

Fisher IT Session V. Challenges to Fisher Survival



Rick Sweitzer¹, Greta Wengert², and Mourad Gabriel²

¹Center for Natural Resources University of California Berkeley

²University of California Davis & Integral Ecology Research Center

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



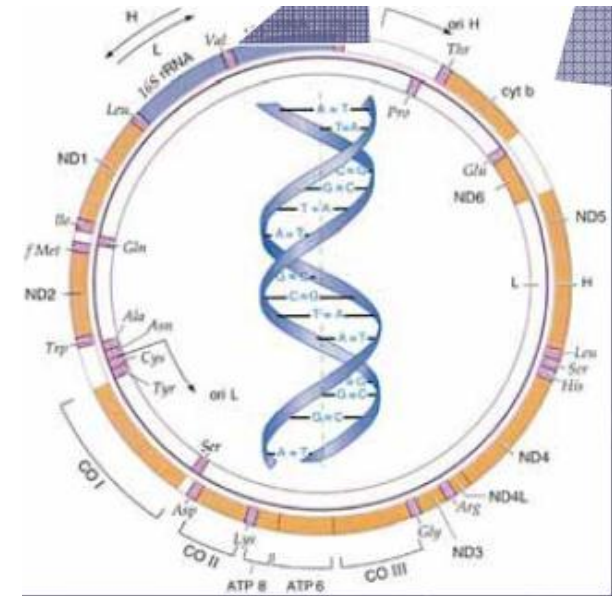
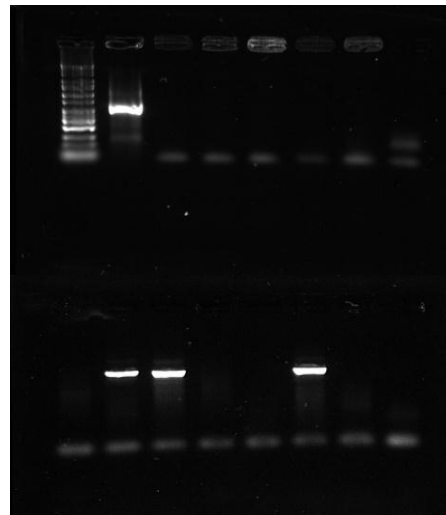
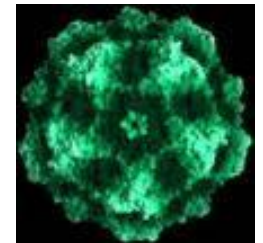
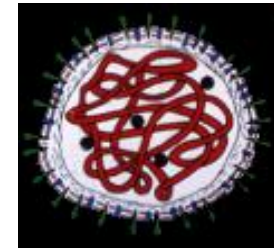
METHODS: Cause-Specific Mortality

Serology, Full Necropsies, Tissue Samples

- ❖ Blood and fluids/swabs; disease exposure to multiple and varied pathogens
- ❖ Series of lab analyses investigating active infections
- ❖ Liver tissues tested for rodenticide exposure (*new*)

Molecular analyses (PCR) for identifying predators of fishers

- ❖ Felid-specific primer: HV1 region mtDNA
- ❖ Canid-specific primer: cytochrome-b region mtDNA



METHODS: Survival By Kaplan-Meier Staggered Entry

- ❖ Allows entry of new animals after start of the study
- ❖ Missing animals censored when not relocated for ≥ 2 months
- ❖ Output: metrics on survival rate ($s(t)$), SE, and 95% CIs over periods of interest
- ❖ Survival estimates compared using Z-tests (Pollock et al. 1989)

ALL ADULT FEMALES - SNAMP					
Month	Pop Year	No. at risk (rj)	No. deaths (dj)	No. censored	No. new Added
01 Apr-30 Apr	All Yrs	33	1	3	0
01 May-31 May	All Yrs	29	3	2	1
01 June-30 June	All Yrs	24	0	1	4
01 July-31 July	All Yrs	27	0	0	3
01 Aug-31 Aug	All Yrs	30	3	0	4
01 Sep-30 Sept	All Yrs	31	0	1	2
01 Oct-31 Oct	All Yrs	32	0	0	0
01 Nov-30 Nov	All Yrs	33	0	1	2
01 Dec-31 Dec	All Yrs	31	0	1	1
01 Jan-31 Jan	All Yrs	31	1	0	1
01 Feb-28 Feb	All Yrs	31	0	0	0
01 Mar-31 Mar	All Yrs	21	1	0	0

** Sample data input: Kaplan-Meier Estimator **

Contribution of different Mortality Factors to Fisher Survival:

% deviation in overall survival (S) = $[(S_t - S)] / S \times 100$,

where S_t = survival rate after censoring predation, disease, etc..

RESULTS: *Cause-specific Mortalities*

- ❖ SNAMP & Kings River have recovered the carcasses of 65 collared, 7 noncollared fishers
- ❖ Top 3 causes of mortality have been predation (>40), disease (7), and roadkill (3 collared, 6 noncollared)

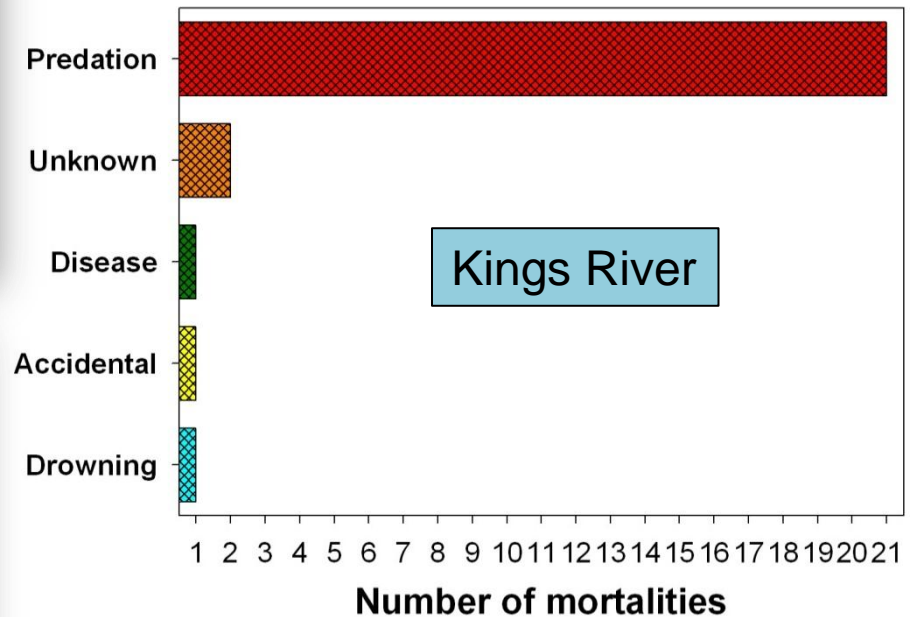
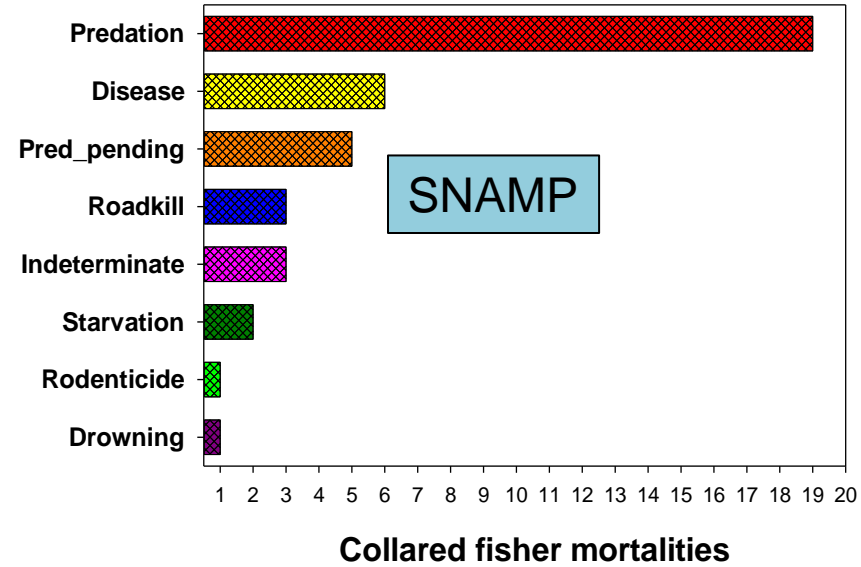


Table 2. Cause-specific mortalities for radiocollared fishers in the southern Sierra Nevada; combined data from SNAMP and Kings River Fisher Studies.

Site	Predation ^a	Disease or Illness	Roadkill	Rodenticide	Indeterminate	Other
SNAMP	19 (+5 pending)	6 ^b	3 (5) ^c	1	3	1, 1, (1) ^d
Kings River	21	1 ^b	0 (1)	0	2	1, 1 ^e
Both	40	6	3 (6)	1	4	4 (1)

^a Numbers include several **suspected** predation events awaiting DNA forensic analyses

^b One SNAMP fisher died during processing but was determined by necropsy as seriously weakened by injury+illness. One KR fisher died during processing; testing revealed she was morbidly ill with CDV

^c Numbers in parentheses represent noncollared fisher deaths reported to or found by research teams

^d Drug interaction, starvation, drowning

^e Apparent drowning, accidental entombment

Emerging Issue in Cause-specific Mortality: **Rodenticide Exposure**

- ❖ 21 and 9 fisher carcasses from SNAMP and Kings River tested positive for rodenticides
- ❖ Exposure on Hoopa Fisher Study as well; exposure appears widespread in CA

Table 1. Percent deviation in fisher survival attributable to different cause-specific mortalities observed on the SNAMP and Kings River Fisher Projects.

Age/Sex	Predation (max)		Disease (max) ^a		Roadkill, rodenticide	
	Kills	% Deviation	Kills	% Deviation	Kills	% Deviation
SNAMP						
Adult females	8	25.2	1	7.1	1	8.2
Adult males	2	26.7	2	14.1	2	16.3
Subadult females	3	61.4				
Subadult males	3	75.0	2	28.6		
Juvenile females	2	13.6				
Juvenile males	1	50.0			1	10.0
Kings River						
Adult females	10	31.6				
Adult males	4	53.8				
Subadult females						
Subadult males	3	45.5				
Juvenile females						
Juvenile males	4	40.6				

^a Does not include one fisher each from SNAMP and Kings River that were diseased and died during captures.

UNEXPECTED RESULTS: Survival Highest during Winter!?

- ❖ Fisher survival highest in fall/winter, lowest during Spring



Fishers like winter, but they might instead dread the springtime!

Season	Spring	Summer	Fall/Winter
Adult Female	0.83	0.90	0.97
Adult Male	0.70	0.86	0.96
Subadults	0.71	0.80	1.0
Juveniles	-	-	0.81

