Distribution, Abundance, and Size of Migratory and Non-migratory Sculpin in Relation to Barriers in Puget Sound Lowland Streams, Washington

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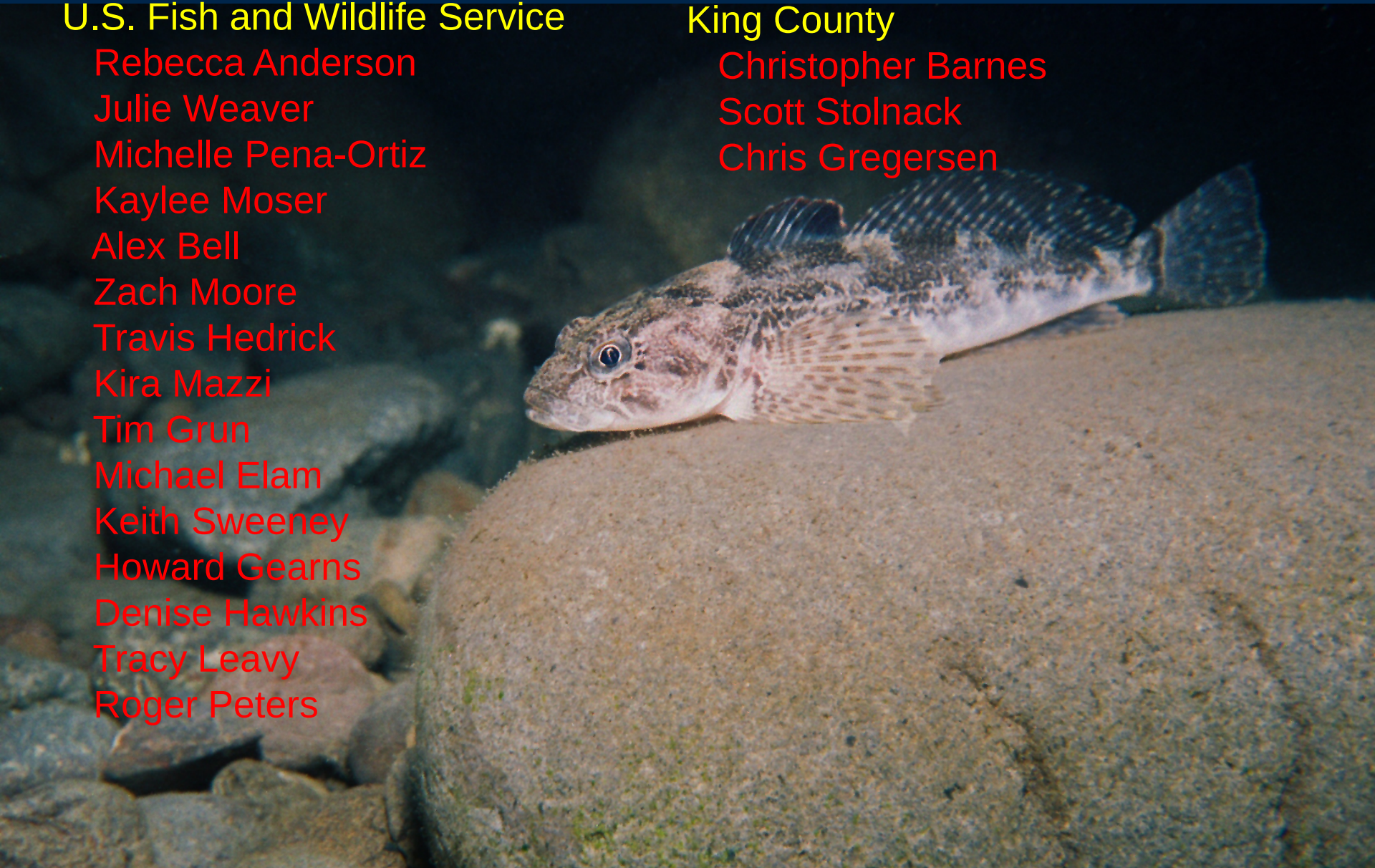


Puget Sound Freshwater Sculpins

- Coastrange sculpin
- Prickly sculpin
- Riffle sculpin
- Shorthead sculpin
- Torrent sculpin

Sculpin are not created equal

Migratory or “lowland” sculpin

Coastrange sculpin

Prickly sculpin

- Pelagic larvae
- Small eggs
- Often migrate downstream to spawn
- Larvae associated with estuary, lake, or slow-moving river
- Widespread coastal distribution

Non-migratory or “upland” sculpin

Riffle sculpin, Shorthead sculpin, Torrent sculpin

- Benthic larvae
- Larger eggs
- Can complete entire life cycle in a small stream
- Patchy distribution

see Goto et al. 2015

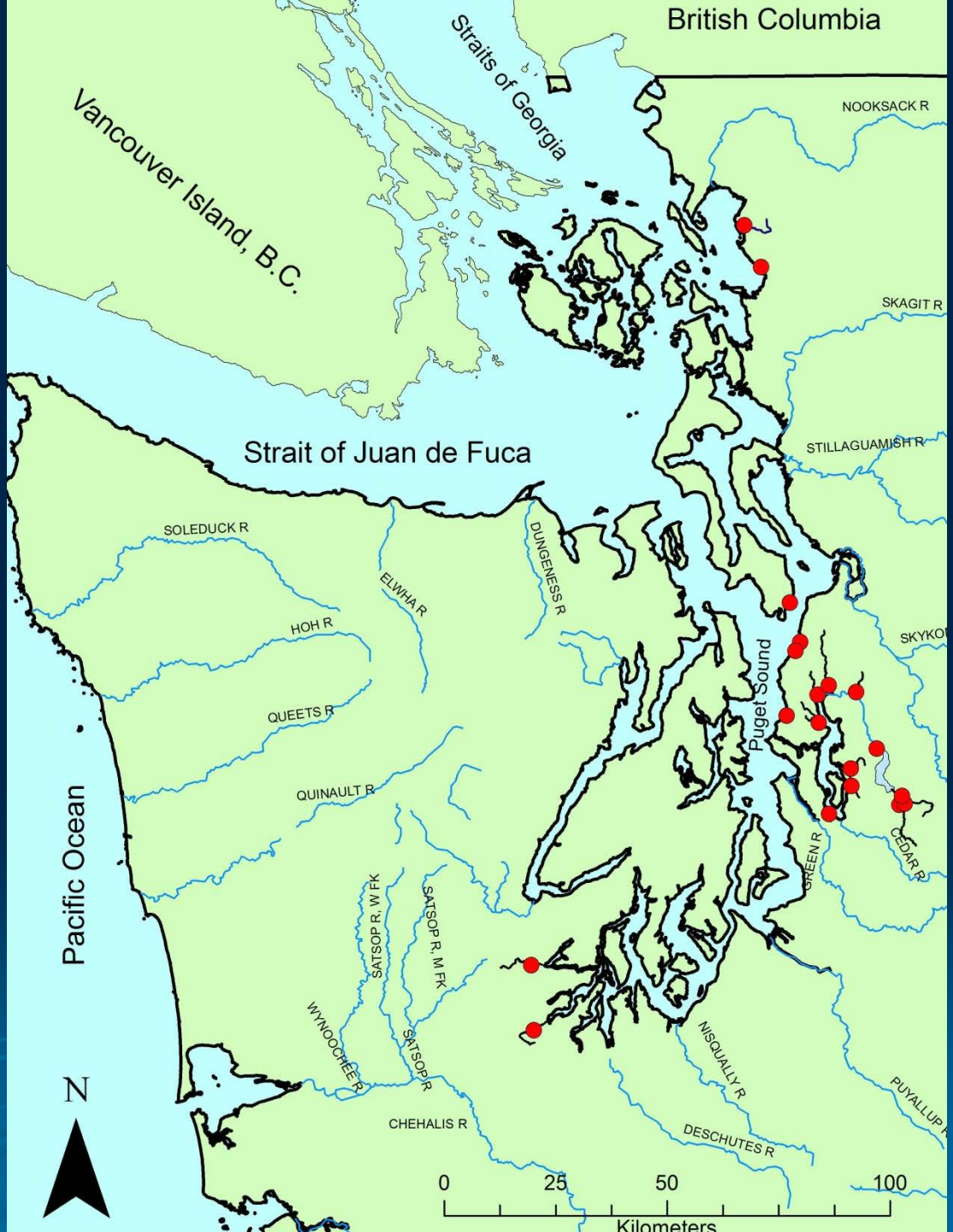
Objective

- Determine what effect barriers have on the sculpin community
  - Direct effects on migratory sculpins
  - Indirect effects on non-migratory sculpins
- Assess first barrier upstream from migratory sculpin rearing area (estuary, lake, or slow-moving river)

Study Sites

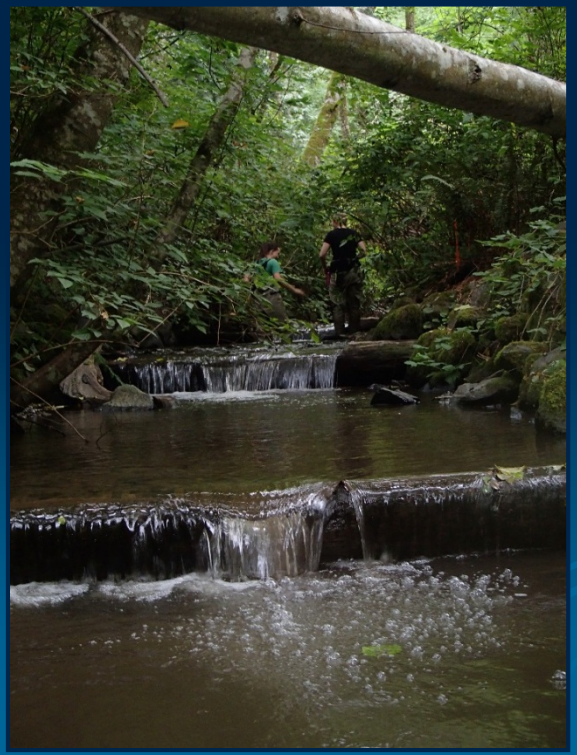
- 19 streams surveyed (2013-15)
  - 11 streams with only migratory species present
  - 8 with a mix of migratory and non-migratory species present
- Barrier types
  - Weirs
  - Perched culverts
  - Waterfalls
- Most barriers were not barriers to anadromous salmonids
- Used barrier criteria of LeMoine and Bodensteiner (2014)

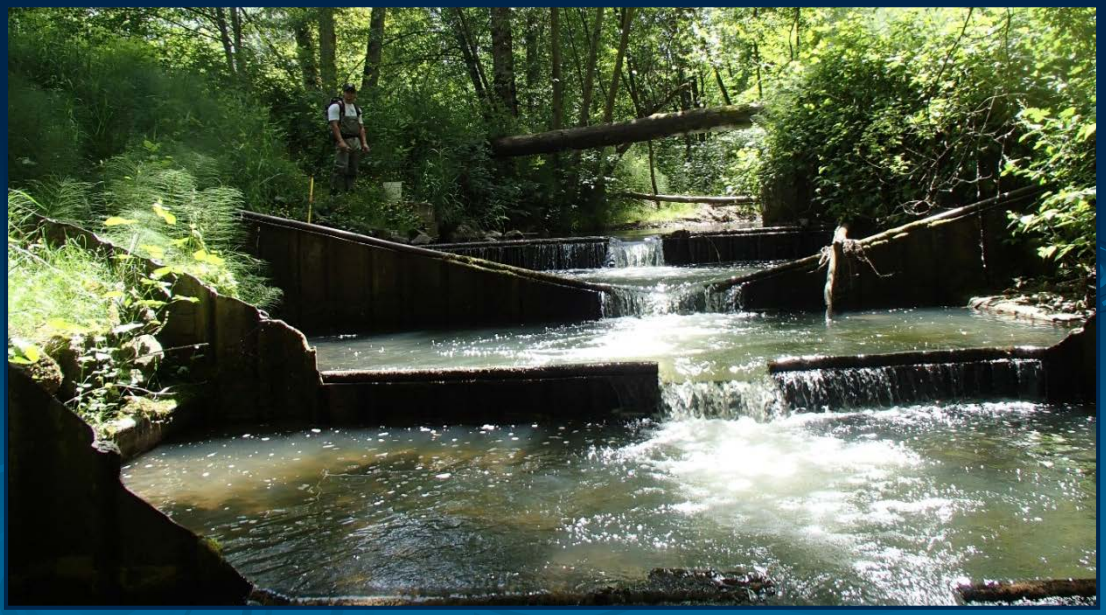
  0.15 m perch height



Methods

- One-pass electrofishing during summer low-flow period
- Sampled immediately downstream and upstream of barrier
- Sampled three pools and three riffles at both locations
- Supplemental sampling also conducted in downstream and upstream reaches





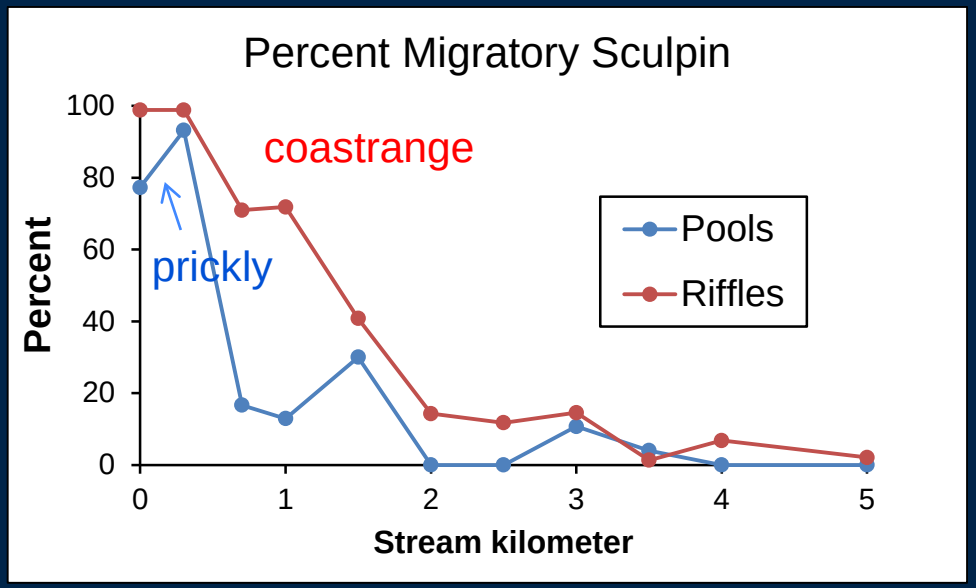
May Creek – small stream with no barriers

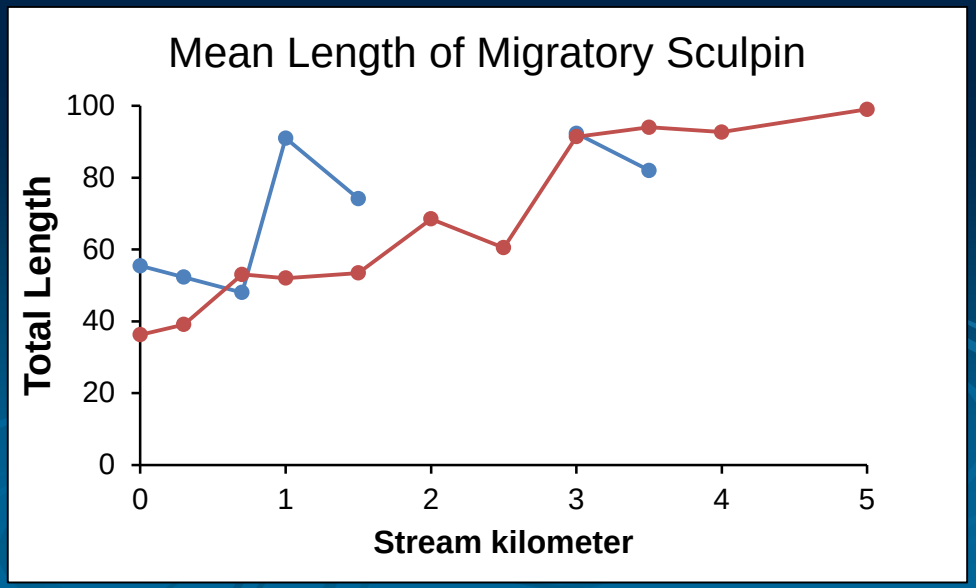
July 10-21, 2015

- Migratory sculpin
  - Coastrange sculpin
  - Prickly sculpin
- Non-migratory sculpin
  - Riffle sculpin
  - Torrent sculpin

- Moderate gradient stream – 1-3%

- Sculpins represented 89% of the fish collected (range 64-98%)

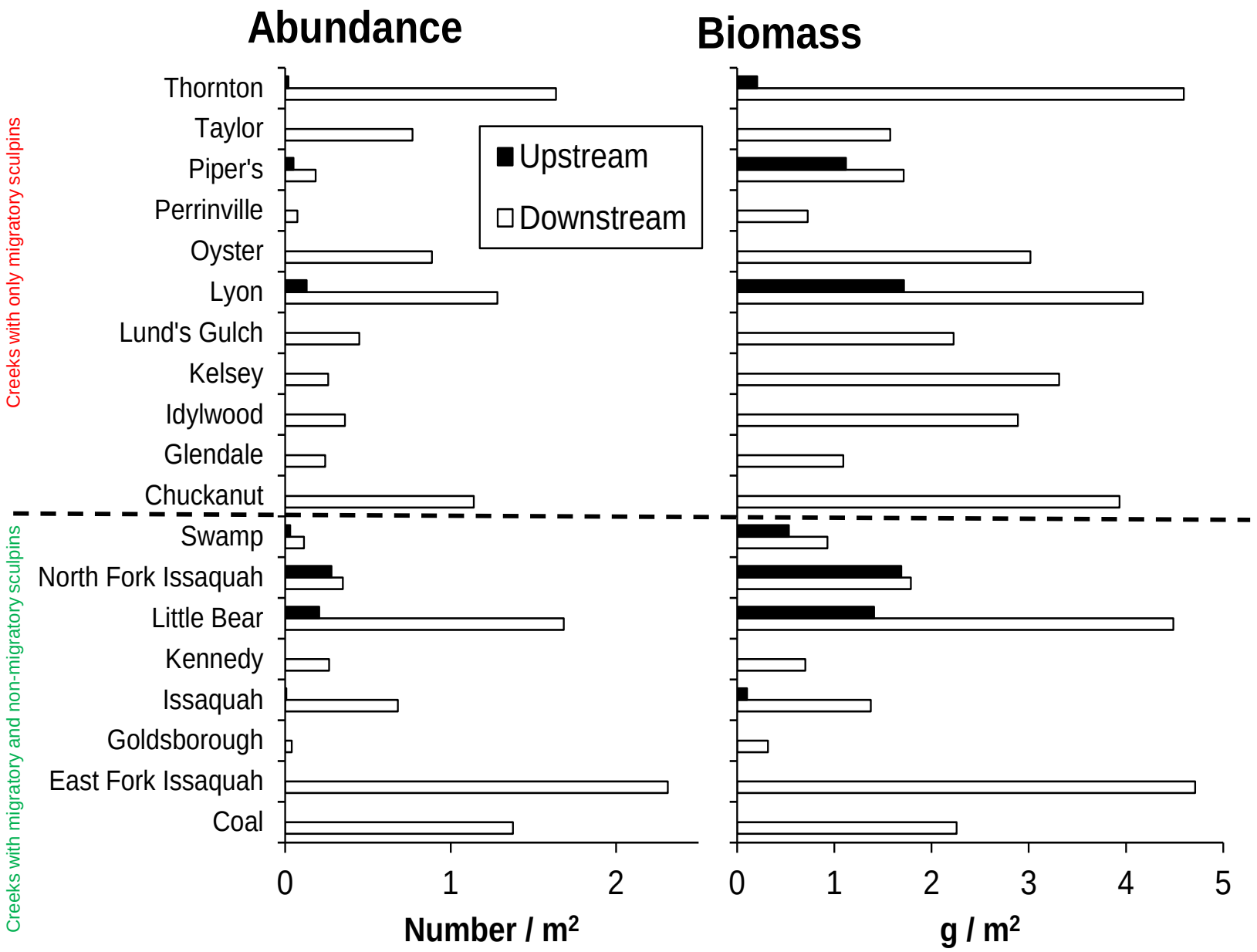




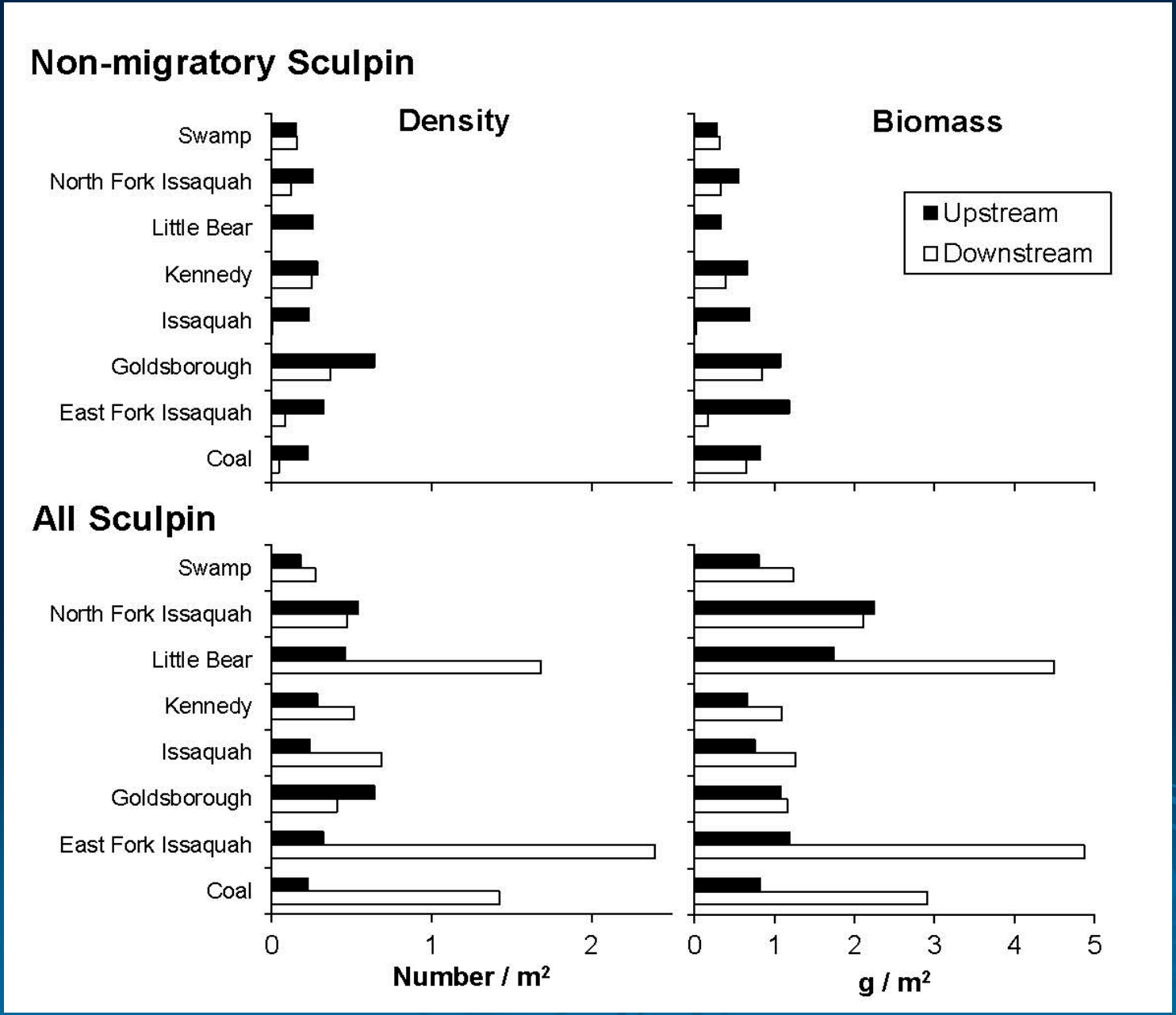
Results

- Over 13,500 sculpin collected
- Migratory sculpin present upstream of barrier in only 7 of 19 streams

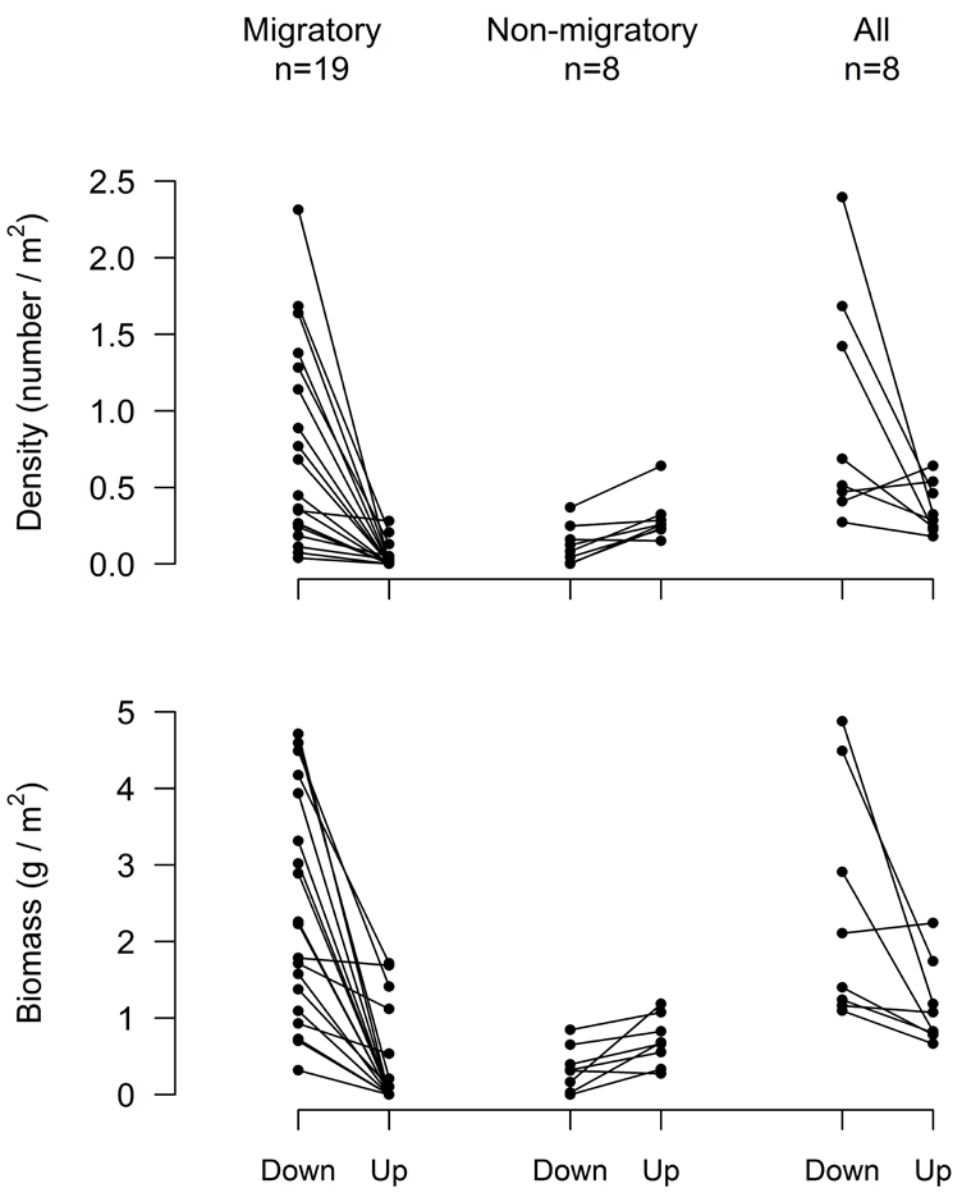
Results – Migratory Sculpin

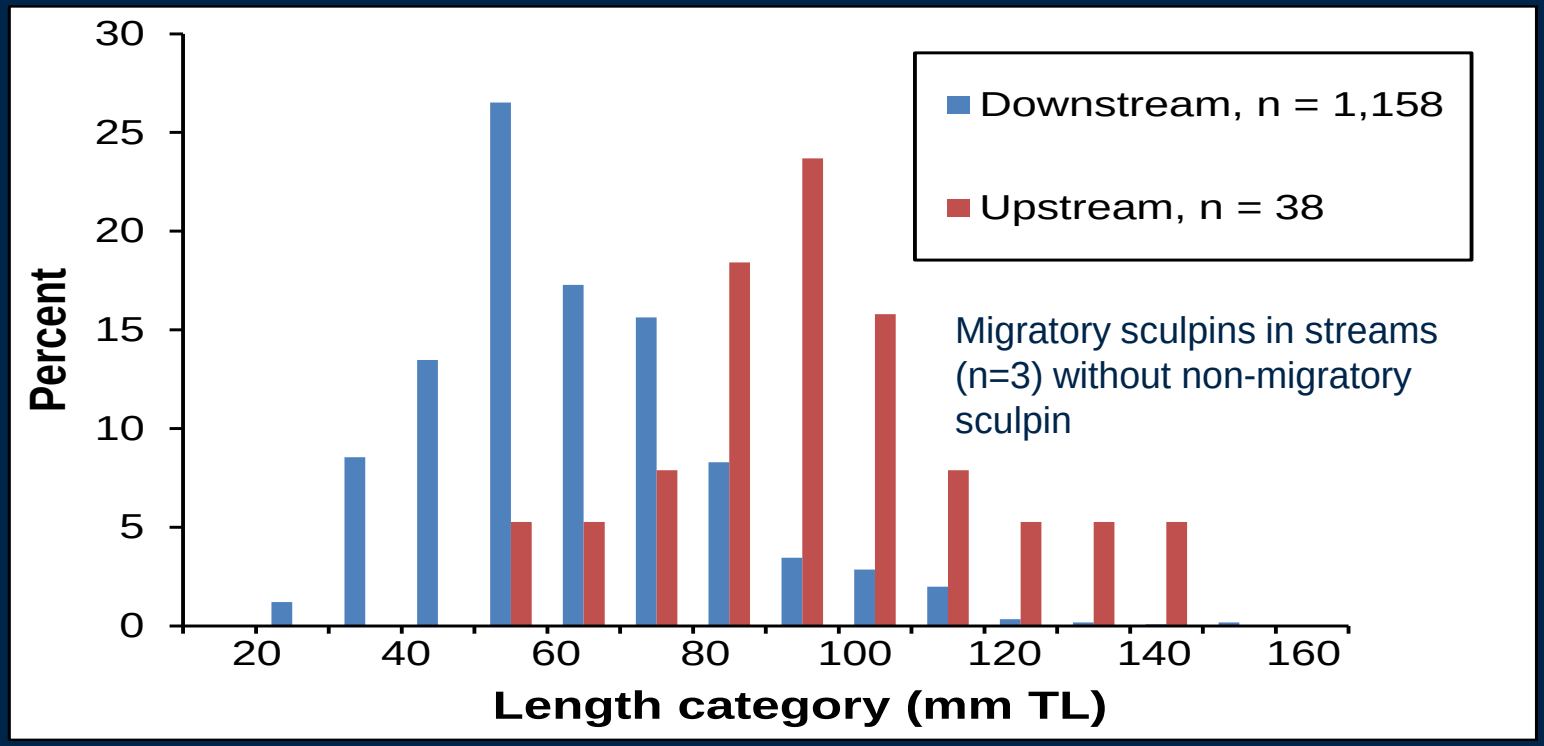


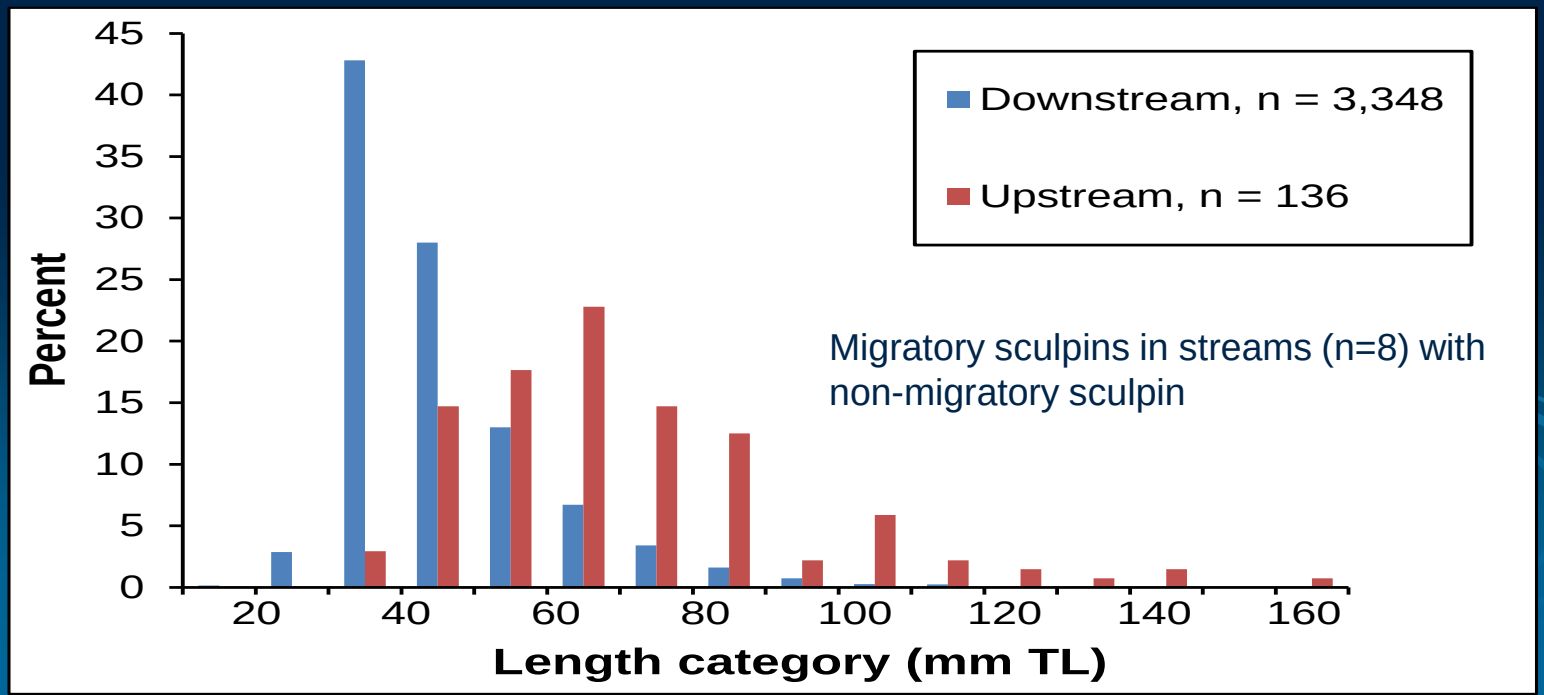
Results – Streams with Non-migratory Sculpin



Results


Migratory
n=19
Non-migratory
n=8
All
n=8
Density (number / m2)
2.5
2.0
1.5
1.0
0.5
0.0
Biomass (g / m2)
5
4
3
2
1
0
Down
Up
Down
Up
Down
Up

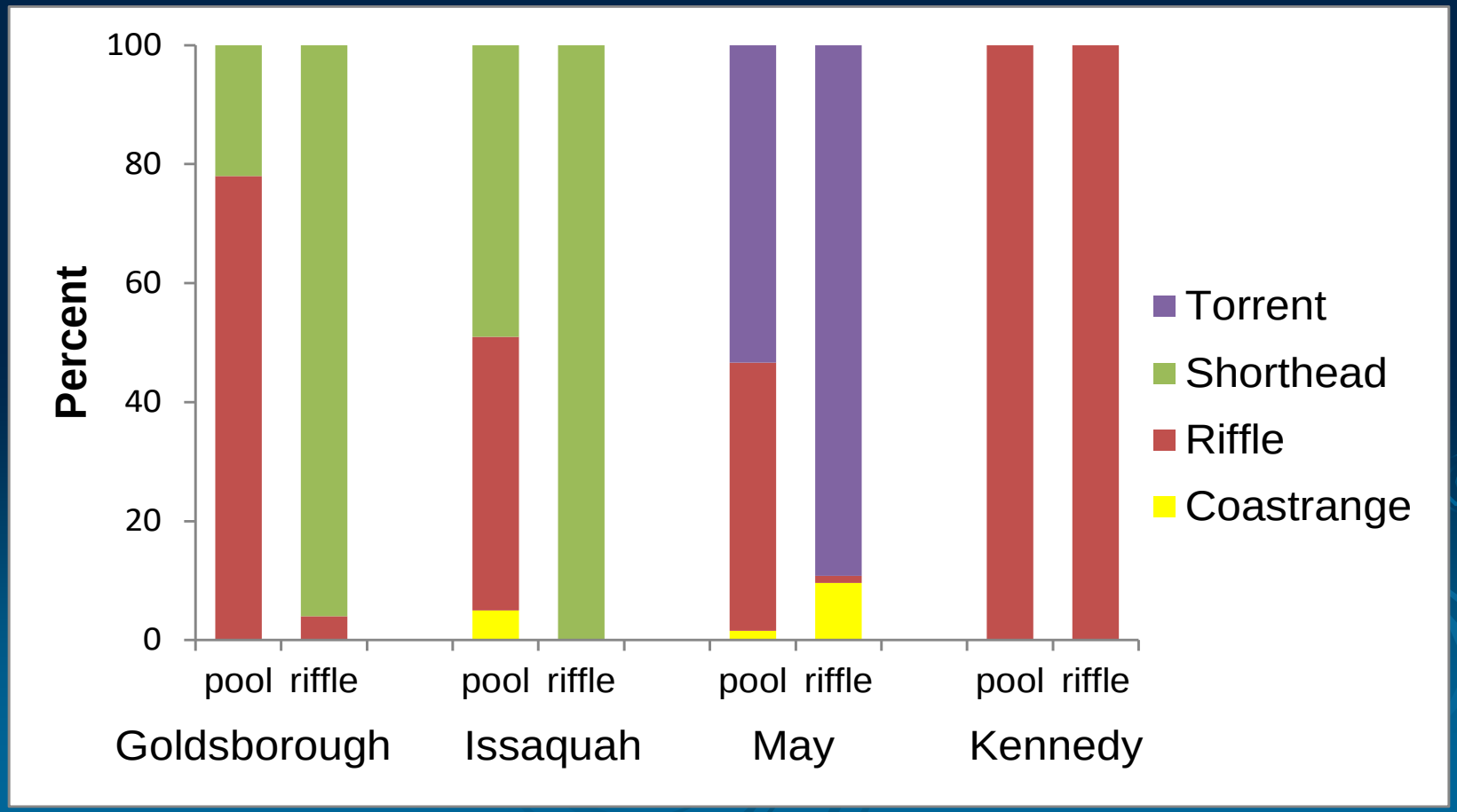

Downstream, n = 1,158
Upstream, n = 38
Migratory sculpins in streams (n=3) without non-migratory sculpin
Percent
Length category (mm TL)
0
5
10
15
20
25
30
20
40
60
80
100
120
140
160


Downstream, n = 3,348
Upstream, n = 136
Migratory sculpins in streams (n=8) with non-migratory sculpin
Percent
Length category (mm TL)
0
5
10
15
20
25
30
35
40
45
20
40
60
80
100
120
140
160

Spatial Segregation

	Pools	Riffles
Downstream	Prickly	Coastrange
Upstream	Riffle, Torrent	Shorthead, Torrent

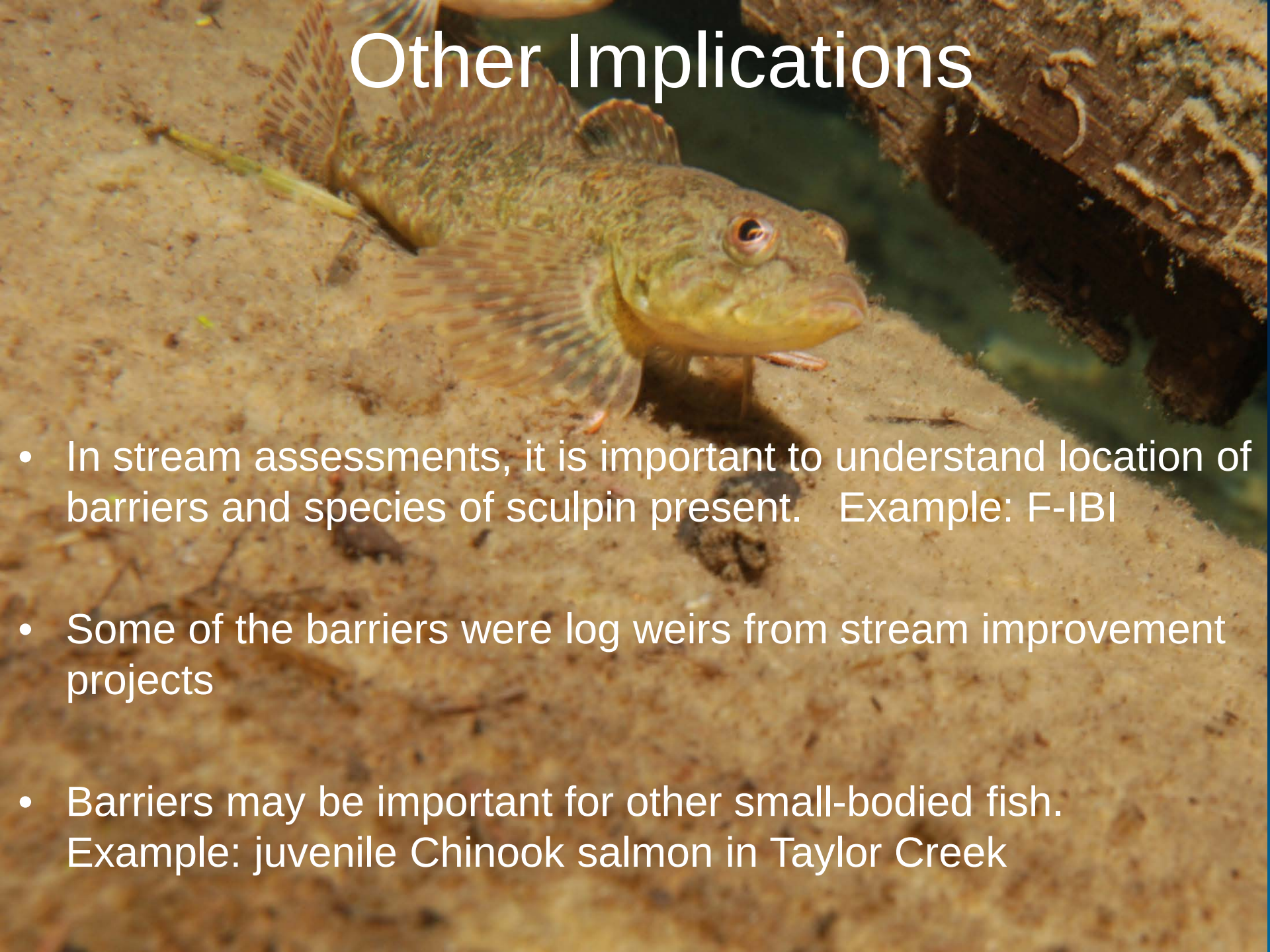
Example: Riffle Sculpin - Upstream of Barriers



Conclusions

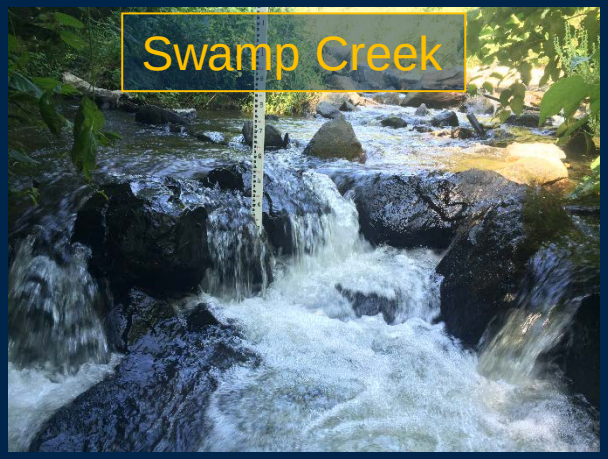
- Sculpin are not strong swimmers and barriers can have a strong effect on their distribution and species composition
- Barriers in lower reaches directly affect migratory sculpin and indirectly affect non-migratory sculpin
- Migratory sculpin usually are the dominant sculpin in lower reaches
- In streams with non-migratory sculpin, the total abundance of sculpin often appears to be lower upstream of the barrier than downstream
- Migratory sculpin above barriers are larger than those below barriers

Other Implications



- In stream assessments, it is important to understand location of barriers and species of sculpin present. Example: F-IBI

- Some of the barriers were log weirs from stream improvement projects

- Barriers may be important for other small-bodied fish. Example: juvenile Chinook salmon in Taylor Creek

Examples of Barriers