

A molecular reinterpretation of the biodiversity of *Cottus* in western North America

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National Genomics Center for Wildlife and Fish Conservation



and the SculpinQwest Collaborative



109	110	113	176	109	222	141	210	162	123	96
Local	Co	Reach	(PBL)	TIME	RYAN	Zone	DET			
				145	120		190			
				167	125		195			
				137	121		211			
				102	87		191			
				164	106		180			
				159	127		178			
				71	116		181			
				180	112		142			
				116			171			
				88			147			

9 April 2019 – WA-BC AFS annual meeting, Bremerton, WA

Outline

- Units of conservation
- The problem with *Cottus*
- Resolving that problem: crowds & genes
- Case studies: the species complexes



What is biodiversity?

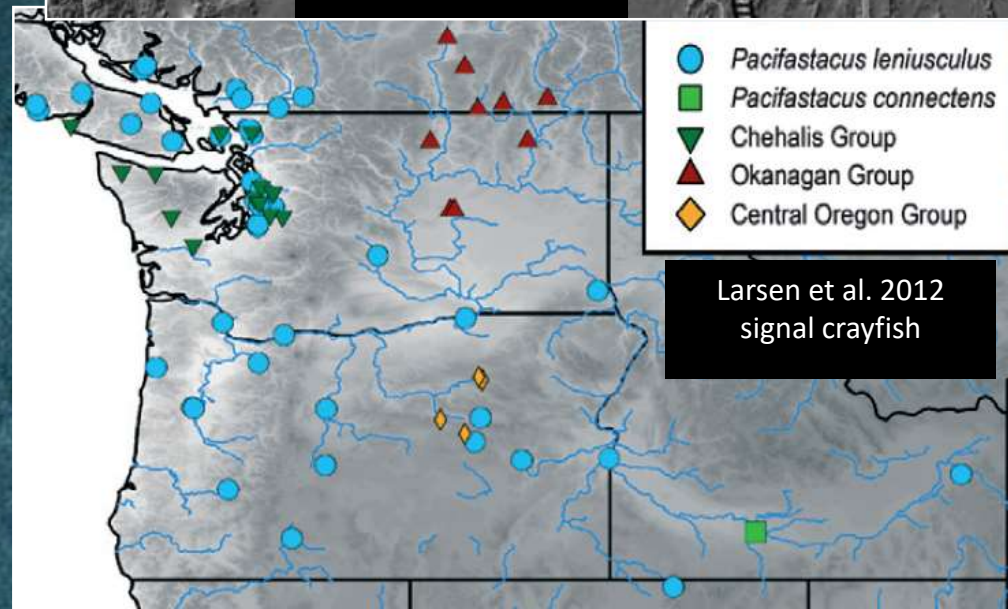
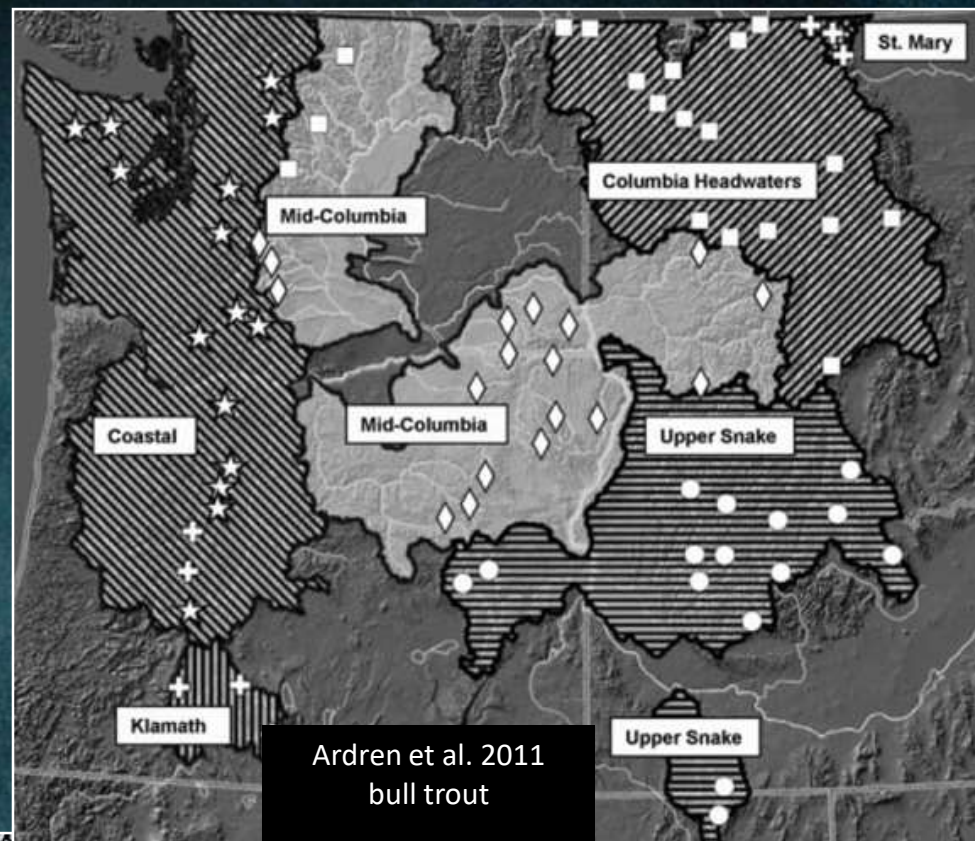
Conservation units: recognizable, substantive components of the evolutionary legacy of a taxon

- DPS
- ESU
- GMU
- Stock
- UCS
- Subspecies
- Species
- MOTU

...all are lineages

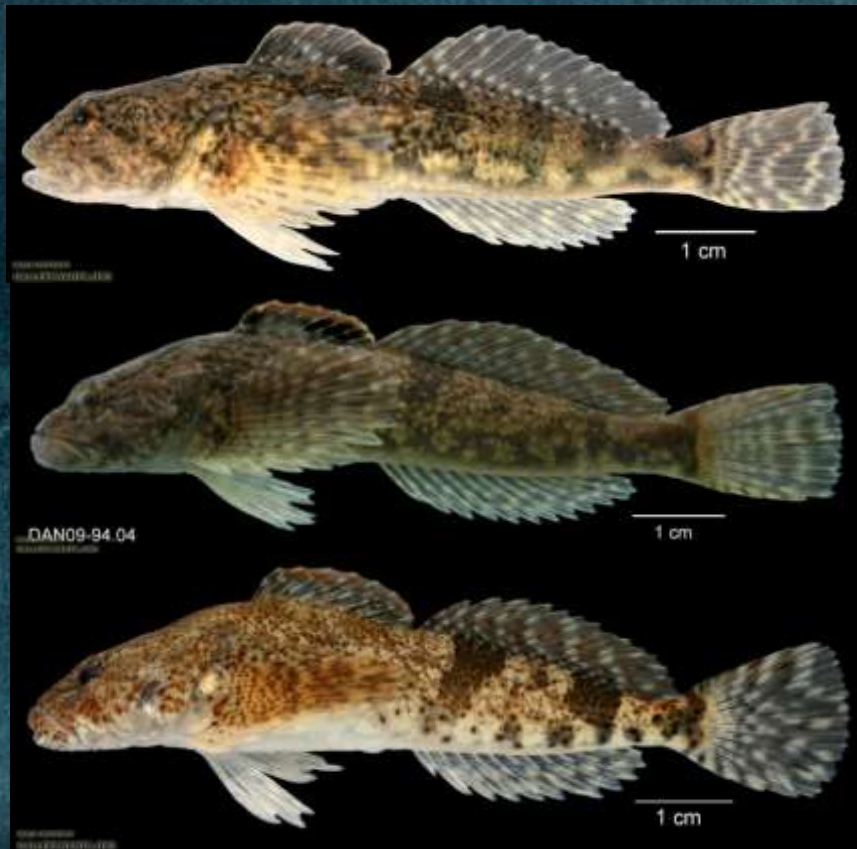
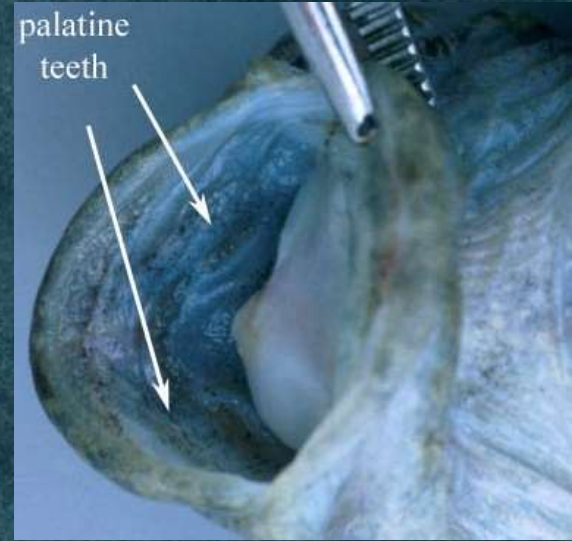
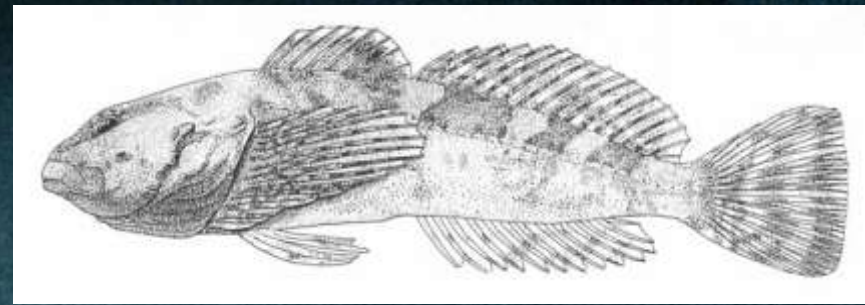
Why is it relevant?

- ESA & SARA
- Tinkering: demographic manipulation via translocation
- Basis for understanding evolutionary histories



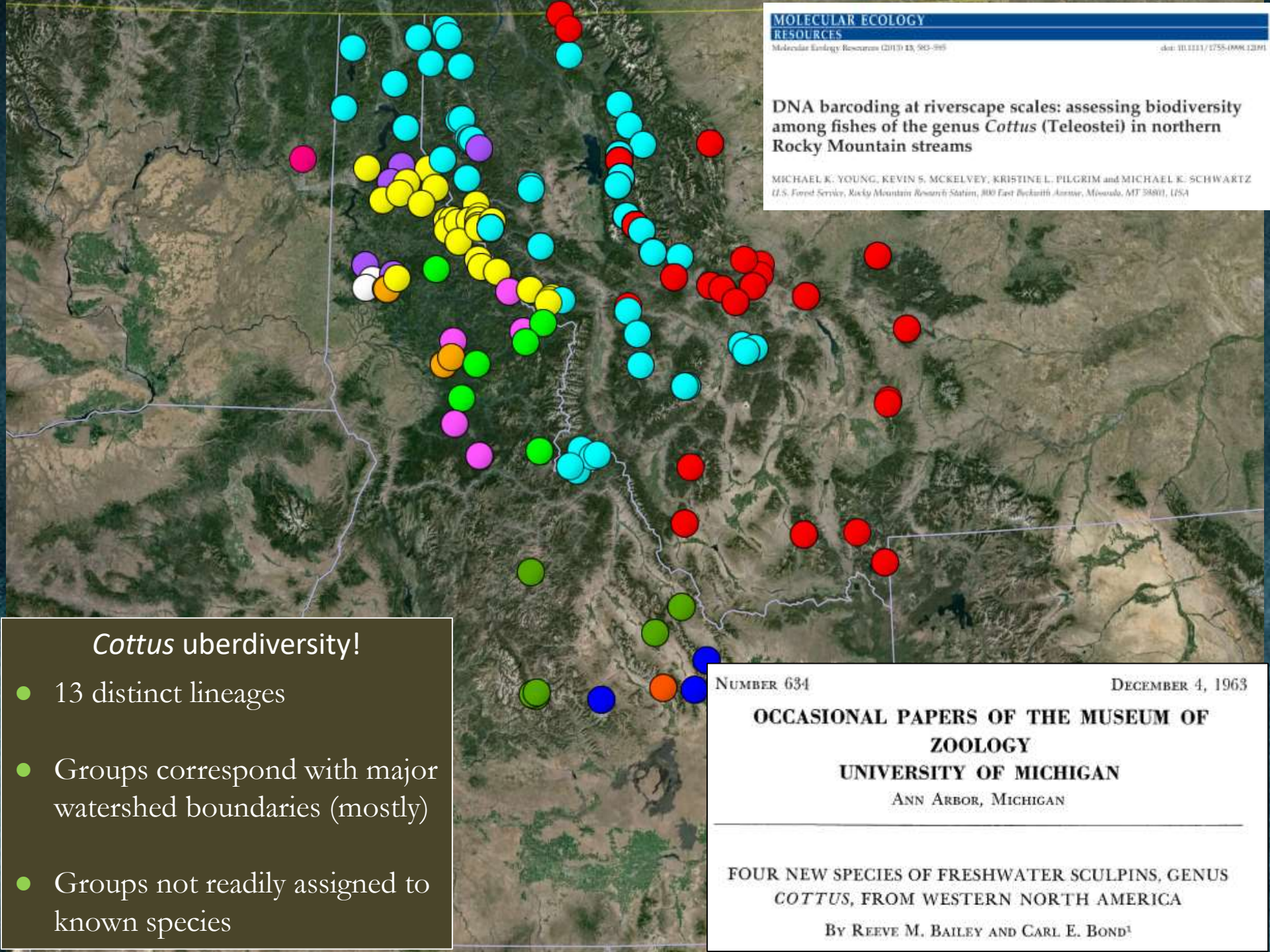
The problem with *Cottus*

- Most challenging group to identify
- Morphology: difficult & “unstable”
- Hybridization ongoing & ancient
- Taxonomy unsatisfying
- Extraordinarily abundant



DNA barcoding at riverscape scales: assessing biodiversity among fishes of the genus *Cottus* (Teleostei) in northern Rocky Mountain streams

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Cottus uberdiversity!

- 13 distinct lineages
- Groups correspond with major watershed boundaries (mostly)
- Groups not readily assigned to known species

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OCCASIONAL PAPERS OF THE MUSEUM OF
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ANN ARBOR, MICHIGAN

FOUR NEW SPECIES OF FRESHWATER SCULPINS, GENUS
COTTUS, FROM WESTERN NORTH AMERICA

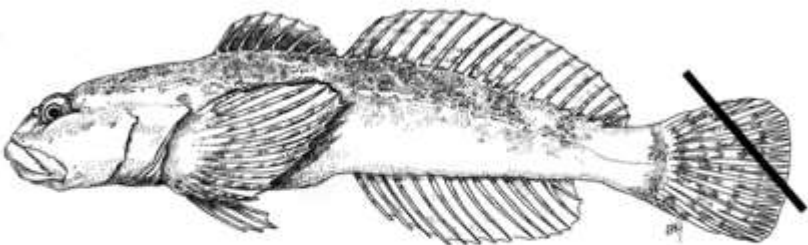
BY REEVE M. BAILEY AND CARL E. BOND¹

SculpinQwest: the collection approach

- Sourcing the crowd: the SculpinQwest collaborative
 - 100s of biologists & citizen-scientists from every state and province in western NA
 - A simple collection protocol
 - ~8,000 specimens
- Rewarding the crowd: providing results to the stakeholders

The screenshot shows the website for the Rocky Mountain Research Station's Air, Water, & Aquatic Environments Program. The main heading is "Sculpins of the West". Below the heading are two detailed illustrations of sculpin fish. A navigation menu includes "ABOUT AWAE", "RESEARCH", "PROJECTS, TOOLS, & DATA", "PUBLICATIONS", and "CONTACT US". A prominent banner reads "Broad-scale genetic monitoring of aquatic species" and "Wanted: Your help to understand the diversity of Cottus in western North America". A sidebar on the left lists "Sculpin DNA" and "Fish of the genus Cottus".

Tissue sampling protocol for sculpins



My colleagues and I are using DNA barcoding to identify and locate potential conservation units—subspecies, ESUs, DPSs, stocks, or species new to science—of sculpins from throughout western North America. Your help is sought to obtain:

- Tissues from up to 5 individuals (or even 1–2) of all sculpin species (see page 2) from individual sites in any river basin in western North America—the Columbia, Colorado, Fraser, Yukon, or coastal river basins, and the Great Basin.



Google "Sculpin Qwest"