

# Oncorhynchus rastrosus

On-ko-rin-kus ras-tro-sus



**FISHING FOR**

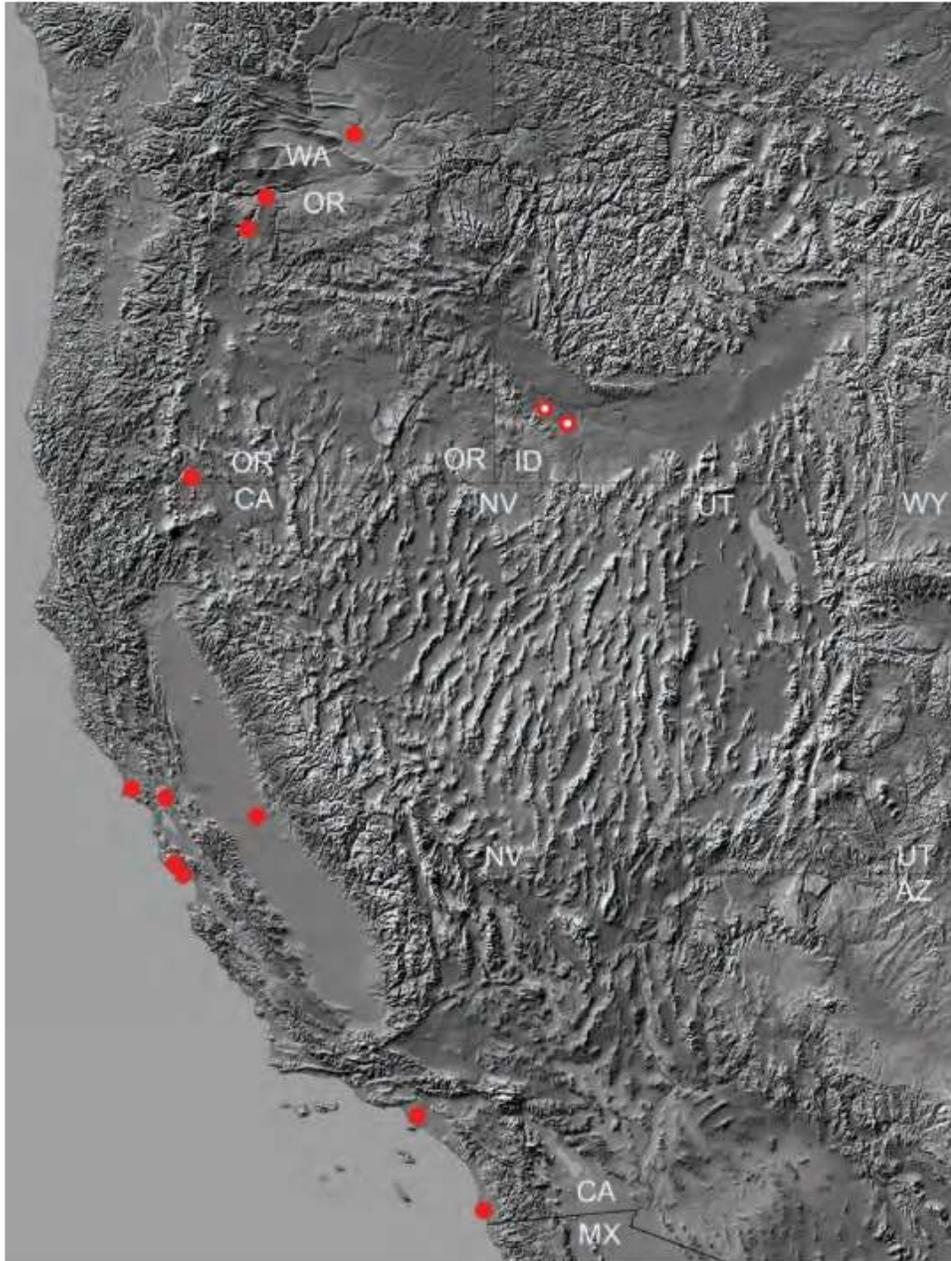
***Spike-Tooth* SALMON**

- These large salmon lived 12 - 6 million years ago, the late Miocene. They have been found in river deposits from the North American west coast - California, Oregon and Washington. No complete specimens have been found, but they were estimated to be 8-10 feet long and 300 – 500 pounds.
- They apparently were filter-feeders, consuming large amounts of zooplankton. Two other species of filter-feeding salmon, of smaller size, are known from the same era - *O. salax* and *O. ketopsis*. They are related to modern Sockeye and Chum Salmon. Specimens were found in the Snake River Plain.



These filter-feeders may have thrived due to a period of unusual productivity in the Pacific ocean at that time. Ocean currents changed during the late Eocene due to climatic cooling. Increased upwelling increased available nutrients, increasing the amount of plankton, zooplankton and sea life in general. This period of increased productivity ran from about 12 myr. to 7.5myr.

# STS Locations



## Vibbert's Quarry, Gateway Oregon

Figure 18.— Distribution map, fossil localities, for *Oncorhynchus rastrosus* and *O. rastellus*. Solid red dots: *O. rastrosus* (see Table 3), dots with white bulls-eyes: *O. rastellus*.

# Illustrations from Ray Troll



Display at the Museum of Cultural and Natural history  
at the University of Oregon Campus



“Everything Sabertooth”

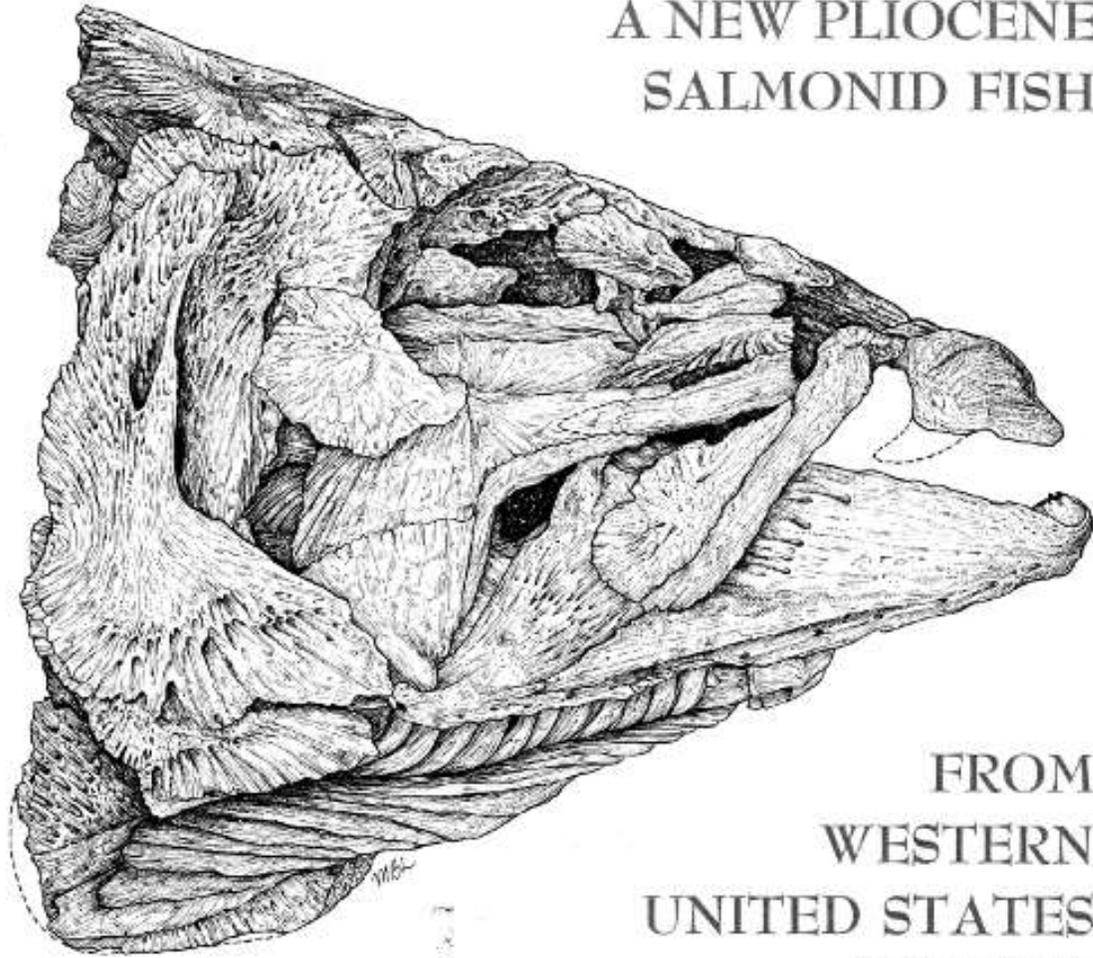
# History of specimens from the Gateway quarry, north of Madras Oregon

- The first specimens were found by the Vibbert family, owners of the quarry, after the initial gravel was extracted for building roads in the area in the 1950's.
- The first classification paper was published in 1972 by Cavender and Miller of the University of Oregon from specimens collected in 1964. The 1964 specimen became the 'Type Specimen' of the museum's Condon collection.
- A very fine specimen was found and collected in 1980 by Reuben Holmann. He kept this specimen in his personal collection until 2018. It was sold on an Ebay auction, purchased by the NARG group, and donated to the UO. It is generally displayed at OMSI (Oregon Museum of Science and Industry).
- Additional articulated backbones were discovered in 2010 and 2011 by members of the NARG (North America Research Group) Tim Fisher and Gloria Carr. These were excavated in 2011 and found to be a pair of backbones side-by-side. The skulls of these two specimens were excavated in 2014. All this material was donated to the UO.
- In May 2022 an additional 6 or 7 specimens were found by Greg Carr and (mostly\*) excavated by the NARG group in June 2022. These appear to be from a single spawning season. They are also part of the UO collection and are being prepared at OMSI. \* Two skulls remain in-situ and will be excavated later.
- In August 2022 an additional 3 partial skulls and articulated backbones of a small variety of STS were also found at the Gateway quarry and excavated. These were located about 50' higher in the deposit. One vertebrae was also found low in the quarry.
- In short, a total of 13 or 14 specimens with 13 skulls (some partial) have been recovered from this quarry. No whole skulls have been collected at any other site in the world.

# 1980 / 2018 specimen by Reuben Holmann

- In 1980 Reuben Holmann collected and prepared a specimen from the quarry. Although it was seen by Eric Gustoffson, it remained in Reuben's possession and was not written about professionally.
- It had the large teeth in situ and is a marvelous specimen.
- Reuben put the skull , several sections of backbone and a fin up for auction on an Ebay auction in 2018.
- The auction was noticed by a NARG member and she notified other members, one of which immediately purchased it as it is the best specimen known. Other parts, not on auction, were purchased as well.
- The specimen was shipped to Greg Carr's house and it arrived essentially intact! It was transferred to OMSI where some additional preparation work was done. It remains there on display (after a year-long vacation at the Oregon Aquarium).
- The specimen skull and a section of folded backbone were CT scanned at OHSU, and an laser surface scan was done at OMSI. The two skull scans were then combined (laboriously!) and printed out. The scans are available to other researchers (and probably should be posted to Morphosource or some other repository).
- The original and the 3D prints are here on display.

*SMILODONICHTHYS RASTROSUS*  
A NEW PLIOCENE  
SALMONID FISH



FROM  
WESTERN  
UNITED STATES  
Cavender and Miller



Cavender & Miller  
Classification Paper



Giant STS  
Klamath River California



Fishes of  
Pliocene Snake River



Miocene Salmon  
from Western US

# Tooth Orientation and Use

- The original 1964 specimen had the two large teeth loose, and the drawing reconstruction tentatively reconstructed them pointing downward like a saber-tooth cat.
- All other specimens from other sites have the teeth loose in the matrix, separated from the skulls, and thus provide no orientation direction.
- The 1980 and 2014 specimens had the teeth in-situ, and when the 2014 skulls were being prepared the preparator (Pat Ward) and Professor Ed Davis realized that the teeth pointed out sideways. This led to a significant revision of the purpose of the teeth. All skulls contain the large teeth, so they were not limited to one sex.
- Most of the spawning-stage teeth are worn or broken, and they are significantly larger than the teeth found in estuary fossils. This means the teeth grew significantly as the fish migrated up to the spawning grounds.
- Two complementary uses for the teeth fit the facts – teeth were used for fighting (offensive and defensive) and were used to construct redds for laying eggs.

# Consequences of revised tooth orientation



Sculptor Garry Staab does some dentistry to the UO fish sculpture

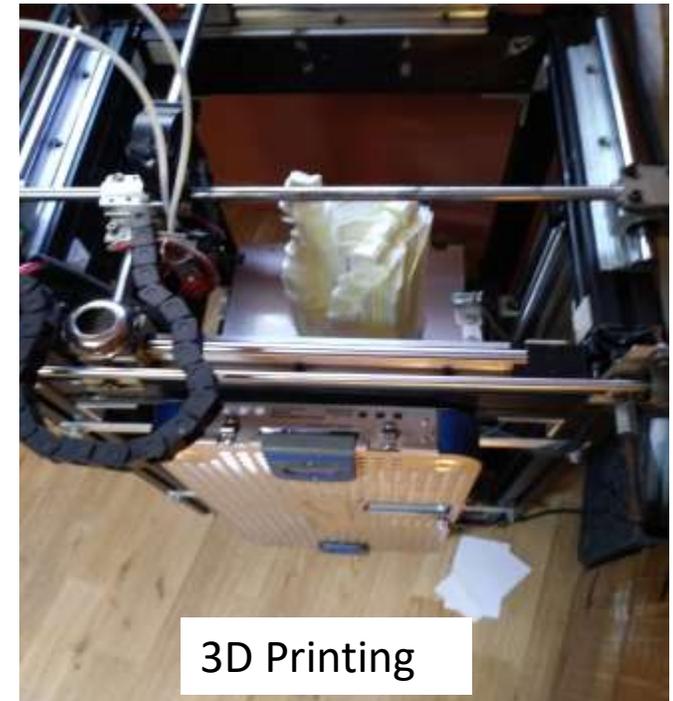
Links: <https://around.uoregon.edu/content/fossil-finds-yield-surprise-about-oregons-sabertooth-salmon>

<https://www.youtube.com/watch?v=GKxbOQSA8Sg>

<https://around.uoregon.edu/content/fish-story-museums-sabertooth-salmon-gets-its-teeth-fixed>

# 3D Scanning and Printing

- One technology that is improving paleontology is 3D scanning, image manipulation and printing. The printed 3D skulls shown here illustrate that.
- The 1980 Holmann skull was externally scanned with a laser scanner, and internally scanned with a medical CT scan at OHSU.
- The CT scan was manipulated to separate the bone image from the matrix of sand and pebbles.
- The exterior and interior scans were then combined and printed out together, showing the inside and the outside of the fish skull.



Here is what the quarry west side cliff looks like – a braided river deposit.



Braided river in New Zealand

# June 2022 Collection Dig by NARG 5+ Specimens Caught!



What to look for:



# But Wait- There's More!

- In August 2022 three specimens of a smaller salmon were found at the Gateway quarry in in the same sand layer as a STS Centrum about 50 feet above the June specimens.
- These salmon were similar in size to modern size salmon. The backbones are about 3/8" diameter as opposed to the 1-1.5" of the STS. One specimen measures 65cm complete with tail.
- They appear to be a small version of the STS – the tooth and jaw anatomy are exactly the same, merely smaller.
- Short reproductive cycle? Extreme Sexual Dimorphism? Dwarf subspecies? Sneaker males?





Small Articulated Backbones aren't they cute?



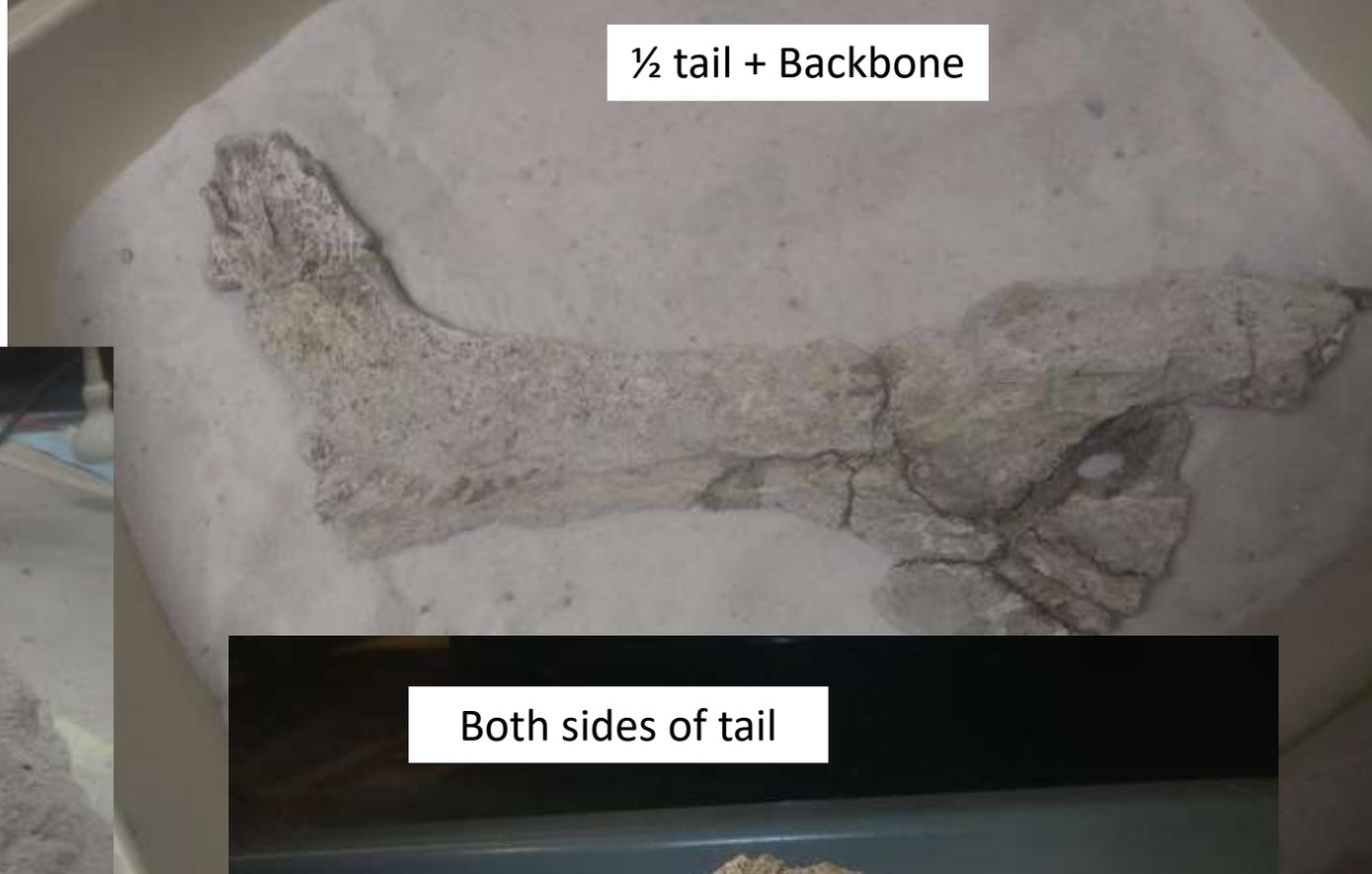
Comparative sizes of 'Normal' STS and small STS

A partial skull and two  
backbones and tails of  
the smaller variety



Fins and Soft tissue from the STS – clay fill in holes left behind as tissue decayed

½ tail + Backbone



Both sides of tail



## Summary of 2022 Finds

### June Specimens – all large size specimens

- 1) 2 complete skulls, removed from quarry and prepared. Both have the upper teeth, though the teeth of one specimen have separated from the skull. The other's teeth are in-situ – both are broken.
- 2) 2 incomplete skulls – one a fragment the size of a deck of cards, the other remains unprepared but is larger.
- 3) 2 complete skulls (probably) still remain in the quarry, will be excavated later. One has the backbone excavated back to the posterior of the skull, the other is presumed to lie just under it (backbone has been excavated).
- 4) Approximately 8 feet of backbones from 4 specimens have been prepared, more remain unprepared.
- 5) Two tails have been recovered, one with both top and bottom fins but no backbone. The other with just one side of the tail but includes 1 foot of backbone.
- 6) Pectoral (one) and Pelvic (a pair) fins have been recovered.
- 7) Some evidence of clay filling in holes left by decaying soft tissue at the thin end of fins.

### August Specimens – all small specimens

- 1) 3 Partial skulls, two with both teeth present and in-situ, the third with only 1 tooth which is slightly out of place.
- 2) Two complete tails with attached backbones.
- 3) One animal is complete - is approximately 65 cm long from tip of skull to center of tail. (number of skulls and tails include this).
- 4) No smaller fins have been found.
- 5) At least one more skull with some backbone is believed to still be in the quarry.

# Lessons we have learned

- Climate change can lead to changes in ocean circulation. In turn, these changes can cause the extinction of old species and the generation of new species.
- Science is the process of discovering new information, and changing information will lead to changes in our understanding of “life, the universe, and everything!” - Douglas Adams
- Digging up old dead things can be fun and interesting. And they can be found in unusual places.
- “Life finds a way” – Ian Malcolm (Jeff Goldblum)
- **References** - Cavender, T., & Miller, R. R. (1972). *Smilodonichthys rastrosus: A new Pliocene salmonid fish from Western United States*. Museum of Natural History, University of Oregon.
- Thomas P. Eiting, Gerald R. Smith, Miocene salmon (*Oncorhynchus*) from Western North America: [Gill Raker evolution correlated with plankton productivity in the Eastern Pacific](#), *Palaeogeography, Palaeoclimatology, Palaeoecology*, Volume 249, Issues 3–4, 19 June 2007, Pages 412-424, ISSN 0031-0182
- Ralph F. Stearley and Gerald R. Smith SALMONID FISHES FROM MIO-PLIOCENE LAKE SEDIMENTS IN THE WESTERN SNAKE RIVER PLAIN AND THE GREAT BASIN
- The giant, spike-toothed salmon, *Oncorhynchus rastrosus* and the “Proto-Tuolumne River” (early Pliocene) of Central California 2016 **Author(s)**: Sankey, Julia; Biewer, Jacob; Basuga, Janus; Palacios, Francisco; Wagner, Hugh; Garber, Dennis