Survival in ephemeral rock pools : A case study with freshwater anostracans

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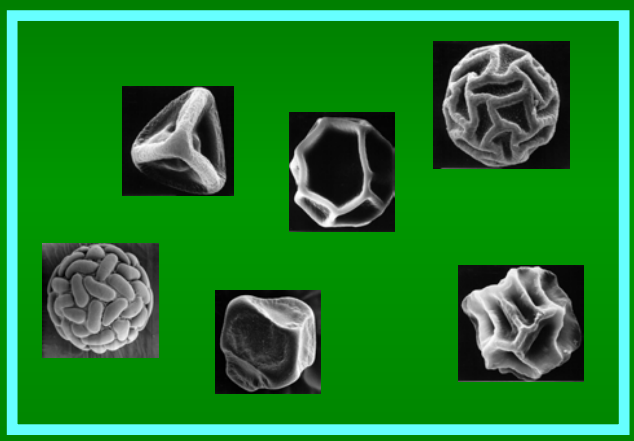

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The rock pool habitat

Botswana
(rock pools)

Australia
(gnamma's)

South Africa (rock pools)

Stress factors in ephemeral rock pools

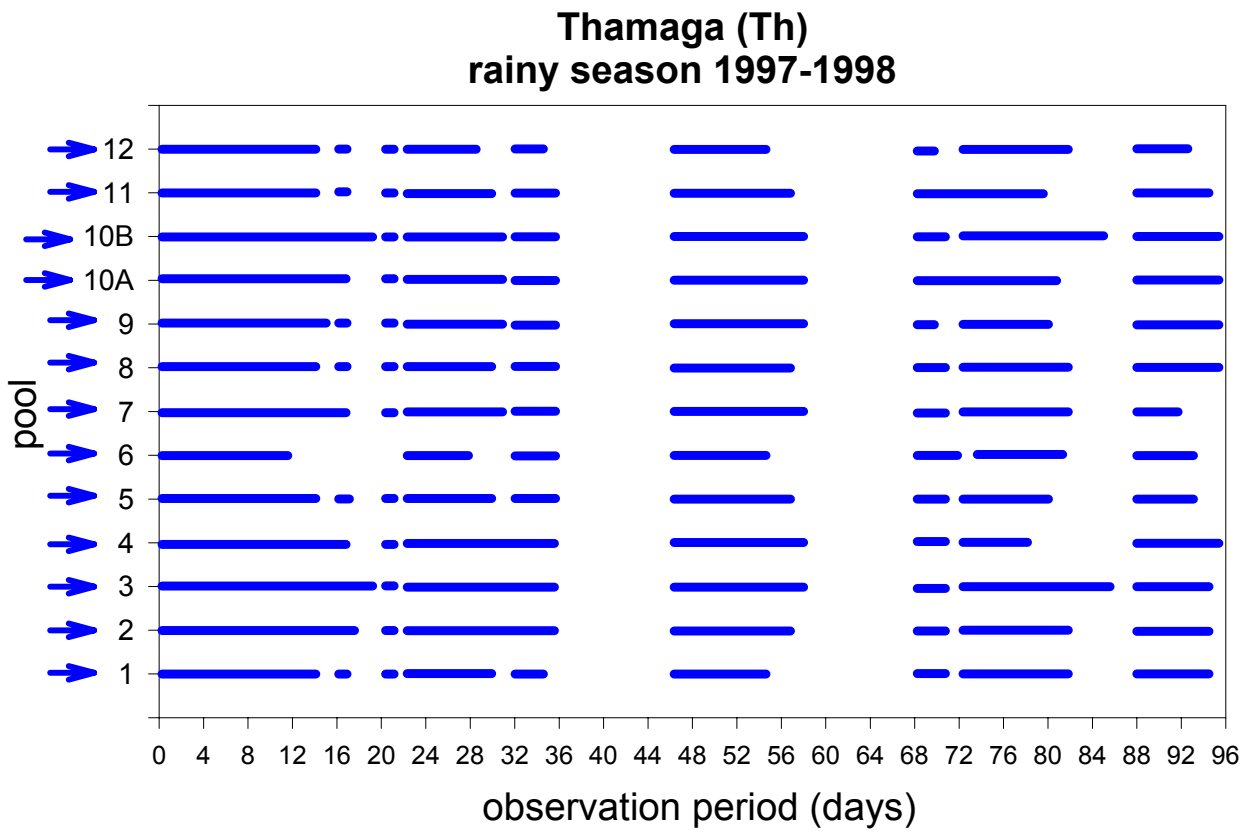
The biotic rock pool environment

The abiotic rock pool environment

- extreme values and fluctuations in temperature, pH, O2, conductivity
- unpredictability, short and variable inundation periods

region	n	conduct (µS/cm)	pH	temp (°C)	duration	ref
Drakensberg	90	3-70	6-8	10-25		Hamer & Martens, 1998
Korannaberg	30	20-200	5-11	11-30	3d-24d 80% < 3d	de Vries, 1996
SE Botswana	30	3-140	4-8	22-41	1d- > 1m 80% < 5d	Brendonck & Riddoch, 1998

long-term observation of pool phenology Thamaga (‘97-’98):



persistence in variable environment

B. spreading of risks :

hatching behaviour of resting eggs
(dormancy strategy - time)

dispersal strategy - space

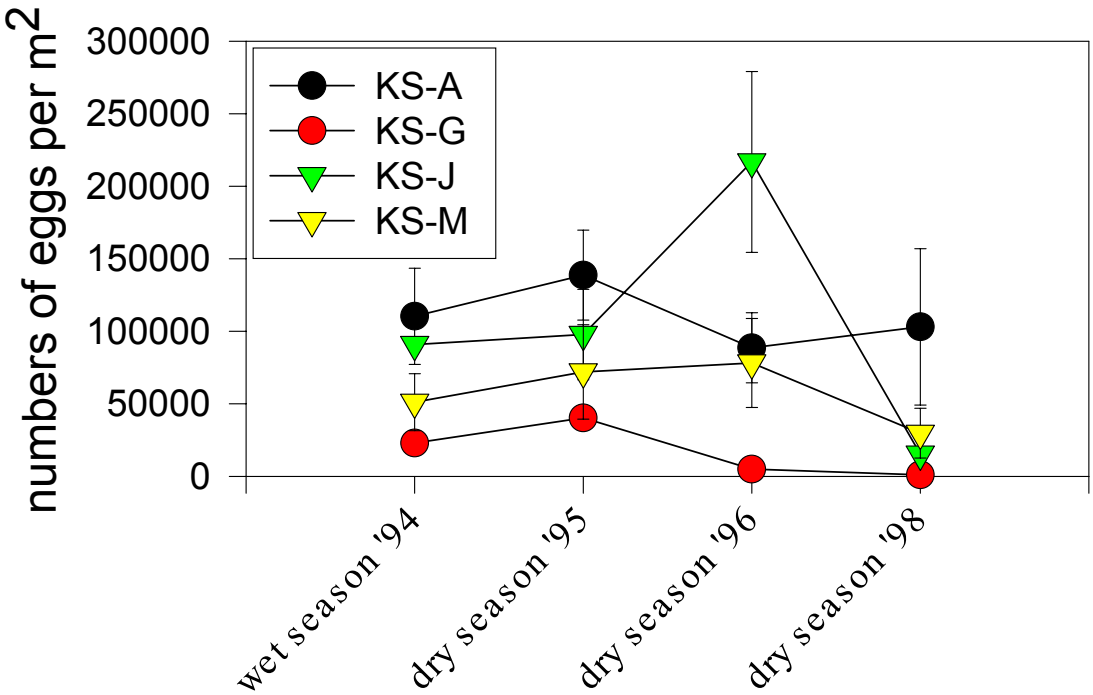
A.racing against time :

reproductive characteristics (early life history)

The study organism: *Branchipodopsis wolfi*

in search of egg banks

egg bank dynamics



Conclusion: *B. wolfi* forms persistent egg banks

egg bank dynamics

(cfr De Stasio, 1989)

egg deposition

emergence

dispersal

viable egg bank

degradation

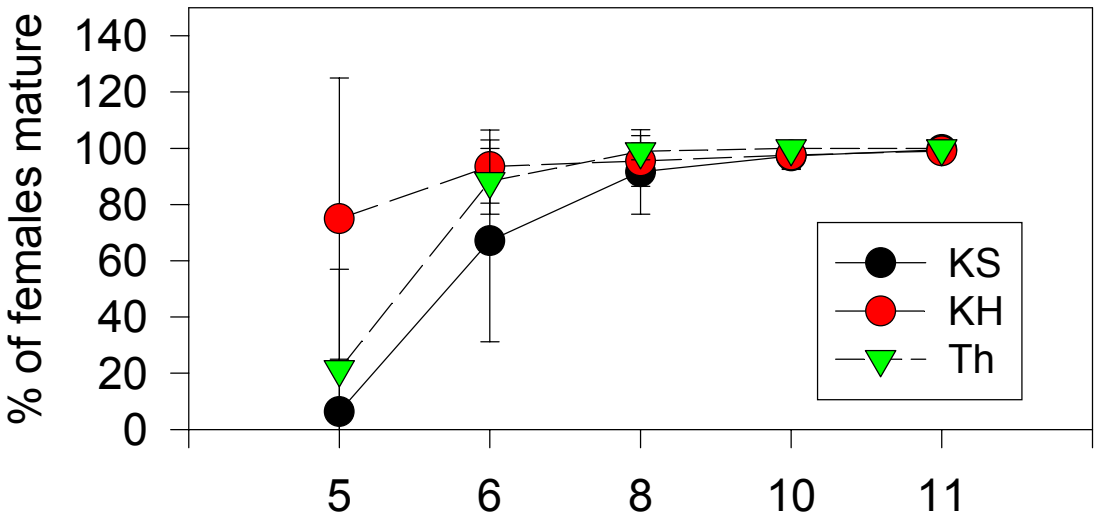
predation

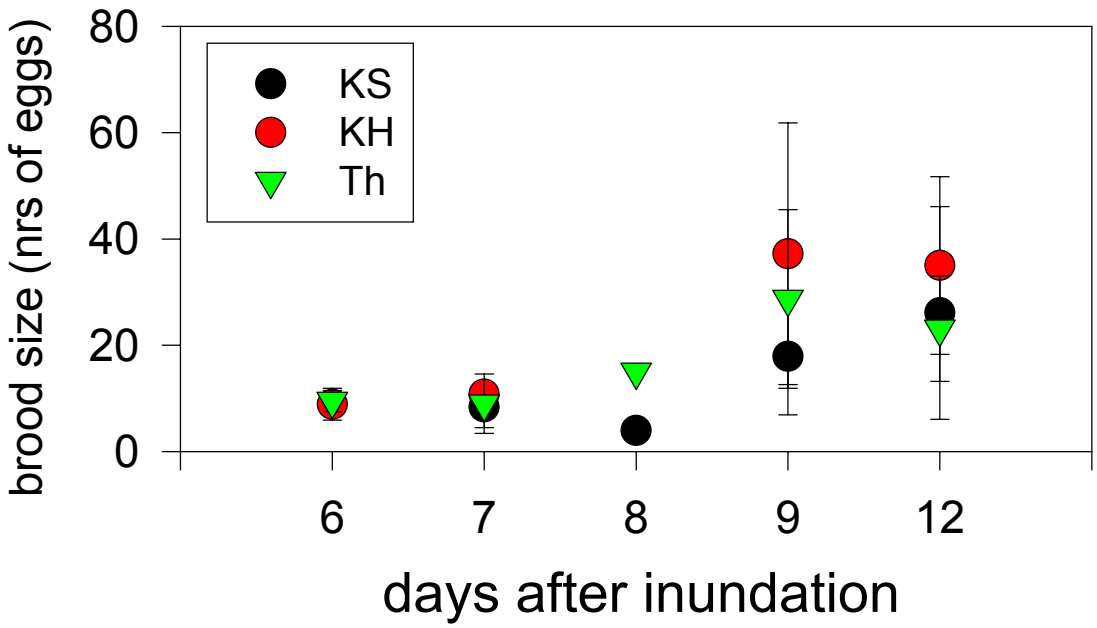
senescence

mixing

movement

Racing against time





Conclusion: *B. wolfi* matures fast (5 days) with first broods after less than 6 days.

Significant Pearsons correlation coefficients between morphometric and phenologic characteristics of studied rock pools and early life history characteristics of rock pool populations of *B. wolfi*.

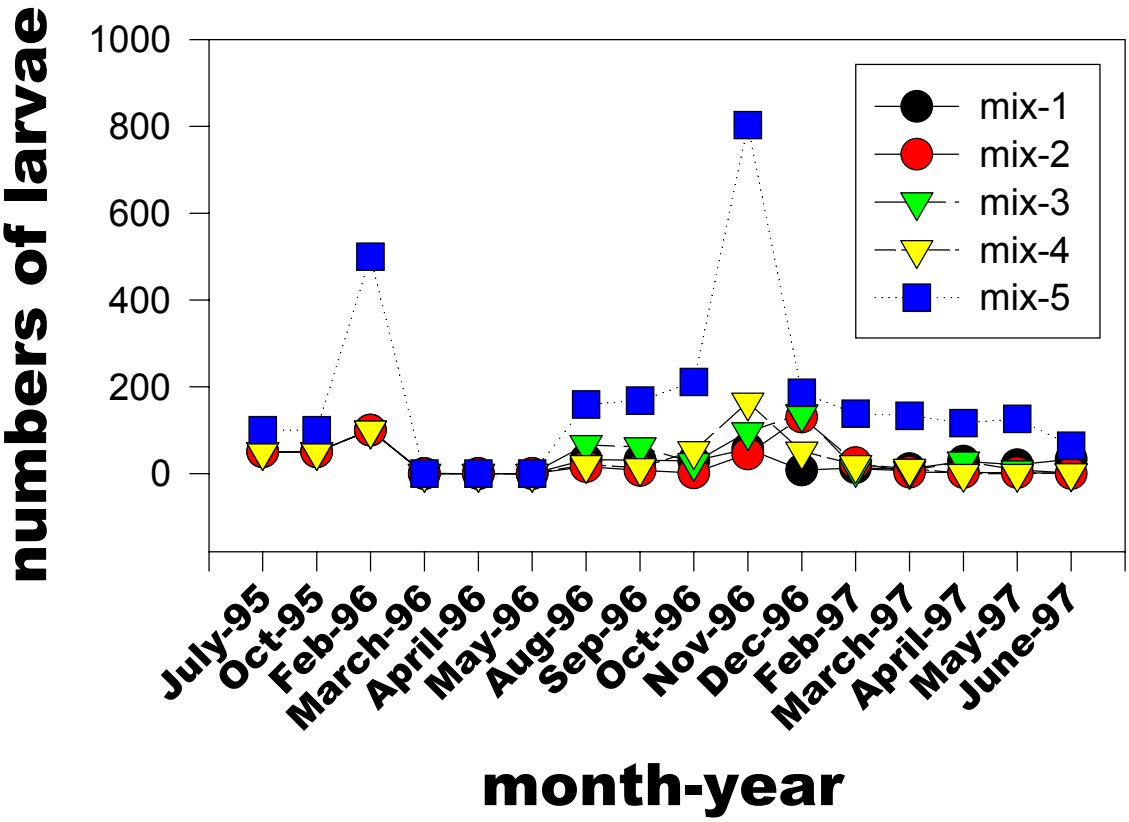
	Lfirst brood	first brood	eggdiam	first mature	fully mature
Surf / depth				r= - 0.712 (p= 0.004)	
maxvol (L)				r= - 0.671 (p= 0.009)	
obsdur (days)			r= 0.748 (p= 0.002)		r= 0.664 (p= 0.01)
C.V.obs dur			r= - 0.569 (p= 0.034)		r= - 0.559 (p= 0.038)
%hydrop >15d			r= 0.634 (p= 0.015)		r= 0.838 (p< 0.001)

Conclusion: correlation between life history variables and inundation period and predictability (local adaptation??).

Spreading of risks

A. Spreading of risk in time

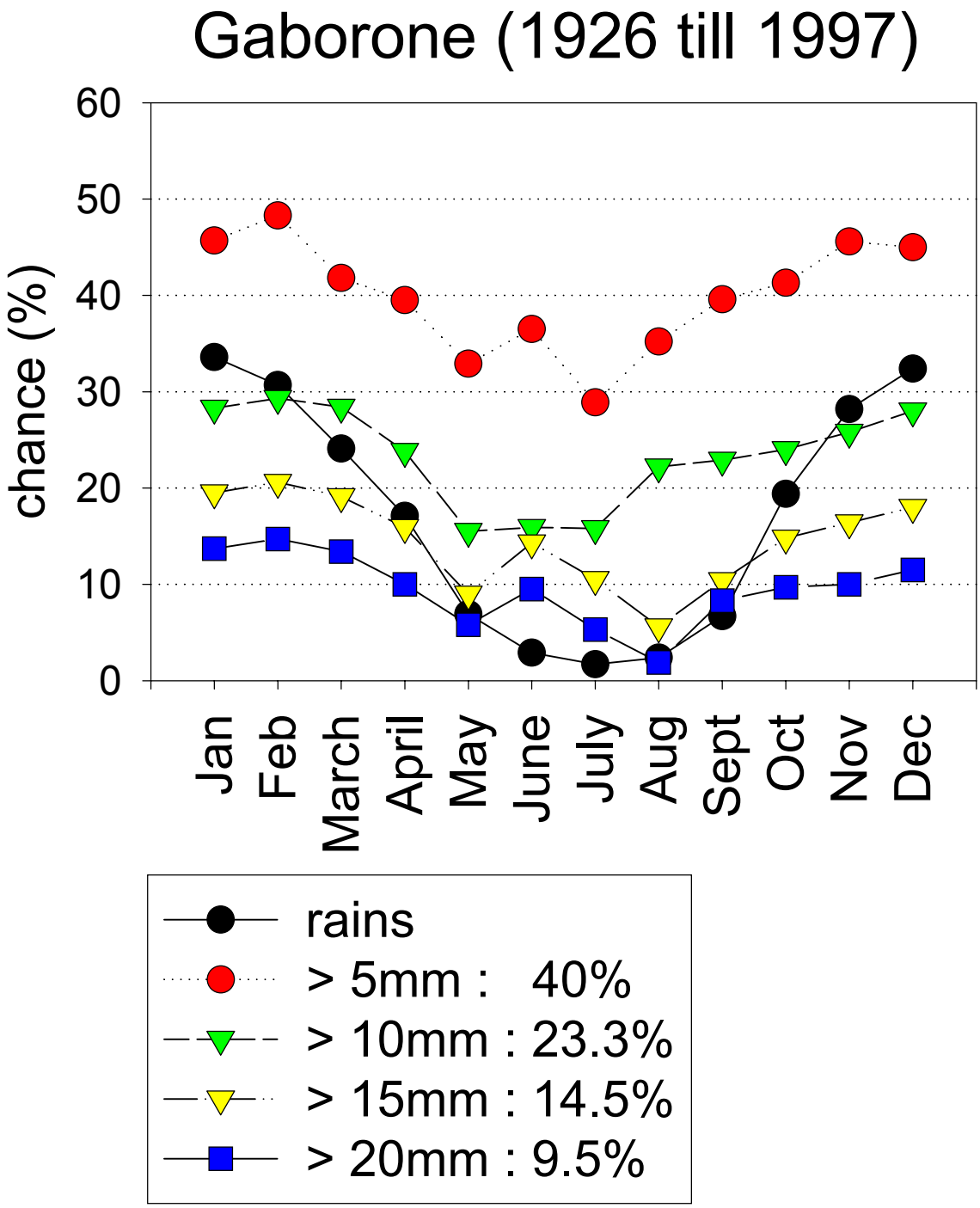
A.1. Buffering capacity



Conclusion: part of egg bank displays long-term dormancy, spreading the risk of a demographic catastrophe

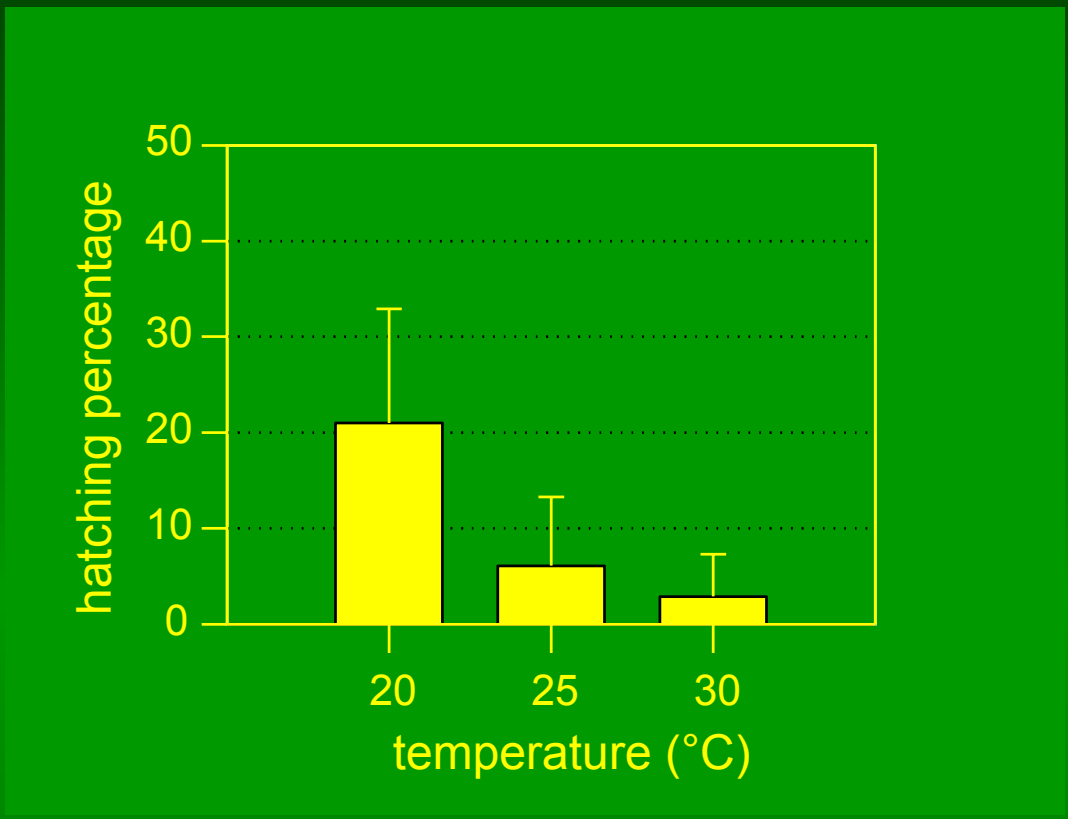
A.2. Hatching fractions

Chances of successful (> 15mm) rains?



A.2. Hatching fractions

Hatching percentage at natural temperatures (20-30°C):

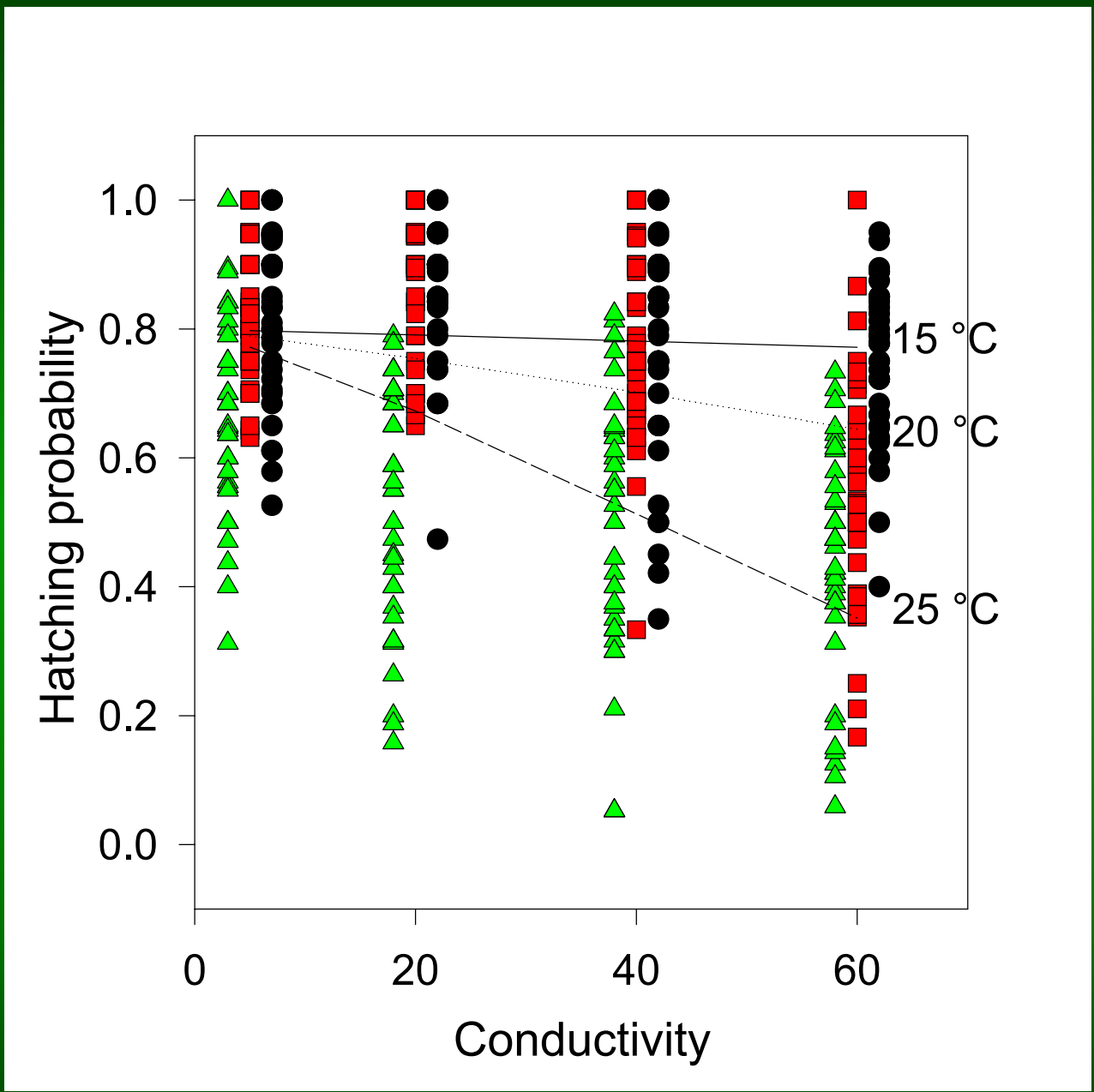


avg...: 10-20%

<u>Conclusion:</u>

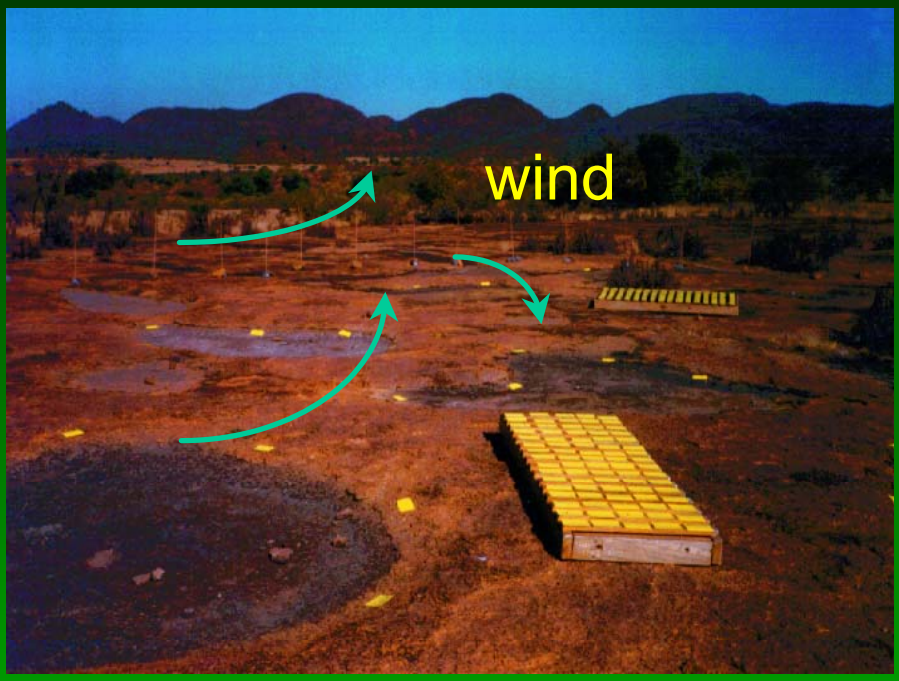
Hatching percentages under simulated field conditions correspond with yield expectations based on long-term (70 years) rainfall records

A.3. Conditional hatching:



Conclusion: sensitivity of egg banks to conductivity conditions, especially at the more unsuitable higher temperatures.

B. Spreading of risk in space (dispersal)

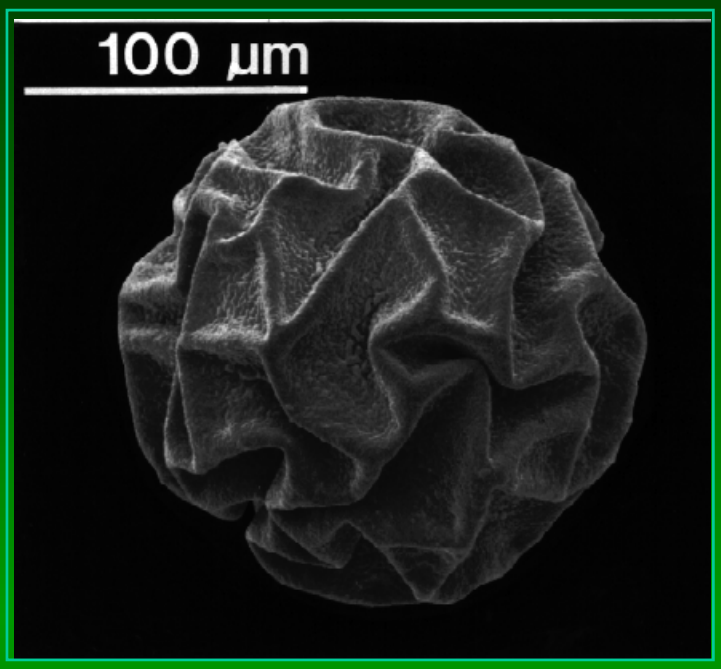


dry season

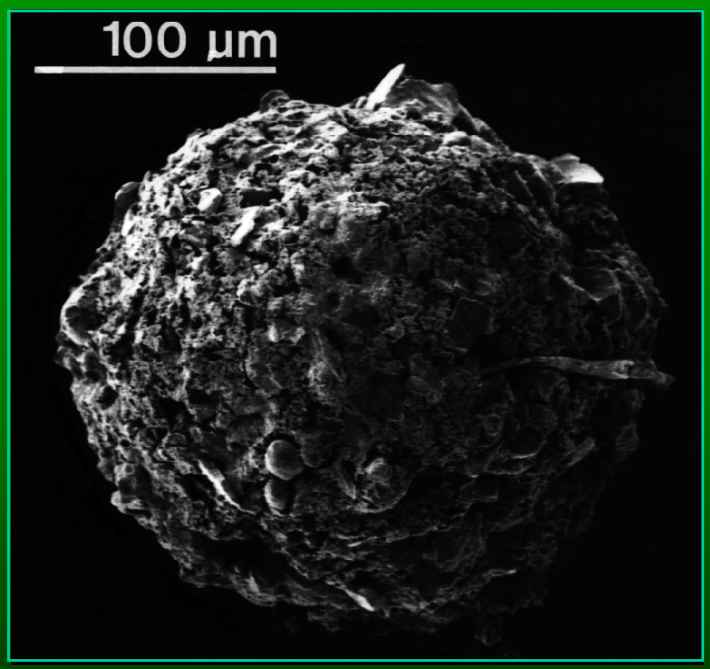
rainy season

other dispersal agents:
cattle, amphibians, birds

Egg types of *Branchipodopsis wolfi*



smooth



sticky

Conclusions:

By generating egg banks with delayed germination, and producing egg types with different potential dispersibility, *B. wolfi* is a strong bet-hedger with means to escape stress both in time and space.

Together with early maturation, these life history functions enable populations to persist in the most extreme of temporary habitats: small ephemeral rock-pools.