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Appendix A from M. A. Duffy and S. R. Hall, "Selective Predation and Rapid Evolution Can Jointly Dampen Effects of Virulent Parasites on *Daphnia* Populations"

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Supplemental Empirical Methods and Results

Effects of Infection on Individual Fecundity

To estimate virulent effects of *Metschnikowia* and *Spirobacillus* on host reproduction, we compared fecundities of infected and uninfected adult females. In this comparison, we reduced the possibility of confounding effects of age/size by scanning samples on each lake date to determine the sizes of females carrying eggs. This size range was then used to classify animals into juvenile and adult classes, even if adults did not carry eggs.

Results of ANOVAs comparing fecundity of infected and uninfected hosts in several lakes are found in table A2; date and infection status were both modeled as categorical variables. Fecundity was not measured in Bassett Lake during the 2003 *Metschnikowia* epidemic because it occurred in late autumn after the population had ceased reproducing asexually.

Calculation of Population Birth Rate

Our study lakes stratify, and *Daphnia dentifera* migrate between warmer, upper waters at night and colder, deeper waters during the day (Leibold and Tessier 1997). We have found little difference in this migratory behavior between infected and uninfected *Daphnia* (Hall et al. 2005*b*). Thus, the temperature *D. dentifera* experience and at which their eggs develop depends on the depth inhabited and the time spent at each depth (i.e., the length of day vs. night). To determine vertical distribution of the *D. dentifera* in these populations, we collected samples with a 20-L Schindler trap at 1–2-m intervals during the day and at night. We collected these samples in July in Baker Lake, in August in Bassett Lake, in September in 3L2, and in August and September in Pine Lake (see Hall et al. 2005*b* for details). In previous years, we have found that diel vertical distributions of *D. dentifera* remain relatively constant throughout this time period (M. A. Duffy, unpublished data). We used these vertical distributions, changing length of day and night, and time series of temperature-depth profiles to calculate a time-weighted temperature experienced by these *Daphnia*. Using this weighted temperature, we could then calculate egg development times and ultimately birth rates (following Bottrell et al. 1976).

Selectivity of Bluegill Predation on Infected Daphnia dentifera

We measured the selectivity of fish predation on individuals infected with *Metschnikowia* in two lakes, Baker (September 19 and 23, 2002; $n = 1$ and 4 fish, respectively) and Bristol (September 14, 2003; $n = 5$ fish). For comparison, we also show similar data for *Spirobacillus*-infected *Daphnia dentifera* (from Duffy et al. 2005). For *Spirobacillus*, the selectivity of predation was measured in four lakes, Baker (September 23, 2002, and July 13, 2003, $n = 4$ and 7 fish, respectively), Bassett (August 6, 2003, $n = 3$ fish), Cloverdale (October 6 and 10, 2002, $n = 2$ and 4 fish, respectively), and Pine (August 14, 2003, $n = 5$ fish).

Table A1

Summary of lakes used for the individual- and population-level studies of a zooplankton host (*Daphnia dentifera*) infected with one of two parasites, a yeast (*Metschnikowia*) or a bacterium (*Spirobacillus*)

Lake	Year	Individual-level studies: Survivorship	Individual-level studies: Fecundity	Individual-level studies: Selectivity of predation	Population-level studies
Baker	2002			*Metschnikowia*, *Spirobacillus*	
Baker	**2003**		*Metschnikowia*	*Spirobacillus*	*Metschnikowia*
Bassett	**2003**	*Spirobacillus*	*Spirobacillus*	*Spirobacillus*	*Metschnikowia*, *Spirobacillus*
Bassett	2004		*Metschnikowia*		
Bristol	2004			*Metschnikowia*	
Cloverdale	2002			*Spirobacillus*	
Pine	**2003**	*Spirobacillus*	*Spirobacillus*	*Spirobacillus*	*Spirobacillus*
Warner	2002	*Metschnikowia*			
Warner	2004		*Metschnikowia*		
3L2	**2003**		*Spirobacillus*		*Spirobacillus*

Note: The four main study lakes (i.e., those extensively sampled to estimate population dynamics) are shown in bold. Due to logistical constraints, some of the individual-level studies were done in additional lakes and/or additional years. Note that while Bassett Lake had a *Metschnikowia* epidemic in 2003, it could not be used for individual-level studies on fecundity, as the epidemic occurred in late autumn, after the population had ceased reproducing asexually.

Table A2

ANOVA tables for analysis of fecundity of uninfected and infected (*Metschnikowia* or *Spirobacillus*) *Daphnia dentifera* adult females

Parasite and lake	Date			Infection status			Date × infection		
	df	*F*	*P*	df	*F*	*P*	df	*F*	*P*
Metschnikowia:									
Baker	4, 419	7.8	<.001	1, 419	10.0	.0017	4, 419	2.8	.0250
Bassett	9, 725	30.8	<.001	1, 725	11.6	<.001	9, 725	3.0	.0018
Spirobacillus:									
3L2	2, 210	1.2	.3106	1, 210	32.1	<.001	2, 210	1.2	.3106
Bassett	2, 174	.27	.7627	1, 174	26.8	<.001	2, 174	.22	.8050
Pine	7, 613	1.33	.2349	1, 613	85.8	<.001	7, 613	1.33	.2349

Note: "Infection status" had only two states for a given analysis: uninfected or infected with either *Metschnikowia* or *Spirobacillus*, as indicated at the top of the table. Analyses were conducted for periods where there was high infection prevalence (≥2% infection prevalence). Thus, the analysis for each lake includes multiple dates. Given that fecundity should change through time (due to population age structure, resource levels, etc.), our model also includes the date and its interaction with infection status.

Literature Cited in Appendix A

Bottrell, H. H., A. Duncan, Z. M. Gliwicz, E. Grygierek, A. Herzig, A. Hillbricht-Ilkowska, H. Kurasawa, P. Larsson, and T. Weglenska. 1976. A review of some problems in zooplankton production studies. Norwegian Journal of Zoology 24:419–456.

Leibold, M. A., and A. J. Tessier. 1997. Habitat partitioning by zooplankton and the structure of lake ecosystems. Pages 3–30 *in* B. Streit, T. Städler, and C. M. Lively, eds. Evolutionary ecology of freshwater animals. Birkhäuser, Basel.