

### **AMBYSTOMA TIGRINUM VIRUS**

JESSE BRUNNER  
WASHINGTON STATE UNIVERSITY

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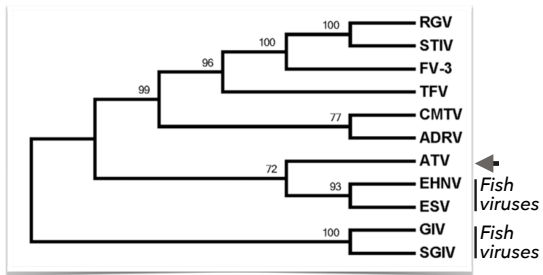
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### **AMBYSTOMA TIGRINUM VIRUS**



Jancovich, J. K., N. K. Steckler, and T. B. Waltzek. 2015. Ranavirus Taxonomy and Phylogeny. Pages 59-70 in Gray, M. J., and V. G. Chinchir, editors. *Ranaviruses: Lethal pathogens of ectothermic vertebrates*. Springer International.

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Photo © Tom Brennan

Vol. 31: 161-167, 1997

DISEASES OF AQUATIC ORGANISMS  
Dis Aquat Org

Published December 30

### **Isolation of a lethal virus from the endangered tiger salamander *Ambystoma tigrinum stebbinsi***

James K. Jancovich<sup>1</sup>, Elizabeth W. Davidson<sup>1</sup>, J. Frank Morado<sup>2</sup>,  
Bertram L. Jacobs<sup>3</sup>, James P. Collins<sup>1</sup>



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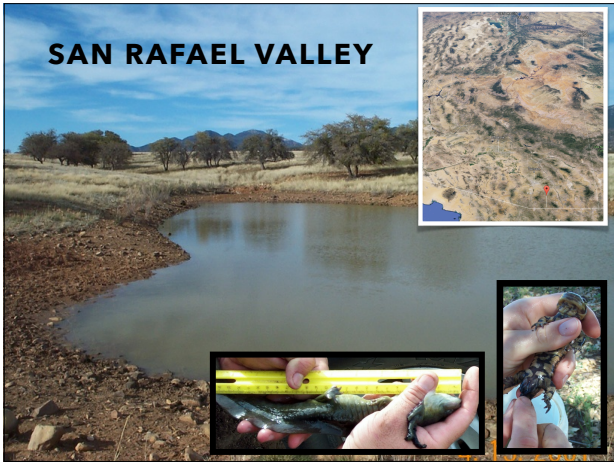
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**ATV INFECTIONS**

Causes systemic infection

Signs include papules, erythema, petechiae, edema, & white cloacal exudate

Usually lethal within about 2-3 weeks

Probability

Time to death (Days)

Time to death (Days)	Probability
5	0.00
10	0.05
12	0.10
14	0.15
15	0.18
16	0.15
18	0.10
20	0.05
25	0.02
30	0.00

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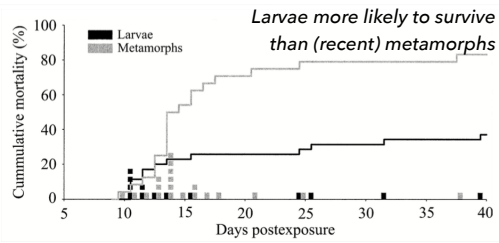
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## ATV INFECTIONS



~1/3 retain sublethal infections

Life stage	Mortality	Time to death (d)	Recovered	Sublethally infected
Larvae	13/35 (37%)	18 ± 9.6	13/26 (50%)	9/22 (41%)†
Remained larval	10/26 (38%)			
Metamorphosed	3/9 (33%)			
Metamorphs	20/23 (87%)	16.1 ± 6.2	1/17 (6%)	1/3 (33%)‡

Burner, J. L., D. M. Schock, J. P. Collins, and E. W. Davidson. 2004. The role of an intraspecific reservoir in the persistence of a lethal ranavirus. *Ecology* 85:560-566.



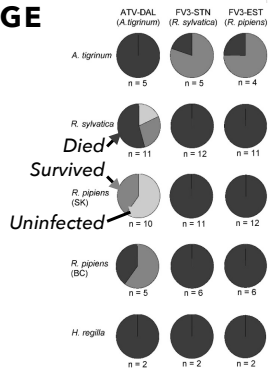
## ATV HOST RANGE

	Culture / PCR
Sals	<i>Ambystoma gracile</i> + / +
	<i>Notophthalmus viridescens</i> + / +
Frogs	<i>Rana pipiens</i> - / -
	<i>R. catesbeiana</i> - / -
	<i>Gambusia affinis</i> - / -
Fishes	<i>Lepomis cyanellus</i> - / -
	<i>Oncorhynchus mykiss</i> - / -

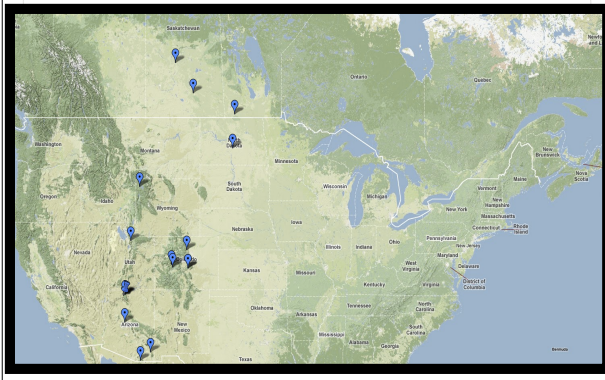
Jancovich, J. K., E. W. Davidson, A. Seiler, B. L. Jacobs, and J. P. Collins. 2001. Transmission of the *Ambystoma tigrinum* virus to alternative hosts. *Diseases of Aquatic Organisms* 46:159-163.

**Caudates (wild & lab)**  
**Anurans (lab)**

Schock, D. M., T. K. Bollinger, V. G. Chinchar, J. K. Jancovich, and J. P. Collins. 2008. Experimental evidence that amphibian ranaviruses are multi-host pathogens. *Copeia* 1:133-143.



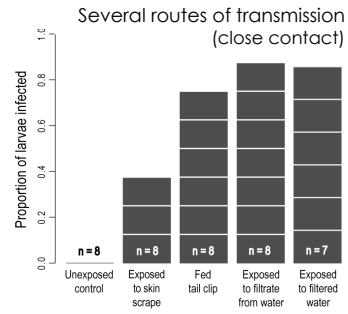
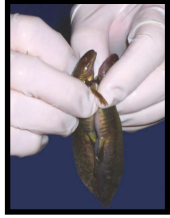
## DISTRIBUTION OF ATV







### ATV TRANSMISSION



Brunner, J. L., K. Richards, and J. P. Collins. 2005. Dose and host characteristics influence virulence of ranavirus infections. *Oecologia* 144:399-406.

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### ATV TRANSMISSION



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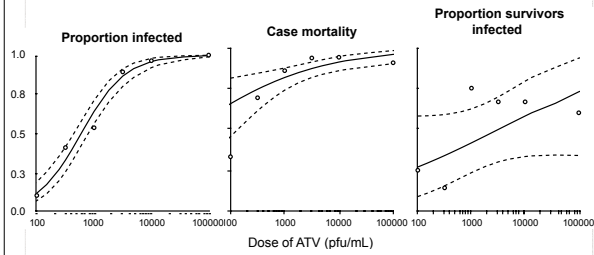
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### ATV TRANSMISSION



Rates of infection increases with dose... as does case mortality... but chronic infections are not related to dose  
*(is there a threshold?)*

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### KAIBAB PLATEAU

8,000-9,000ft elevation  
 limestone sink-holes &  
 dugout tanks  
 ponderosa pine-aspen  
 stands




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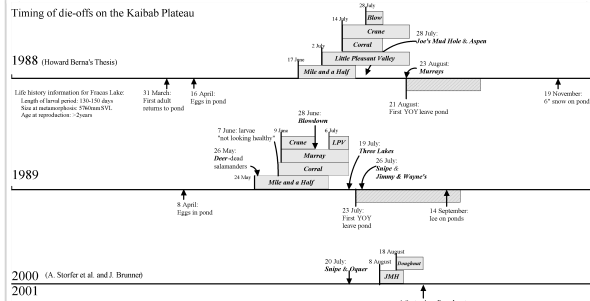
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### SEASONALITY AND PERSISTENCE

Timing of die-offs on the Kaibab Plateau




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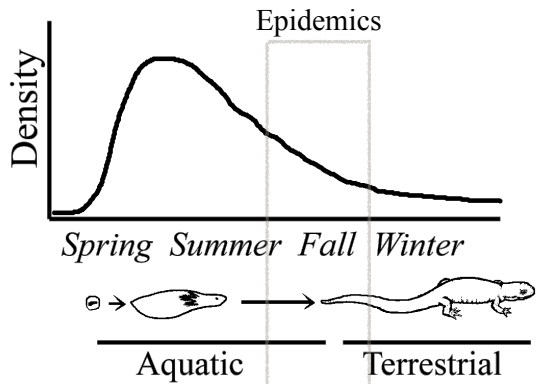
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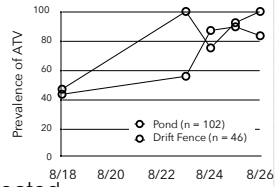
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# ATV PERSISTENCE AT DOT

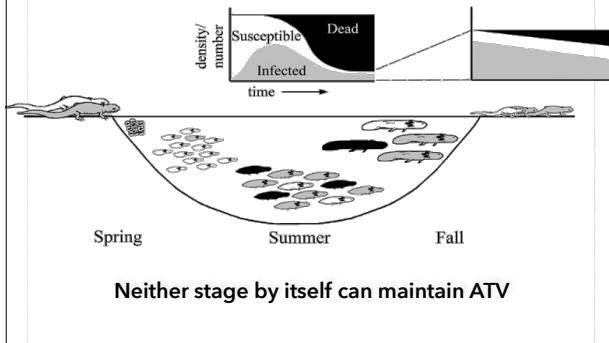


Metamorphs leave ponds infected...

and adults return to ponds infected

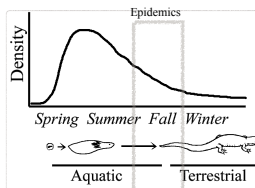


# INTRASPECIFIC RESERVOIR

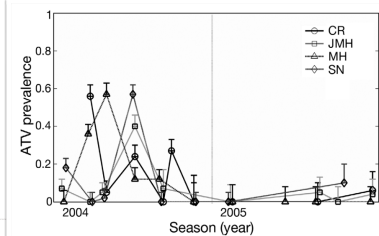


Neither stage by itself can maintain ATV

Brunner, J. L., D. M. Schock, J. P. Collins, and E. W. Davidson. 2004. The role of an intraspecific reservoir in the persistence of a lethal ranavirus. *Ecology* 85:560-566.



Actual patterns of prevalence and die-offs are far more complex



Greer, A. L., J. L. Brunner, and J. P. Collins. 2009. Spatial and temporal patterns of *Ambystoma tigrinum* virus (ATV) prevalence in tiger salamanders (*Ambystoma tigrinum nebulosum*). *Diseases of Aquatic Organisms* 85:1-6.



## TAKE HOME MESSAGES

- **ATV is unique in that:**
  - (relatively) restricted host range (but little recent work)
  - restricted geographic distribution (but little recent work)
  - sister to fish viruses
- **Like other ranaviruses it is:**
  - often lethal, but can cause sublethal infections (means of persistence?)
  - transmitted by close contact (dose is the key)
  - moved around in trade (water dogs)

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