Introduction

Juvenile salmon use nearshore kelp forests.

| Chinook *Oncorhynchus tshawytscha* | Coho *Oncorhynchus kisutch* | Chum *Oncorhynchus keta* | Pink *Oncorhynchus gorbuscha* |

Forage fish also use nearshore kelp forests, and provide a vital trophic link.

| Pacific herring *Clupea pallasi* | Surf smelt *Hypomesus pretiosus* | Sand lance *Ammodytes hexapterus* |

Understanding dynamics of kelp forest ecosystem function for these fish

Methods

Video snorkel surveys: April-October 2013-2019

- Permanent transect lines
- GoPro footage
- Pole mounts to reduce disturbance
- Salmon – forage fish interactions recorded
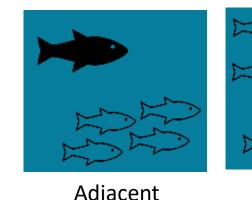- Video processed in the lab

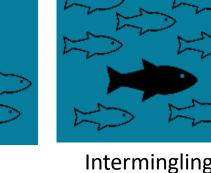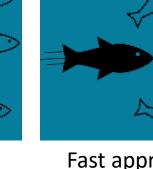**Study sites:** Two nearshore kelp forests and adjacent non-kelp zones in south-central Strait of Juan de Fuca

Crescent Bay   Freshwater Bay

Washington State

Crescent Bay   Freshwater Bay

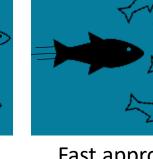- Continuous bands of kelp at 2-10m depth
- Bull kelp dominated

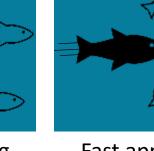**Video analysis:** 105 snorkel videos used

- Four surveys per month, per site
- 177 interactions analyzed between salmon & forage fish
- Forage fish counts estimated & binned
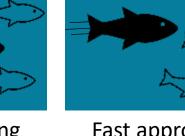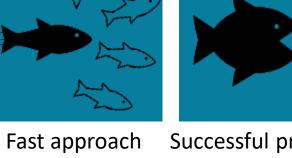- Kelp presence categorized: none, edge, in-kelp
- Interactions categorized:

| Adjacent | Intermingling | Fast approach | Successful predation |

- Data visualized with R Studio
- Predictor variables considered for Poisson distribution models: abundance of fish species, month, kelp presence

Juvenile salmon interact with forage fish in nearshore kelp forests, with seasonal and spatial patterns.

Dynamics of juvenile salmon and forage fish in nearshore kelp forests

Anne Shaffer[1,2], Justin Gross[1,3], Morgan Black[3], Amelia Kalagher[1,2*], and Francis Juanes[3]

[1]Coastal Watershed Institute, P.O. Box 266, Port Angeles, Washington 98362 USA

[2]Western Washington University College of the Environment Salish Sea Region, Port Angeles, Washington 98362 USA

[3]University of Victoria, Department of Biology, PO Box 1700, Station CSC, Victoria, BC V8W 2Y2 Canada

*Student presenter: Amelia Kalagher

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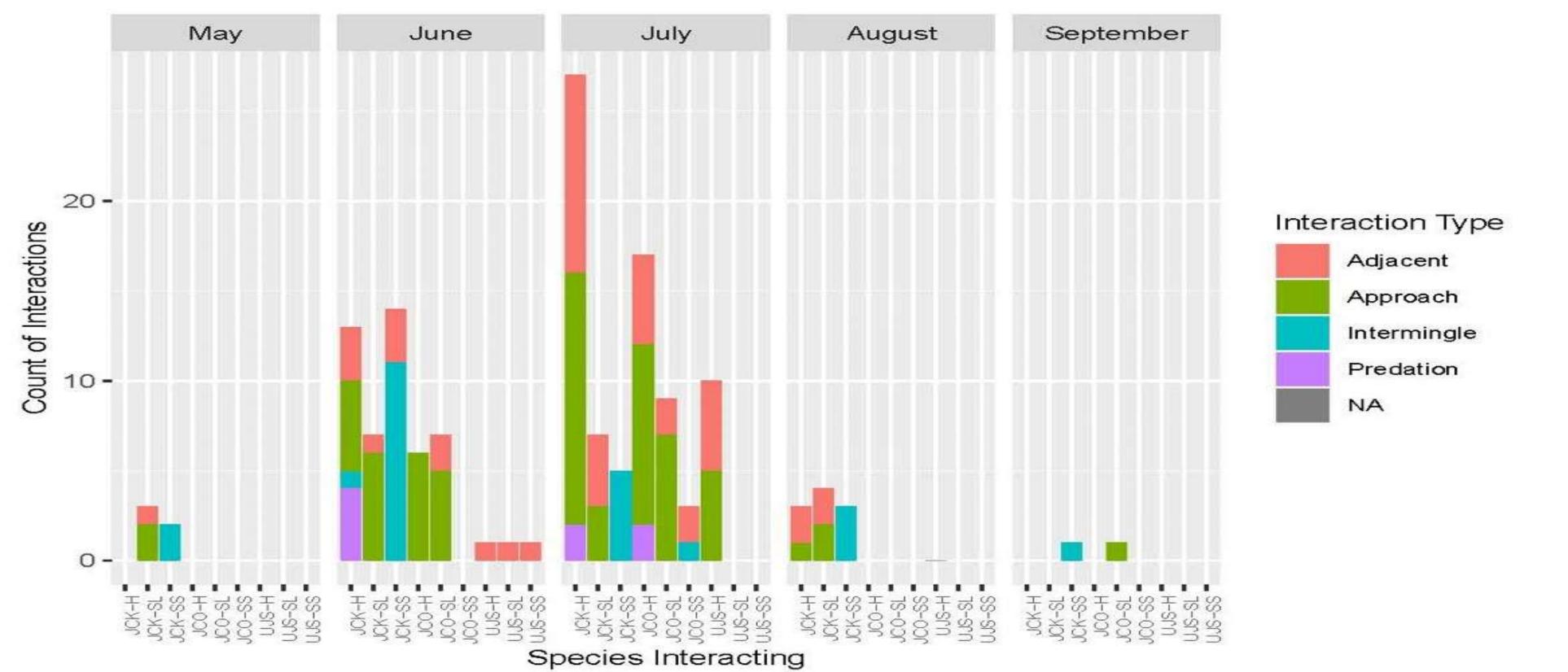
UVIC UNIVERSITY OF VICTORIA

Contact: cwi.general@coastalwatershedinstitute.org

Implications

- Kelp forest conservation and restoration are rapidly emerging as coastal management priorities.
- Strict regulations and prevention of oil spills and pollutants must be instituted around kelp forests, especially during April-October.
- Conserving intact kelp forests known to support salmon and forage fish is most important.
- Restoration is a lower priority, and must address the root causes of habitat degradation.

Results

- **The majority of salmon observed were juvenile Chinook and coho.**
- **Interactions increased in June and July, and declined in August.**
- **Intermingling with surf smelt suggests possible mutualistic schooling.**
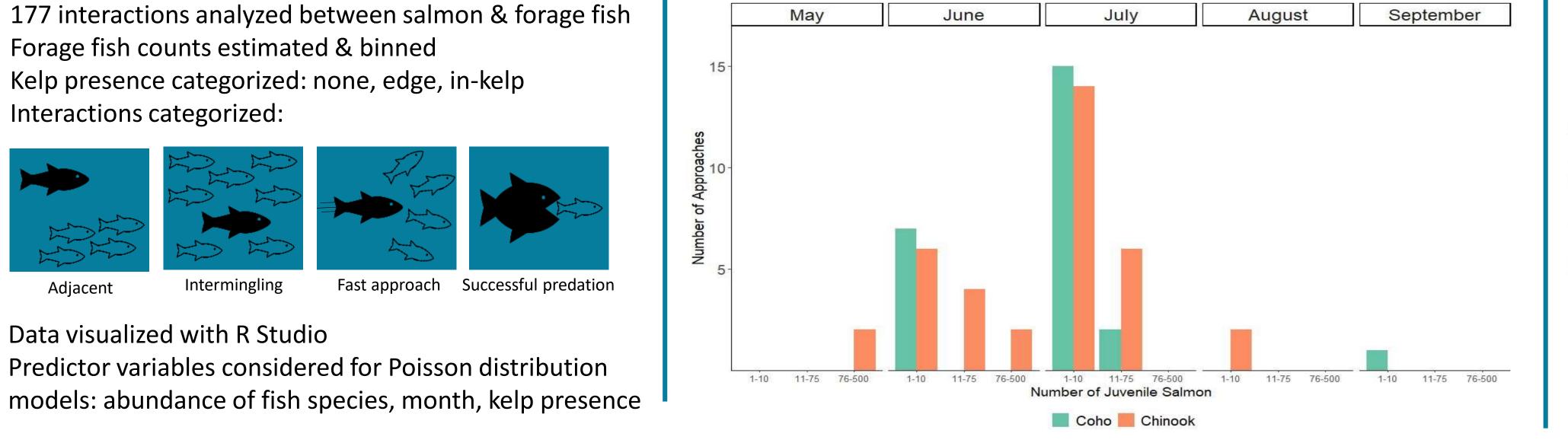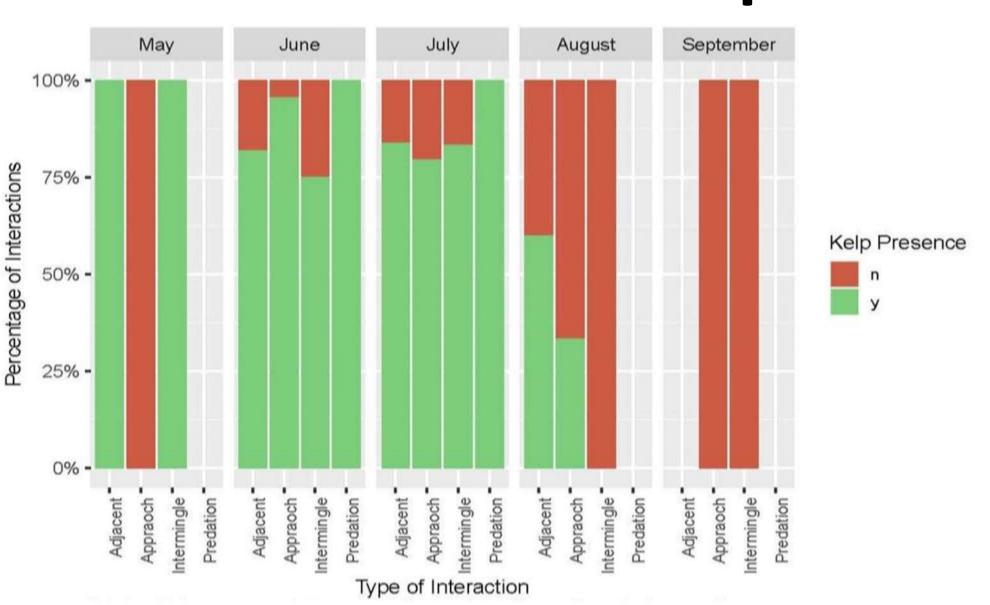- **Herring and sand lance are more important for foraging than surf smelt.**

Salmon smolt with forage fish in nearshore bull kelp forest

Fish abundance, month and kelp were significant predictors of interactions.

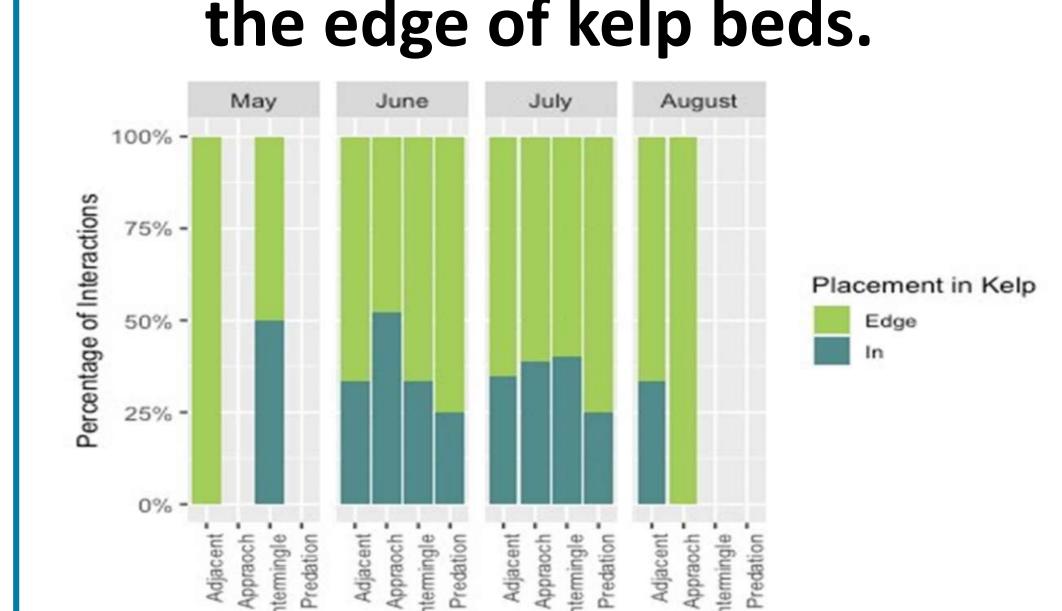| Species	Interaction	Significant Predictors
Surf smelt	Intermingle	coho, Chinook, month, in-kelp
Sand lance	Approach	Chinook, sand lance, Unknown Salmon, in-kelp
Herring	Approach	Chinook, coho, Unknown Salmon, month, in-kelp
Herring	Adjacent	Chinook, coho, month, kelp presence

Fast approaches were observed for Chinook four months earlier than previously published.

78% of interactions, and 100% of predations, were associated with kelp.

60% of kelp forest zone interactions happened along the edge of kelp beds.

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