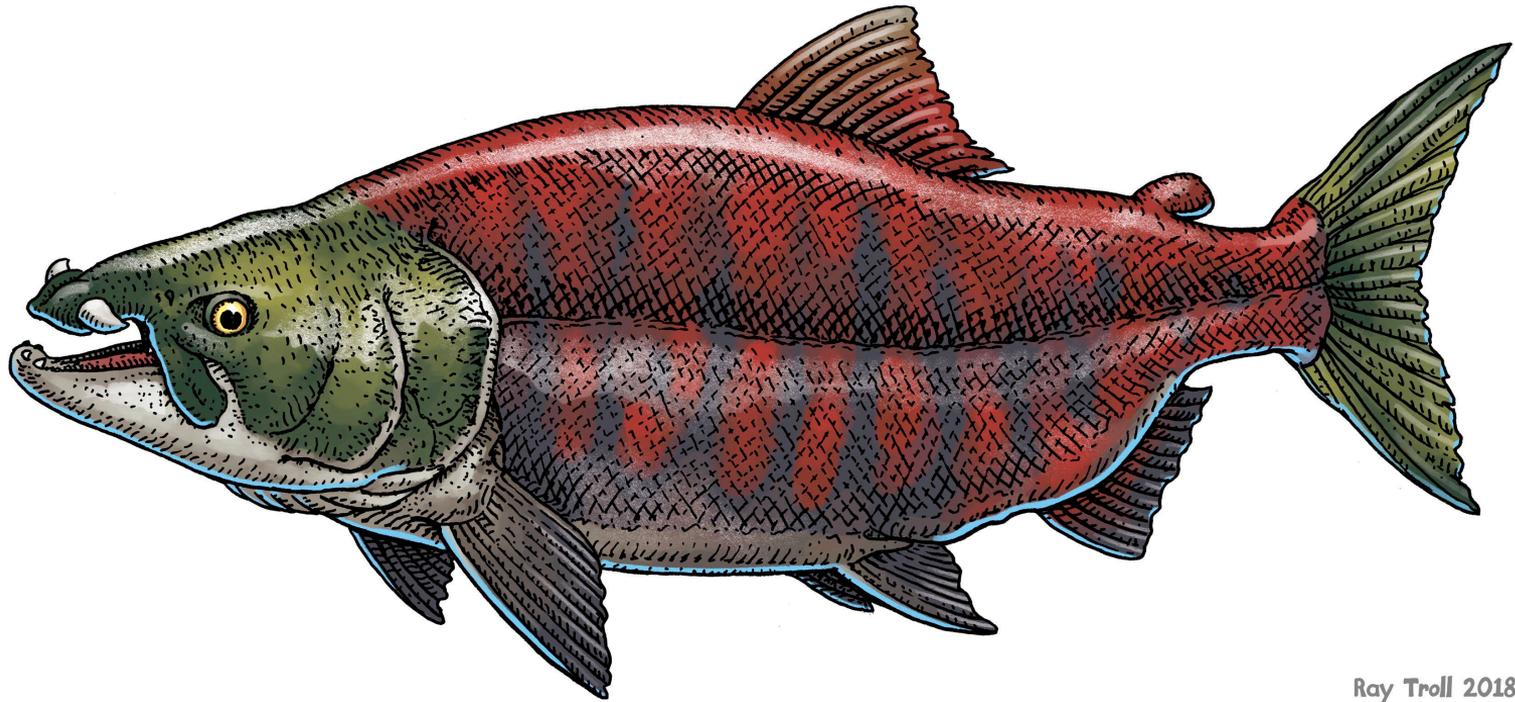
Swords?

- Active defense against oceanic predators?
- Competition for limited resources, such mates or the best redd sites?

or Plowshares?

- A practical aid to nest construction?
- More than one explanation may be correct
- Any explanation needs to grapple with tooth monomorphism: males and females appear to have similarly sized and shaped spikes.





Ray Troll 2018

Acknowledgments

- **Greg Carr, Gloria Carr, Tim Fischer and the North America Research Group** for discovering and donating exquisite specimens
- **Ray Troll** for expertly illustrating the newfangled reconstruction and his unending enthusiasm for all things salmoniform or ichthyological.
- **Peter Konstantinidis** for helpful discussion and insight about premaxillary tooth morphology among fishes.