SNAMP Fisher Study: *Sources of Mortality*

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SNAMP Fisher Integration Meeting
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SNAMP Fisher Study: Collaborators/Cooperators Aiding Investigations on Fisher Mortalities & Disease

Mourad Gabriel, PhD Candidate, UC Davis & Integral Ecology Research Center

- Disease in carnivore communities, emphasizing health status of fisher populations in California and other areas of North America
- Coordinates/assists UCD Pathologists on "full" necropsies for all fisher

Greta Wengert, PhD Candidate, UC Davis & Integral Ecology Research Center

- Predation in fisher populations, intraguild predation in carnivore communities
- Molecular genetic analyses for identifying predators of fishers

UCDAVIS
UNIVERSITY OF CALIFORNIA

WHC WILDLIFE health center

IERC
Integral Ecology Research Center

SNAMP Fisher Study: Documenting Fisher Mortalities

Primary Weapon:

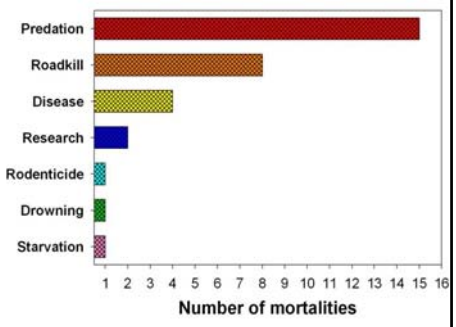
"Weasel 1" (Cessna 185 or Piper Supercub)

1. Flights 6 days/week except in bad weather: *primary purpose - detect possible mortalities, investigate, & recover carcasses for full necropsy*
2. Biologist detects signal, immediately alerts ground crew, then transmits position coordinates
3. Ground crew navigates to area with telemetry equip., locates carcass
4. Site investigated, photographed, biological samples collected
5. Carcass frozen, shipped to UC Davis, added to queue for necropsy

SNAMP Fisher: Time to Recovery of Fisher Carcasses

RESULTS: *Cause-specific Mortalities*

- To date we've determined causes of mortality for 31 fishers (24 collared, 7 noncollared)
- Top 3 causes of mortality are predation (14), roadkill (8), and disease (4)




F33 Bobcat

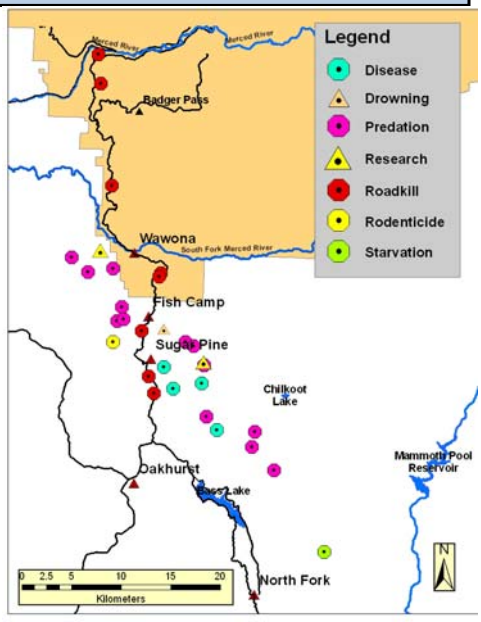

F25 Hwy 41


M14 CDV

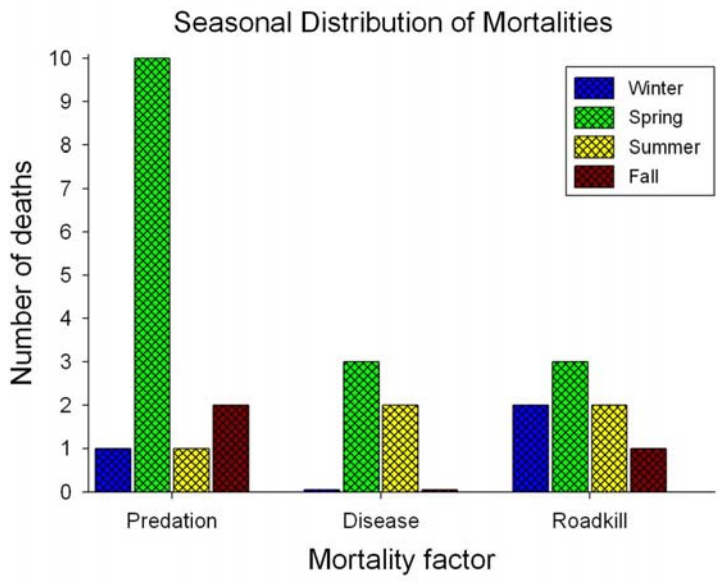
SNAMP Fisher: Distribution of Identified Fisher Mortalities

31 Total Mortalities Documented to Date

- Predation occurs throughout area
- All roadkills have been along Hwy 41
- Disease deaths: a CDV epizootic occurred in the study area last year
- **GOOD NEWS!** There haven't been any disease-linked deaths since last spring\summer



BASIC MORTALITY RESULTS: Fisher Mortalities by Season



SNAMP Fisher Study: Who are the Fisher Predators in Our Area?

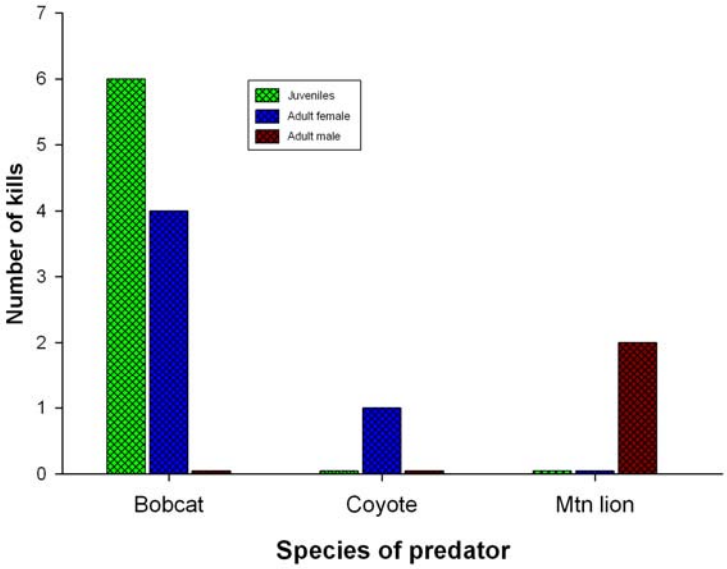
- Bobcats
- Mountain lions
- Coyotes
- **Perhaps owls or large raptors? <u>Update – *No, it was Bobcat*</u>**

SNAMP Fisher Study: Fisher Mortalities – Questions/Issues for Discussion

- Many of SNAMP Fisher mortalities have been "natural" - other predators killing fishers. *Is this unusual?*
- Topic of collaborator Greta Wengert's PhD Dissertation; ***prelim answer seems to be no; even healthy adults are predated, and there are emerging patterns…***



BASIC RESULTS: Apparent size-related pattern of predation by different species of carnivores



SNAMP Results: Continuing high level of bobcat predation in study area

- Minimum 9 (*up to 11*) SNAMP fishers killed by bobcats
- All bobcat kills have been female fishers; *bobcats detected at 5 different den trees*
- 3 bobcat killed adult females were reproductive at death
  - *F09 – 2 kit embryos in carcass*
  - *F15 – denning female; 2 kits in den tree*
  - *F31 – denning female; 3 kits in den tree*

Photos from Den Cameras

Most Fisher Predation in SNAMP Project Area Now Linked to Bobcats by DNA analyses


Bobcat at base
F04 den tree


Bobcat with fisher kit near
base of F15 den tree

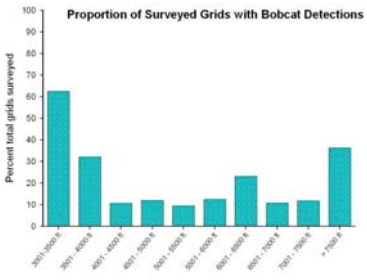
Table 1. Predation Events Recorded in other Studies of Pacific Fishers in California.

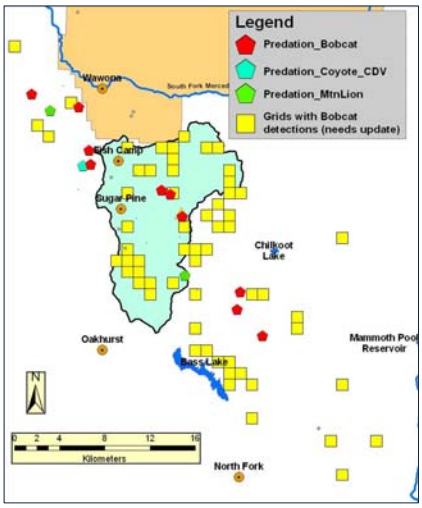
Project	Mt lion	Bobcat	Coyote	Unknown	Totals
Hoopa	2	6	2	6	16
Kings River	4	3	2	3[a]	10
SNAMP	2	9 *(11?)*	1	2[a]	9
[a] *DNA testing underway or pending*					

EXPANDED COLLABORATION: **Greta will work with SNAMP to collar bobcats in our study area for examining overlap in habitat use: *1st try at collaring bobcats here in late winter was unsuccessful***

SNAMP COLLABORATION: Attempting to understand factors contributing to high level of bobcat predation

- Greta will likely resume trapping for bobcats in SNAMP study area this fall
- SNAMP Fisher will provide logistical support and information we have/acquire on bobcats to facilitate the collaboration





SNAMP Fisher: Identified Fisher Mortalities in Study Area

ROADKILL UPDATE:

- Min. 3 additional road-related mortalities over last 12 months
  - F25 – female with kits
  - Lactating female – YNP
  - Unknown sex/age - YNP
- Vehicle traffic is likely limiting fisher distribution/expansion in Yosemite National Park

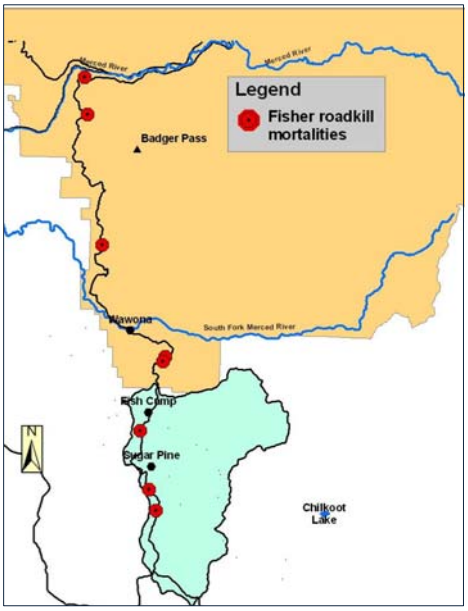


Table 2. Roadkill Mortalities Recorded in Other Studies or in Other Areas of California with Pacific Fishers.

	Hoopa	Kings River	SNAMP	Yosemite NP[a]	Yosemite NP Recent[b]
Number	2-3[c]	1	3	**4**	**5**

[a] 11 year period (1993-2004)(Chow 2009, unpublished manuscript).
[b] 27 month period: May 2008 to July 2010.
[c] Mourad Gabriel, personal communication.
NOTE: In the northeastern U.S. roadkill mortalities are common.

... and fishers

New Findings: CDV Epizootic occurred in SNAMP Project Study Area during April to early May 2009

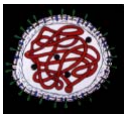
- Sick gray fox – died after capture (April 3) on Hwy 41 near Cedar Valley exhibiting symptoms of CDV
- Carcasses of M14 & M05 picked up nearby on April 22 & April 28; both confirmed as having died from active infection with CDV
- Adult female fisher (F14) with an ongoing CDV infection was killed by predator (left uneaten), 1 week Later
- Collaboration with Mourad Gabriel/UC Davis has been extremely valuable and will continue…

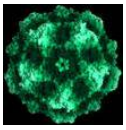
Carcass of M05

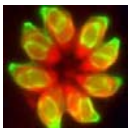
M. Gabriel – UCD: Serology & Disease Evaluations

SEROLOGY

- Canine distemper virus
- Canine parvo virus
- Canine adenovirus
- Canine herpesvirus
- West Nile virus
- Lyme borreliosis
- *Anaplasma phagocytophilum*
- *Rickettsia* spp.
- *Yersinia pestis*
- *Bartonella* spp.
- *Toxoplasma gondii*
- *Neospora caninum*
- *Fleas, Ticks*







ACTIVE INFECTIONS

- Parvovirus/canine parvo
- Canine Distemper Virus
- Canine Influenza Virus (H3N8),
- *Bordetella bronchiseptica*
- Canine adenovirus-2
- Canine herpes virus
- Parainfluenza
- Canine Respiratory Coronavirus

Full Necropsies completed for all fisher carcasses recovered by SNAMP and those we take temporary possession of from Yosemite NP (THANKS NPS!)

SNAMP Fisher Study: Fisher Mortalities – Questions/Issues for Discussion

- We've verified disease mortalities in Sierra NF*: Where are the diseases coming from and what can be done?*
- *How common is disease or disease exposure in other fisher populations?*

Canine Distemper Virus (CDV) Exposure

Individual Fishers

British Columbia
4% (2 of 50)

WA. Reintro. Project
NA

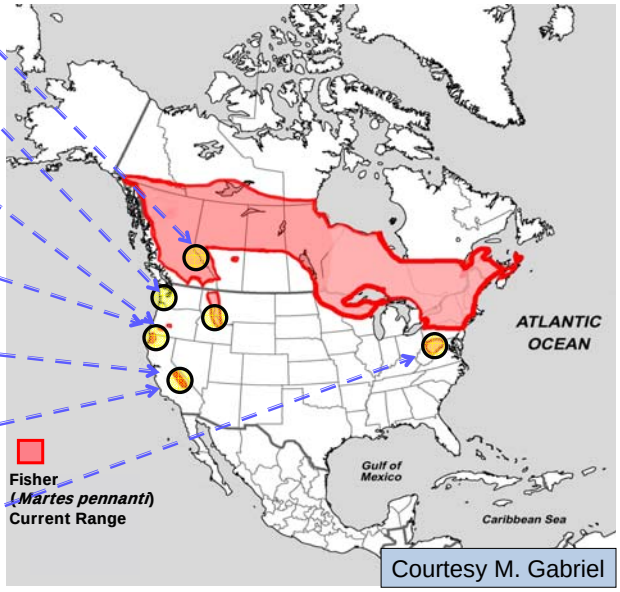
Hoopa Project
5% (5 of 98)

N. Coast Inter.
0% (0 of 19)

SNAMP Project
3% (1 of 36)

USFS Project
14% (5 of 36)

PA Project
20% (9 of 45)



Courtesy M. Gabriel

Canine Parvo Virus (CPV) Exposure

British Columbia
6% (1 of 17)

WA. Reintro. Project
NA

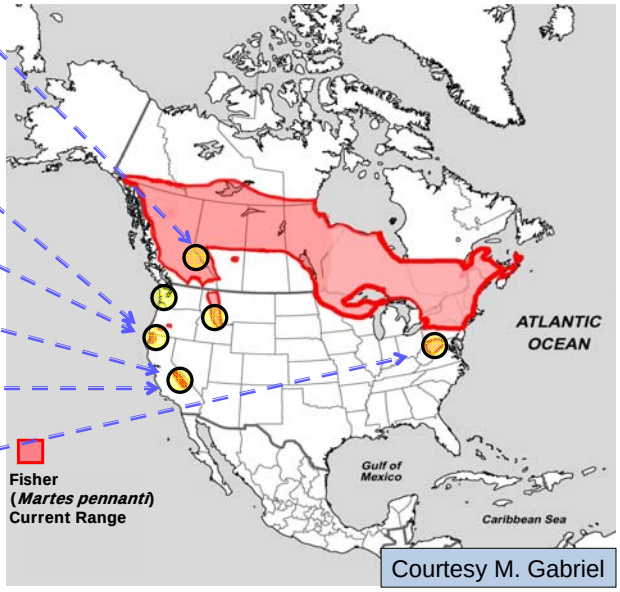
Hoopa Project
31% (28 of 90)

N. Coast Inter.
11% (2 of 19)

SNAMP Project
4% (1 of 24)

USFS Project
47% (9 of 19)

PA Project
66% (20 of 30)



Courtesy M. Gabriel

Canine Parvo Virus (CPV) Active infections

British Columbia
0% (0 of 17)

WA. Reintro. Project
NA

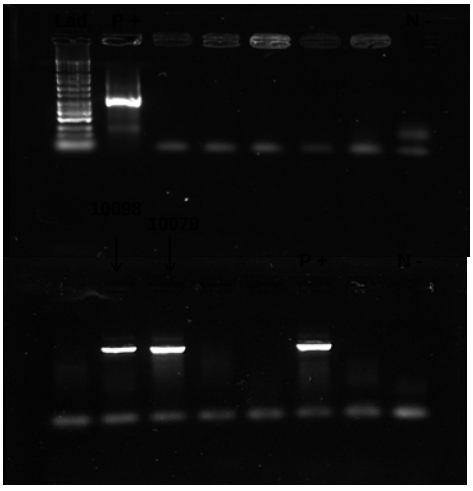
Idaho
8% (1 of 12)

Hoopa Project
18% (18 of 98)

SNAMP Project
4% (2 of 46)

USFS Project
3% (2 of 67)

PA Project
17% (5 of 30)



Courtesy M. Gabriel

Toxoplasma gondii (Toxo) Exposure

British Columbia
28% (9 of 45)

WA. Reintro. Project
NA

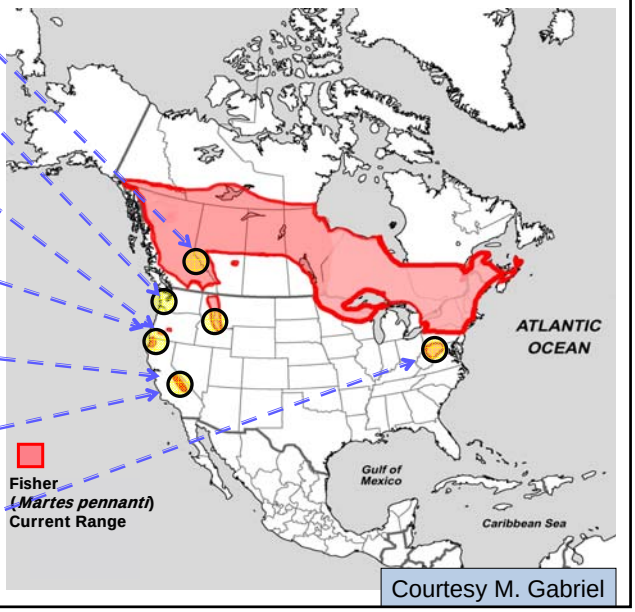
Hoopa Project
58% (45 of 77)

N. Coast Inter.
46% (6 of 13)

SNAMP Project
66% (22 of 33)

USFS Project
54% (21 of 39)

PA Project
93% (28 of 30)



Courtesy M. Gabriel

What are the Benefits of Conducting **Full** Necropsies *(= expensive)* ?

Accurately determine cause of death

Verify current or previous causes of morbidity

Determine synergistic effects on non-disease suspect mortalities

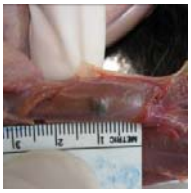
Verify predation vs. scavenging

Archive tissue samples for future research

Will Continue Full Necropsies w/Disease Testing to Accurately Determine Causes of Death

Suspicious "drowning" ⟷

Canine Distemper



Suspect unknown ⟷ *Toxoplasma gondii*

OTHER KEY NECROPSY FINDINGS:

- *F10 – yes starvation, but also wounded*
- *F35 drug-related, but also had wound from snare on rostrum*
- *F14 – Suspected disease, but bite wounds from coyote = proximate cause of death*