

# **Delayed metamorphosis of amphibian larvae facilitates *Batrachochytrium dendrobatidis* transmission and persistence**

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**Running Head:** Amphibian long-lived larvae and chytridiomycosis

**Key Words:** *Batrachochytrium dendrobatidis*; delayed metamorphosis; intraspecific reservoir; overwintered larvae; pathogen transmission

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1 **ABSTRACT**

2 Highly virulent pathogens that cause host population declines confront the risk of fade-out, but if  
3 pathogen transmission dynamics are age-structured, pathogens can persist. Among other features of  
4 amphibian biology, variable larval developmental rates generate age structured larval populations,  
5 which in theory can facilitate pathogen persistence. We investigated this possibility empirically in a  
6 population of *Salamandra salamandra* in Spain affected by *Batrachochytrium dendrobatidis* (*Bd*) at  
7 breeding sites that lacked alternative amphibian hosts. None of the adults presented infection by *Bd*.  
8 However, for the larvae, while environmental heterogeneity was the most important predictor of  
9 infection, the effect on infection dynamics was mediated by transmission from overwintered larvae to  
10 new larval recruits, which occurred only in permanent larval habitats. We suggest that interannual *Bd*  
11 maintenance in a host population that experiences mass mortality associated with infection can occur  
12 without an environmental reservoir or direct involvement of an alternative host in our study system.  
13 However the two aquatic habitat types that support intraspecific reservoirs, permanent streams and  
14 ponds, are not ideal habitats for long-term *Bd* maintenance, either due to poor transmission  
15 probability or low host survival respectively. While intraspecific pathogen maintenance due to larval  
16 plasticity might be possible at our study sites this transmission pattern is not without significant risk  
17 to the pathogen. The availability of alternative hosts nearby does indicate that permanent *Bd* fade-out  
18 is unlikely.