

# Revised Classification and Taxonomy of Cutthroat Trout—An Update

First there was one species → Now there are four



**CUTTHROAT TROUT**  
**EVOLUTIONARY BIOLOGY AND TAXONOMY**



**Special Publication 36**

**The Western Division AFS Panel on Cutthroat Trout Taxonomy**  
Patrick Trotter, Peter Bisson, Luke Schultz, and Brett Roper, editors

RETICULATE SPIKEFISH

*Hollardia hollardi*

ATLANTIC BELPOUT

*Lycodes terraenovae*

HOGCHOKEN

*Trinectes maculatus*

VACA VOLADORA

*Prionotus stephensoni*

CALIFORNIA LANTERNFISH

*Symbolophorus californicus*

MIMIC CUSK-EEL

*Ophidion imitator*

SAND SHINER

*Miniellus stramineus*

CHEVALIER CUIVRÉ

*Moxostoma hubbsi*

SANTA CRUZ PUFFFISH

*Cyprinodon arcuatus*

TOTOABA

*Totoaba macdonaldi*

**Common and Scientific  
Names of Fishes from  
the United States,  
Canada, and Mexico**

**Eighth Edition**

**American Fisheries Society**

**Special Publication 37**

# Some Definitions

**Systematics:** The research on evolutionary differentiation that provides the evidence for...

**Classification:** Arranging the results of evolution in a hierarchical order.

**Phylogeny:** Term often used for the hierarchical arrangement.

**Taxonomy:** Application of classification principles to the naming of organisms in the hierarchical arrangement (ICZN).

# Cutthroat Trout

Behnke (1979)

- Single species with 4 “major” & 10 “minor” subspecies based on Mayr (1969) biological species concept.
- Inland radiation via Columbia and Snake Rivers, historically widespread across west.



# Previous Classification & Phylogeny

## No Longer Scientifically Adequate

- Behnke's "major" and "minor" subspecies designations at odds with ICZN naming protocols.
- Evolutionary species concept now favored over the biological species concept; changes criteria for assigning taxonomic rank.
- Fossil evidence of Cutthroat Trout in Lahontan Basin ~10 Ma; opens possibilities for interior radiation pathways not realized before.
- New molecular phylogenetics methods now revealing greater differentiation in Cutthroat Trout than earlier methods could detect—11 new subspecies plus Behnke's original 14.

# What Constitutes a Species?

“There are nine and sixty ways of constructing tribal lays,  
and every single one of them is right.”

In the Neolithic Age  
Rudyard Kipling, 1892

- As many as 26 species concepts published, each with its own delimiting criteria & restrictions.
- Behnke used the Biological Species Concept of Mayr (1969) but relaxed its prohibition against interbreeding.
- WDAFS Panel used the Unified Species Concept of De Queiroz (2007), an evolutionary species concept with no prohibitions; uses a broad set of evidence to assess if lineages are evolving independently.

# But What About the Subspecies ?

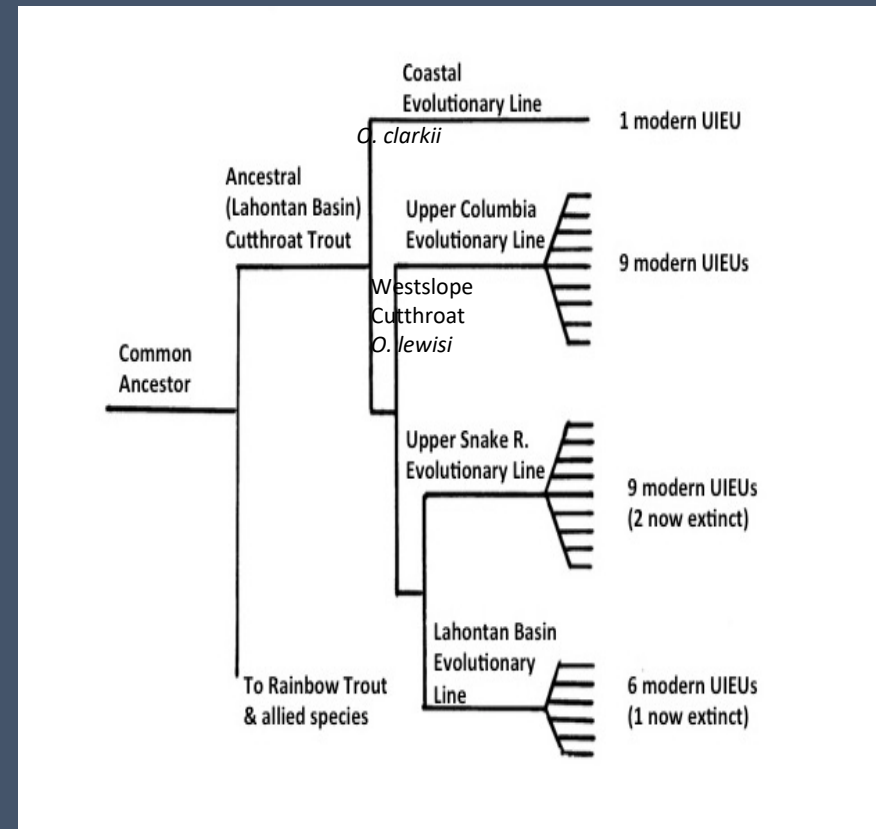
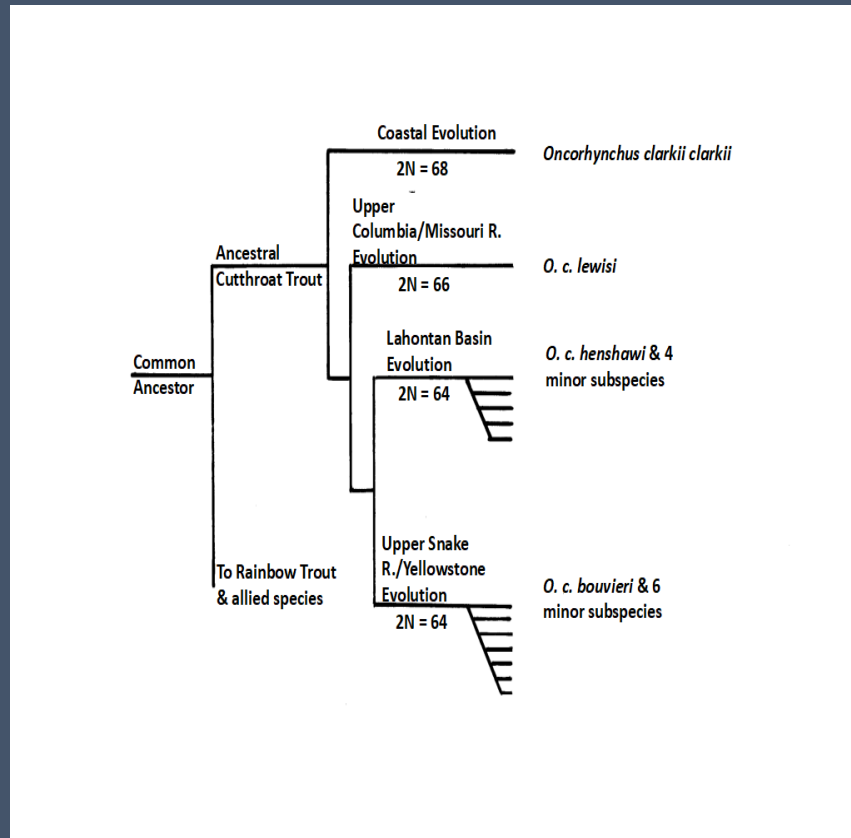
- Major disagreement in science community re validity of subspecies as taxonomic rank; rendered meaningless by years of misuse—not aligned with real evolutionary entities; WDAFS panel split 50-50 on using!!
- Subspecies (complete with common and trinomial scientific names) are allowed as a taxonomic rank under species in International Code of Zoological Nomenclature.
- Also allowed by the joint AFS/ASIH Names of Fishes Committee, but use of trinomial scientific names discouraged in favor of common names.
- Although allowed & recognized, the Names of Fishes Committee opts not to publish common and trinomial scientific names of subspecies; they publish only as far down the chain as the species level.

# Cutthroat Trout Phylogeny

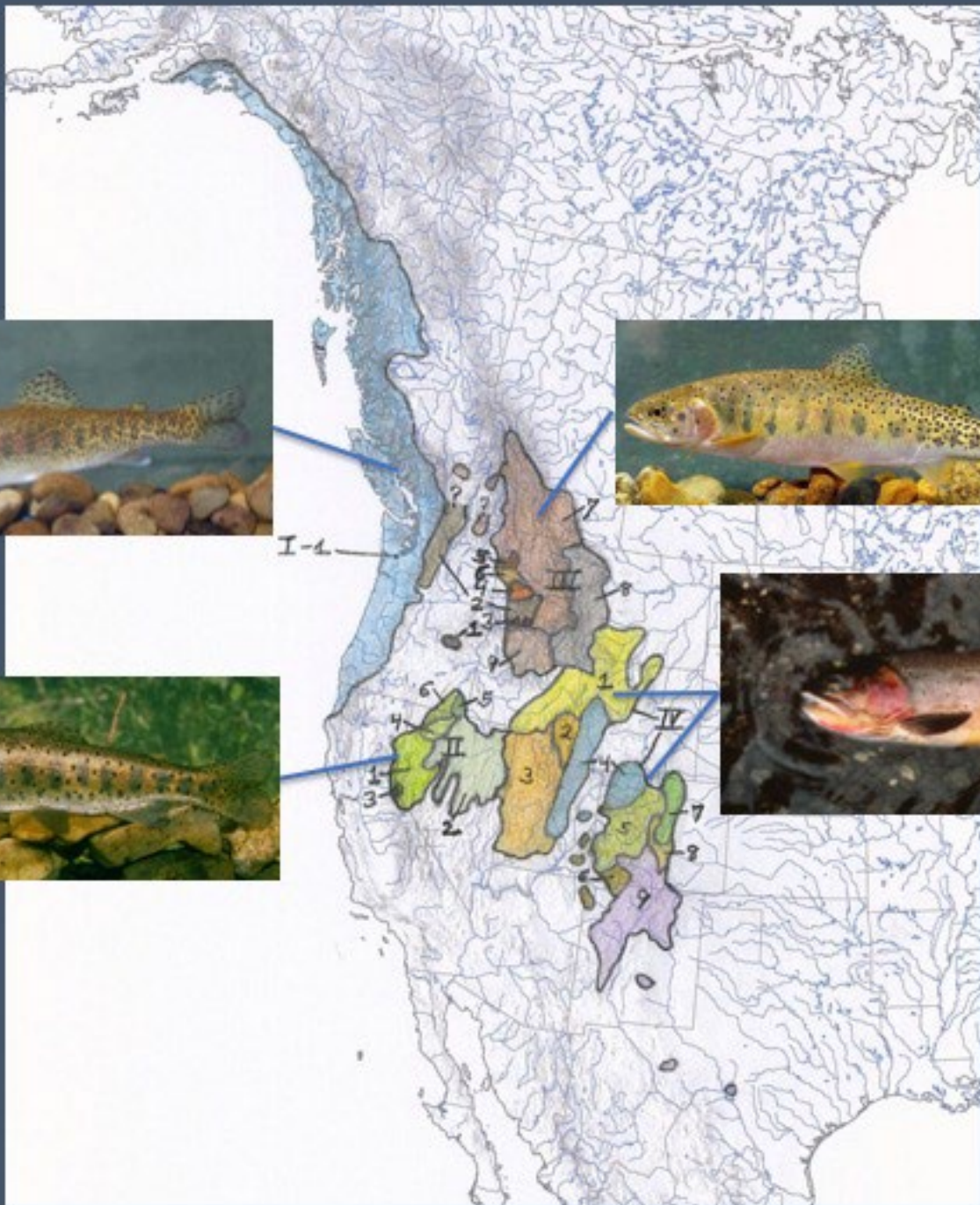
One Species with 14 subsp.  
(4 major & 10 minor)



Now Four Species with 25  
evolving subspecies







# Cutthroat Trout

WDAFS panel majority (2018):

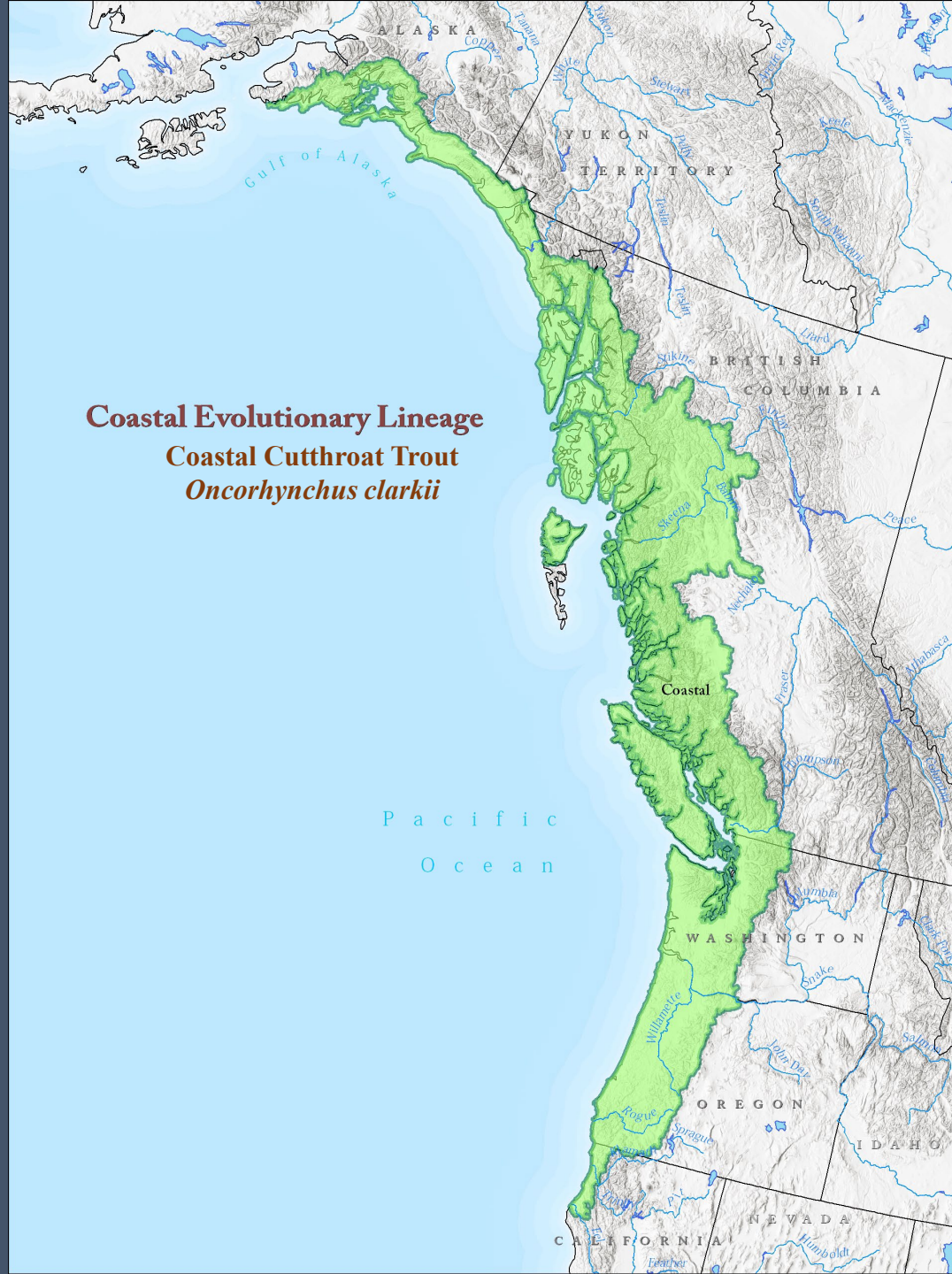
- 4 species with 25 modern subspecies (23 extant, 2 extinct).
- Inland radiation from paleo-Lahontan basin via upper Columbia & upper Snake Rivers.



Coastal Evolutionary Lineage  
*Oncorhynchus clarkii*, Coastal Cutthroat Trout



**Coastal Evolutionary Lineage**  
**Coastal Cutthroat Trout**  
*Oncorhynchus clarkii*



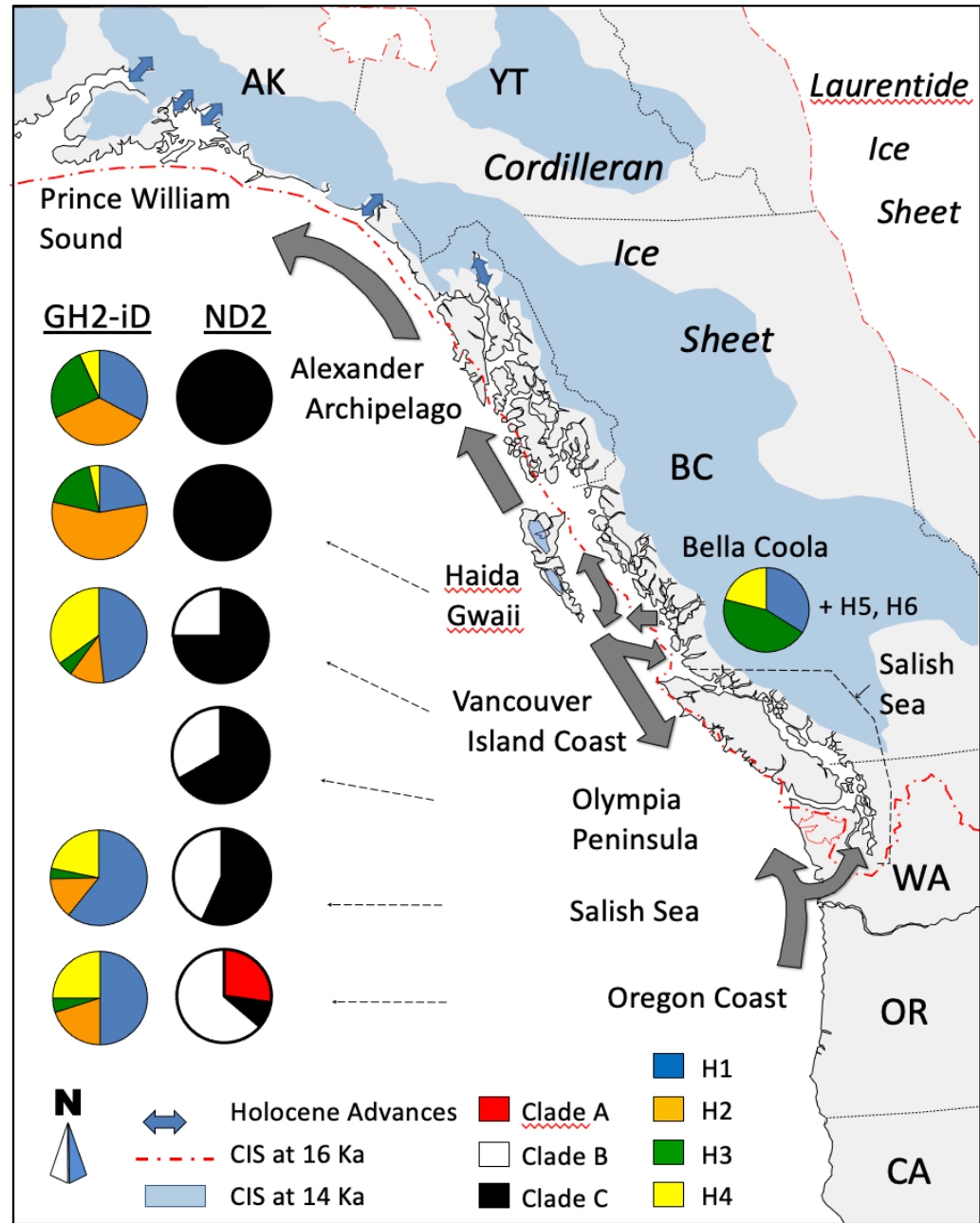
# What's It Mean To Be An Endemic ?

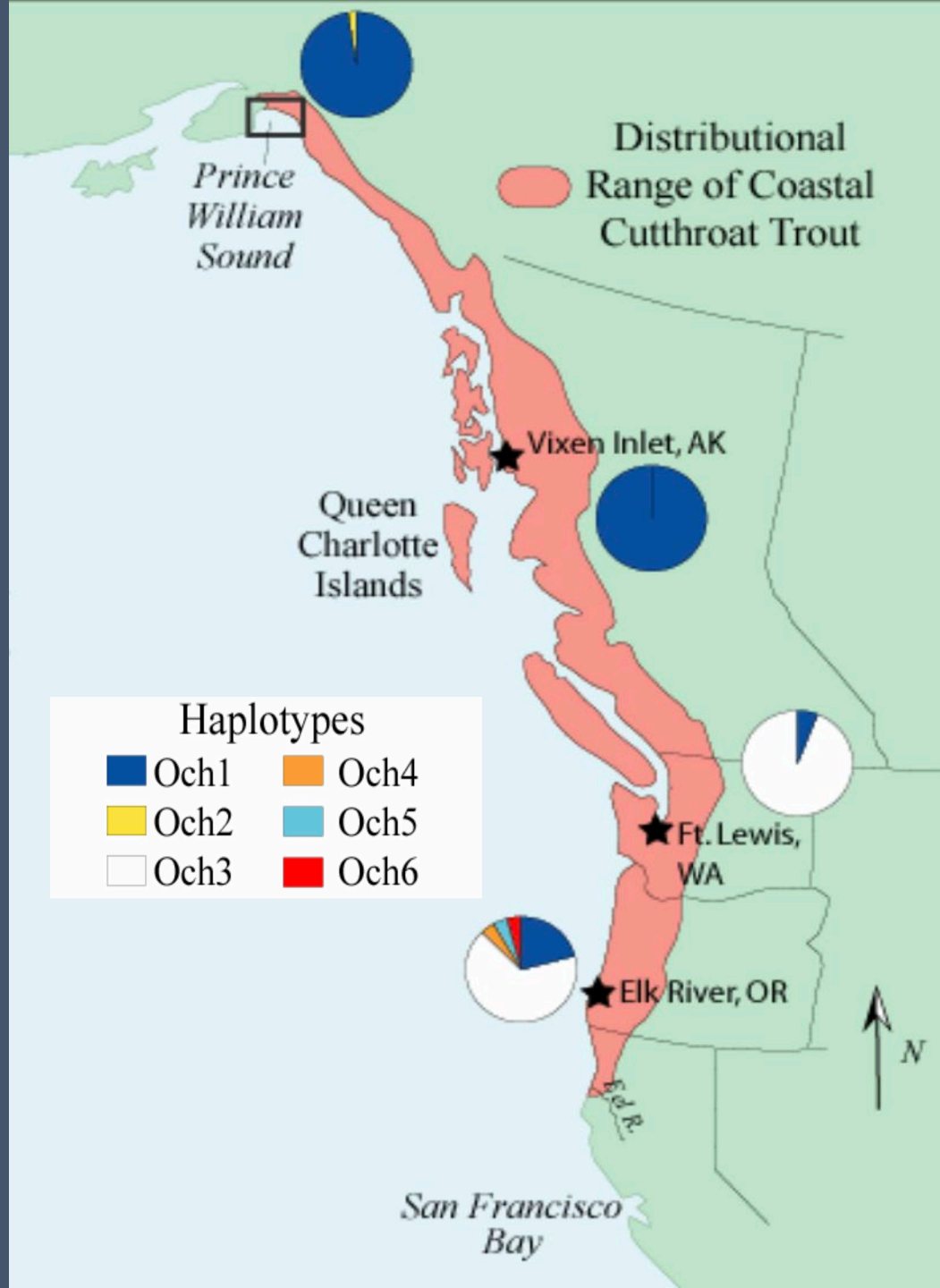
Coastal Cutthroat Trout: Endemic at the species level to the great Pacific Coast Temperate Coniferous Forest Zone.

It's the only Pacific salmonid species that is!

Will this garner it greater respect and (at last) "1st class citizen" status from natural history writers, forest & fisheries managers, and forest & fisheries scientists?

What factors explain how this particular endemism has happened & endures....what's in it for the fish & what's in it for the forest ecozone?





# Evolutionary Biology & Taxonomy— Always a Work In Progress

- Classification and taxonomy are based on the best scientific information available at the time...
- ...and should adapt as a deeper understanding of the evolutionary history of the entity under study becomes available.
- For Cutthroat Trout, continue work on resolution of the finer points of subunit/subspecies evolutionary differentiation.
- Collaborative exam of all 25 subunits in a common study with an agreed-on common set of morphological and molecular markers.



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