

# Birds Eat Fish: Tracking avian predation on juvenile salmonids in central California

Danielle Frechette, Ann-Marie Osterback, Sean Hayes, Scott Shaffer, Jonathan Moore, Jim Harvey

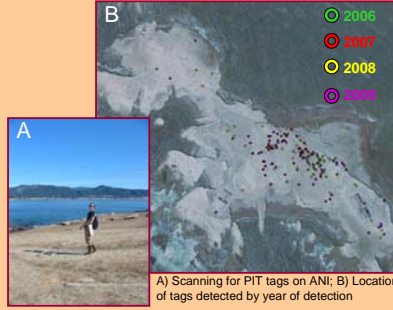
## Introduction

- In central California, coho salmon (*Oncorhynchus kisutch*) are endangered and steelhead (*O. mykiss*) are threatened, under the U.S. Endangered Species Act.
- Until recently, the role of bird predation in limiting recovery of coho and steelhead in central California has been overlooked.
- Passive Integrated Transponders (PIT tags) are used to monitor population biology and marine survival of these species.
- Tags are implanted in fish as small as 65 mm fork length and last indefinitely.



11.5 mm long PIT tag with grain of rice

• Detections of 208 PIT tags on Año Nuevo Island (ANI), an important breeding site for seabirds in central California, indicate that predation by birds, especially Western Gulls, may be a significant source of mortality for local salmonids.



A) Scanning for PIT tags on ANI; B) Locations of tags detected by year of detection

• During Spring of 2008 and 2009, we captured Western Gulls at Scott and Waddell Creeks and tagged 72 gulls with VHF transmitters.

• During 2008 gulls were tracked at night to locate additional roosting sites to scan for PIT tags and improve estimates of predation of juvenile salmonids by Western Gulls.

• During 2009, we tagged Western Gulls with the objective of addressing the question: "What is the effect of the ANI breeding population of WEGU on juvenile salmonids in central California?"



Juvenile steelhead



Juvenile coho

## Capturing and Tagging Gulls

Gulls were captured on beaches at Scott and Waddell Creeks using cannon nets which were launched using 1) black powder or 2) an air canister. During 2008, 33 Western Gulls (juveniles and adults) were tagged using tail-mounted radio-transmitters. During 2009, 39 adult Western Gulls received backpack-style radio-transmitters, which were attached to the bird using harnesses made of neoprene or Teflon.

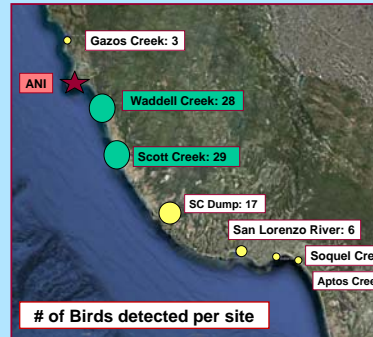


A) Air propelled cannon net being deployed to capture gulls at Waddell Creek; B) Adult Western Gull with a neoprene harness and backpack mounted radio-transmitter; C) Adult Western Gull with steel and plastic identification bands

## Results

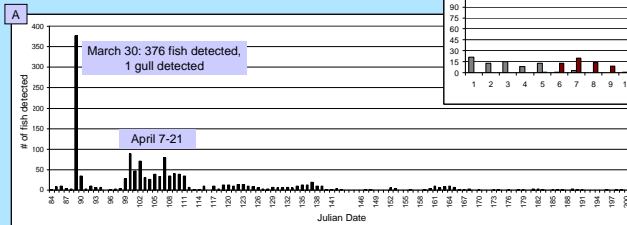
**Location of additional roosting sites:** Of 33 gulls tagged in 2008, 23 were detected after release. The primary roosting site identified was ANI

**Do gulls travel to other creeks?** Of 39 gulls tagged in 2009, 33 were detected after release. Gulls tagged at Scott and Waddell Creek used both of these watersheds, and were detected at four additional watersheds in Santa Cruz and San Mateo Counties.



**When are gulls at creek mouths?** An in-stream PIT tag antenna installed at the mouth of Scott Creek enabled estimation of the number of tagged juvenile salmonids migrating out of creek and into the ocean on a daily basis.

**A)** The greatest number of tagged fish were detected on March 30, coincident with a release of hatchery steelhead. Peak migration out of the system occurred April 7-21, 2009.



14 gulls were detected using ANI during the 2009 breeding season (April-August)

**Locating additional feeding sites:** 100% of gulls using ANI were detected at the Santa Cruz landfill

**How far are gulls travelling?** This gull was detected at ANI during the 2009 breeding season. It was sighted in Half Moon Bay on March 18, and detected at the Watsonville Dump during the June aerial survey.



All other gulls which used ANI March - August 2009 were detected between Gazos and Aptos Creeks.

## Radio-Tracking

1. Locate additional roosting sites to scan for PIT tags → Night-time tracking (2008)
2. Figure out whether gulls travel to other creeks, locate additional feeding sites → Day-time tracking (2009)
3. How far from ANI are gulls travelling? → Aerial Survey, Observations by the public (2008-2009)
4. Determine time spent at creek mouths, and when gulls are at creek mouths → Permanent listening stations at Scott and Waddell Creeks (2009)



Tracking gulls using a Yagi antenna and handheld receiver

Radio-tracking was conducted weekly along a stretch of coastline from Gazos Creek in the north to Aptos Creek in the south. Two aerial surveys were flown during 2009 (June and September) and covered the area from Point Sur to San Francisco Bay and out to the Farallon Islands.

## Significance

- Gulls use a variety of food sources including landfills, agricultural fields, and intertidal habitat
- Western gulls use creeks for bathing and drinking, and beaches for loafing during the day
- Predation on salmonids at creek mouths likely is opportunistic
- Gull populations have increased in recent years, salmonid populations have decreased drastically
- Increases in gull populations may be attributed to subsidies from human sources (i.e. landfills)
- PIT tag recoveries indicate predation of juvenile salmonids from some central CA watersheds may exceed 3%, and represent only minimum estimates
- Only adult Western Gulls use ANI, so predation by juveniles or adults roosting elsewhere is underestimated

**Predation by Western Gulls represents a significant source of mortality for threatened and endangered juvenile salmonids in central California.**