# The fecundity rate of snails

Chester Kalinda. 2017, experiment with Bulinus globosus. (Note Age of maturity and hatching rate getting from El-Hassan 1974 for buliunus)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Temperature | Age at maturity | Hatching rate | Daily survival rate | Egg/snail/day | Fecundity rate |
| 15.5°C | na | na | 0.998 | 0 | 0 |
| 21.2°C | 108 | 100 | 0.993 | 2.59909 | 0.027 |
| 25.8°C | 75 | 93.7 | 0.989 | 2.766767 | 0.037 |
| 31°C | 135 | 97.5 | 0.979 | 2.08225 | 0.019 |
| 35.5°C | na | na | 0.955 | 0 | 0 |

Nicky McCreesh 2014, experiment with Biomphalaria sudanica. (Note Age of maturity and hatching rate getting from El-Hassan 1974) (we did not use this study because Sudanica is not common and change the behavior of curve significantly)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Temperature | Age at maturity | Hatching rate | Daily survival rate | Egg/snail/day | Fecundity rate |
| 13.4°C | 9999 | 0 | 0.93800 | 0.11714 | 0 |
| 15.7°C | 360 | 89.5 | 0.89404 | 3.71714 | 0 |
| 16.7°C | 107 | 89.5 | 0.96464 | 6.48286 | 0.0395 |
| 18.9°C | 107 | 89.5 | 0.95313 | 8.52714 | 0.0432 |
| 20.9°C | 107 | 97.9 | 0.98906 | 8.63857 | 0.0403 |
| 22.8°C | 107 | 97.9 | 0.94082 | 7.00000 | 0.0432 |
| 26.7°C | 77 | 98.8 | 0.95123 | 7.03857 | 0.0539 |
| 28.3°C | 77 | 98.8 | 0.86416 | 5.11429 | 0 |
| 29.5°C | 154 | 97.7 | 0.78427 | 2.96286 | 0 |
| 32.0°C | 360 | 0 | 0.70681 | 0.58714 | 0 |

K. N. de Kock and J.A. van Eeden, 1986, experiment with Biomphalaria pfeifferi fluctuate (we did not use this study because it is fluctuating temperature and the mean in same for all experiments)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Temperature | Age at maturity | Hatching rate | Daily survival rate | Egg/snail/day | Fecundity rate |
| 18-280 | 32 | 98 | 0.99748 | 10.22014 | 0.09774 |
| 20.5-25.50 | 33 | 99 | 0.99368 | 4.024405 | 0.07891 |
| 230 | 36 | 99 | 0.99631 | 4.941586 | 0.07686 |

C. C. Appleton, 1977, experiment with Biomphalaria pfeifferi

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Temperature | Age at maturity | Hatching rate | Daily survival rate | Egg/snail/day | Fecundity rate |
| 250 | 42 | 95.6 | 0.99717 | 7.133363 | 0.07058 |
| 270 | 35 | 88.8 | 0.98991 | 3.652113 | 0.06824 |
| 290 | na | na | na | 0 | 0 |

El- Hassan 1974, Biomphalaria Alexandrina

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Temperature | Age at maturity | Hatching rate | Daily survival rate | Egg/snail/day | Fecundity rate |
| 150 | 360 | 89.5 | 0.989 | 0.166 | 0.00683 |
| 200 | 107 | 97.9 | 0.994 | 0.663 | 0.0229 |
| 250 | 77 | 98.8 | 0.993 | 0.849 | 0.0309 |
| 300 | 154 | 97.7 | 0.985 | 0.057 | 0.00824 |
| 350 | 360 | 0 | 0.962 | 0 | 0 |

El- Hassan 1974, Bulinus truncatus

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Temperature | Age at maturity | Hatching rate | Daily survival rate | Egg/snail/day | Fecundity rate |
| 150 | 220 | 90.7 | 0.998 | 0.261 | 0.0103 |
| 200 | 108 | 100 | 0.999 | 0.968 | 0.025 |
| 250 | 75 | 93.7 | 0.995 | 1.335 | 0.0348 |
| 300 | 135 | 97.5 | 0.970 | 0.548 | 0.0199 |
| 350 | 250 | 95.2 | 0.908 | 0.102 | 0 |

R. F. Sturrock, 1966, experiment with Biomphalaria pfeifferi

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Temperature | Age at maturity | Hatching rate | Daily survival rate | Egg/snail/day | Fecundity rate |
| 190 | 110 | 100 | 0.98581 | 1.06366 | 0.02612 |
| 250 | 40 | 100 | 0.98647 | 5.15756 | 0.07638 |
| 300 | 38 | 75 | 0.95977 | 4.21051 | 0.07381 |
| 350 | na | 0 | na | 0 | 0 |

# 

# The mortality rate of snails

Chester Kalinda 2017, Bulinus globosus (Note use log function and take an average of actual data to get mortality rate)

|  |  |
| --- | --- |
| Temperature | Mortality rate |
| 15.5°C | 0.00244925 |
| 21.2°C | 0.006901087 |
| 25.8°C | 0.01151302 |
| 31°C | 0.02073716 |
| 35.5°C | 0.04642702 |

Nicky. McCreesh 2014, Biomphalaria sudanica (Note use log function and take an average of actual data to get mortality rate) (we did not use this study because Sudanica is not common and change the behavior of curve significantly)

|  |  |
| --- | --- |
| Temperature | Mortality rate |
| 13.4°C | 0.064 |
| 15.7°C | 0.112 |
| 16.7°C | 0.036 |
| 18.9°C | 0.048 |
| 20.9°C | 0.011 |
| 22.8°C | 0.061 |
| 26.7°C | 0.050 |
| 28.3°C | 0.146 |
| 29.5°C | 0.243 |
| 32.0°C | 0.347 |

P. H. Joubert, 1986, Bulinus globosus (Note use log function and take an average of actual data to get mortality rate)

|  |  |
| --- | --- |
| Temperature | Mortality rate |
| 34°C | 0.02924029 |
| 36°C | 0.1490773 |
| 38°C | 0.8022027 |
| 40°C | 3.540546 |

P. H. Joubert, 1986, Bulinus africanus (Note use log function and take an average of actual data to get mortality rate) (we did not use this study because these value has strong impact on the shape of curve, so while we get info about higher temperature, we lose info about medium temperature)

|  |  |
| --- | --- |
| Temperature | Mortality rate |
| 34°C | 0.1044946 |
| 36°C | 0.5664857 |
| 38°C | 1.618022 |
| 40°C | 4.344277 |

P. H. Joubert, 1986, Biomphalaria pfeifferi (Note use log function and take an average of actual data to get mortality rate) (we did not use this study because these value has strong impact on the shape of curve, so while we get info about higher temperature, we lose info about medium temperature)

|  |  |
| --- | --- |
| Temperature | Mortality rate |
| 34°C | 0.1457006 |
| 36°C | 0.6661235 |
| 38°C | 1.649401 |
| 40°C | 5.821733 |

K. N. de Kock and J.A. van Eeden, 1985, Biomphalaria pfeifleri (Note use log function and take average of actual data to get mortality rate) in here is temperature fluctuate (we did not use this study because it is fluctuating temperature and the mean in same for all experiments)

|  |  |
| --- | --- |
| Temperature | Mortality rate |
| 230 , no fluctuation | 0.00369937 |
| 20.5-25.50 fluctuation | 0.006338469 |
| 18-280 | 0.002522396 |

C. C. Appleton, 1977, Biomphalaria pfeifleri (Note use log function and take average of actually data to get mortality rate)

|  |  |
| --- | --- |
| Temperature | Mortality rate |
| 250 | 0.002832593 |
| 270 | 0.01014083 |
| 290 | 0.02164846 |

El- Hassan 1974, Biomphalaria Alexandrina

|  |  |
| --- | --- |
| Temperature | Mortality rate |
| 100 | 0.01161 |
| 12.50 | 0.01119 |
| 150 | 0.01077 |
| 200 | 0.00596 |
| 250 | 0.00674 |
| 300 | 0.01505 |
| 350 | 0.03891 |
| 370 | 0.3 |

El- Hassan 1974, Bulinus truncates

|  |  |
| --- | --- |
| Temperature | Mortality rate |
| 100 | 0.00442 |
| 12.50 | 0.00329 |
| 150 | 0.00218 |
| 200 | 0.00144 |
| 250 | 0.00518 |
| 300 | 0.03077 |
| 350 | 0.09622 |
| 370 | 0.3 |

R. F. Sturrock, 1966, Biomphalaria pfeifleri (Note use log function and take average of actual data to get mortality rate)

|  |  |
| --- | --- |
| Temperature | Mortality rate |
| 190 | 0.0142923 |
| 250 | 0.01361983 |
| 300 | 0.04106602 |

Foster 1964, Biomphalaria pfeifleri

|  |  |
| --- | --- |
| Temperature | Mortality rate |
| 22.850 | 0.006674626 |
| 24.010 | 0.01155245 |
| 26.260 | 0.0260108 |
| 28.070 | 0.03678792 |





# The prepatent period of snails

Guo-Jing Yang 2007, Oncomelania hupensis with S. japonicum (we do not use this study because Oncomelania hupensis is not our interest species)

|  |  |
| --- | --- |
| Temperature | Prepatent period |
| 240 | -(days) |
| 180 | -(days) |
| 210 | 125 (days) |
| 240 | 90 (days) |
| 270 | 71 (days) |
| 300 | 62 (days) |

W. Pflüger 1984, Bulinus truncatus with S. haematobium

|  |  |  |
| --- | --- | --- |
| Temperature | Prepatent period | Average of the prepatent period |
| 170 | No infection |  |
| 330 | No infection |  |
| 180 | Min 106-113, Max 120-129 (days) | 117 |
| 190 | Min 75-78, Max 137-151 (days) | 110 |
| 200 | Min 64-67, Max 91-95 (days) | 79 |
| 210 | Min 41-56, Max 69-75 (days) | 60 |
| 220 | Min 44-54, Max 62-69 (days) | 57 |
| 230 | Min 39-42, Max 70-76 (days) | 56 |
| 250 | Min 29-33, Max 52-65 (days) | 44 |
| 280 | Min 22-24, Max 41-44 (days) | 32 |
| 300 | Min 17-19, Max 33-54 (days) | 30 |
| 310 | Min 17-19, Max 41-50 (days) | 31 |
| 320 | Min 17-20, Max 35-48 (days) | 30 |

W. Pflüger 1981, Biomphalaria glabrata with S. mansoni, diurnally changing water temperature

|  |  |  |
| --- | --- | --- |
| Temperature | Prepatent period | Average of the prepatent period |
| 12 hours 28-190, mean 24.30 | 25-27 (days) | 26 |
| 6 hours 28-190, mean 21.90 | 35-36 (days) | 35.5 |
| 2 hours 28-190, mean 20.20 | 43-45 (days) | 44 |
| 1 hours 28-190, mean 19.80 | 50-51 (days) | 50.5 |
| 23.4 – 11.50 , mean 17.50 | 68 (days) | 68 |
| 22.5 – 13.30, mean 17.90 | 57-58 (days) | 57.5 |
| 25.2 – 13.10, mean 19.20 | 52 (days) | 52 |
| 26.9 – 15.20, mean 21.10 | 37 - 39 (days) | 38 |
| 21.5 – 16.40, mean 18.90 | 56-59 (days) | 57.5 |
| 30 – 200, mean 250 | 16-18 (days) | 17 |
| 35.1 – 24.70, mean 29.90 | 16-17 (days) | 16.5 |
| 38.9 – 27.5, mean 330 | 16-17 (days) | 16.5 |

W. Pflüger 1980, Biomphalaria glabrata with S. mansoni, constant temperature

|  |  |
| --- | --- |
| Temperature | Prepatent period |
| 170 | 92.5 (days) |
| 190 | 55.5 (days) |
| 220 | 34 (days) |
| 250 | 24.8 (days) |
| 280 | 19.2 (days) |
| 300 | 16.3 (days) |
| 310 | 15.9 (days) |
| 320 | 14.9 (days) |
| 330 | 15.3 (days) |
| 340 | 15.9 (days) |
| 350 | 16 (days) |

Foster 1964, Biomphalaria pfeifleri with s. mansoni

|  |  |
| --- | --- |
| Temperature | Prepatent period |
| 180 | 1/57 |
| 210 | 1/37 |
| 22.850 | 1/32 |
| 24.010 | 1/30 |
| 26.260 | 1/23 |
| 28.070 | 1/19 |
| 30.040 | 1/18 |
| 31.750 | 1/16 |

R. M. Gordon, 1934, Physopsis (bolinus) globosa with S. haematobium

|  |  |
| --- | --- |
| Temperature | Prepatent period |
| 220 | 67 (days) |
| 26.30 | 38.5 (days) |
| 26.40 | 39.3 (days) |
| 26.80 | 34.8 (days) |
| 31.90 | 27.5 (days) |
| 32.10 | 23 (days) |
| 330 | 25.5 (days) |
| 35.20 | 26.3 |

R. M. Gordon, 1934, Planorbis pfeifferi with S. mansoni

|  |  |
| --- | --- |
| Temperature | Prepatent period |
| 21.70 | 36 (days) |
| 220 | 33 (days) |
| 26.30 | 23.5 (days) |
| 26.60 | 23 (days) |
| 26.90 | 22.2 (days) |
| 27.30 | 22 (days) |
| 27.70 | 19 (days) |
| 31.80 | 15.4 (days) |
| 32.10 | 15.8 (days) |
| 32.70 | 17.2 (days) |
| 32.80 | 14.7 (days) |
| 350 | 16.4 (days) |





# The Hatching rate of miracidia

Nguyen et al. 2021, S. mansoni

|  |  |
| --- | --- |
| Temperature | Hatching rate |
| 50 | 0.2333333 |
| 90 | 0.2 |
| 130 | 0.3 |
| 170 | 0.33 |
| 210 | 0.253 |
| 220 | 0.38 |
| 250 | 0.456 |
| 290 | 0.35 |
| 330 | 0.5 |
| 370 | 0.45 |



# The cercarial release rate

Nguyen et al. 2021, S. mansoni with Biomphalaria glabrata

|  |  |
| --- | --- |
| Temperature | The number of cercarial release per day per snail |
| 50 | 0 |
| 90 | 15 |
| 130 | 260 |
| 170 | 1350 |
| 210 | 1970 |
| 250 | 2900 |
| 290 | 1970 |
| 330 | 1770 |
| 370 | 690 |

Chester Kalinda 2017, Bulinus globosus with S. haematobium

|  |  |
| --- | --- |
| Temperature | The number of cercarial release per day per snail |
| 21.20 | 1738 |
| 25.80 | 2409 |
| 310 | 829 |

Fried *et al* (Fried et al., 2002) presented data on the number of cercariae released by Biomphalaria glabrata during one hour under various conditions. Based on their standard (incandescent light) conditions, at different temperatures, the daily cercarial production rates (per infected snail) are: ) (we did not use this study because the experiment results from one hour, we do not have reliable resources to calculate the number of cercarial daily)

S. mansoni

|  |  |  |
| --- | --- | --- |
| Temperature | The number of cercarial release per hour per snail | The number of cercarial release per day per snail, adjusted based on Nguyen’s results |
| 12 | 21 | 352 day-1 per 24 hours |
| 25 | 172 | 2900 day-1 per 24 hours |
| 35 | 350 | 5880 day-1 per 24 hours |

Echinostoma capron

|  |  |  |
| --- | --- | --- |
| Temperature | The number of cercarial release per hour per snail | The number of cercarial release per day per snail, adjusted based on Nguyen’s results |
| 12 | 2 | 33 day-1 per day |
| 25 | 27 | 453 day-1 per day |
| 35 | 82 | 1377 day-1 per day |

M. A. Striwalt 1954, Australorbis glabratus with S. haematobium

|  |  |
| --- | --- |
| Temperature | The number of cercarial release per day per snail |
| 230  to 250 | 784 |
| 260  to 280 | 838 |

(we did not use this study because we are not interested in Australorbis census) (revisit this)

Freda glass schreiber and maxwell schubert, 1949 S. mansoni with Australorbis glabratus

Temperature is 30o and the average number of cercarial produced from 9 am to 11 am is 511 when it is dark, and 692 when it is light. From 11 am to 3 pm is 340 when it is dark, 654 when it is light.

(we did not use this study because the experiment results not daily)



# 

# The mortality rate of miracidia

R.M. Anderson et al. 1982, experiment with S. mansoni

|  |  |
| --- | --- |
| Temperature | The mortality rate of miracidia |
| 50 | 4.957653 |
| 100 | 2.141901 |
| 150 | 1.50839 |
| 200 | 1.974984 |
| 250 | 2.513615 |
| 300 | 4.322767 |
| 350 | 4.490178 |
| 400 | 5.114 |

S. K. Prah and C. James, 1977 S. mansoni

|  |  |
| --- | --- |
| Temperature | The mortality rate of miracidia |
| 5-100 | 2.56078 |
| 18-220 | 0.6536434 |
| 25-300 | 1.499468 |
| 35-380 | 3.940166 |

S. K. Prah and C. James, 1977 S. haematobium

|  |  |
| --- | --- |
| Temperature | The mortality rate of miracidia |
| 5-100 | 2.275331 |
| 18-220 | 2.210028 |
| 25-300 | 2.24239 |
| 35-380 | 4.354702 |

R.E. Purnell, 1966, experiment with S. mansoni and two-time range

6 hours at temperature

|  |  |
| --- | --- |
| Temperature | The mortality rate of miracidia |
| 120 | 1.637893 |
| 140 | 1.785148 |
| 160 | 1.957561 |
| 18.50 | 3.054279 |
| 21.50 | 2.812790 |
| 24.80 | 3.891444 |
| 28.60 | 8.757026 |
| 32.70 | 9.721674 |

2 hours at temperature

|  |  |
| --- | --- |
| Temperature | The mortality rate of miracidia |
| 120 | 3.261705 |
| 140 | 2.396054 |
| 160 | 2.904859 |
| 18.50 | 1.520372 |
| 21.50 | 2.337589 |
| 24.80 | 2.752958 |
| 28.60 | 3.842463 |
| 32.70 | 4.877587 |





# The mortality rate of cercarial

J.R. Lawson and R.A.Wilson 1980, experiment with S. mansoni

|  |  |
| --- | --- |
| Temperature | The mortality rate of cercarial |
| 150 | 1.586999 |
| 200 | 2.564106 |
| 250 | 3.366767 |
| 300 | 4.089931 |
| 350 | 4.763993 |
| 400 | 6.101306 |

R.E. Purnell, 1966, experiment with S. mansoni (Note we use r code to get these value which is in the thermal sensitive parameter list)

|  |  |
| --- | --- |
| Temperature | The mortality rate of cercarial |
| 120 | 0.5454545 |
| 150 | 0.8407562 |
| 180 | 1.0624748 |
| 210 | 1.5481674 |
| 240 | 1.9848736 |
| 270 | 2.3653733 |
| 300 | 2.7134615 |
| 330 | 3.0395660 |



# The mortality rate of infected snails

Chester Kalinda 2017, Bulinus globosus (Note use log function and take an average of actual data to get mortality rate)

|  |  |
| --- | --- |
| 15.5°C | 0.00244925 |
| 21.2°C | 0.006901087 |
| 25.8°C | 0.01151302 |
| 31°C | 0.02073716 |
| 36°C | 0.04642702 |

W. Pflüger 1984, Bulinus truncatus with S. haematobium (This result from prepatent snails)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Temperature | Length of prepatent | Average | Percentage of death | Death rate |
| 170 | No infection | - | - | - |
| 330 | No infection | - | - | - |
| 180 | Min 106-113, Max 120-129 (days) | [109.5, 124.5] = 117 | 78.6 | 0.0131776 |
| 190 | Min 75-78, Max 137-151 (days) | [76.5, 144] = 110.25 | 71.6 | 0.01141752 |
| 200 | Min 64-67, Max 91-95 (days) | [65.5, 93] = 79.25 | 78.9 | 0.01963277 |
| 210 | Min 41-56, Max 69-75 (days) | [48.5, 72] = 60.25 | 72.3 | 0.02130685 |
| 220 | Min 44-54, Max 62-69 (days) | [49, 65.5] = 57.25 | 71.7 | 0.02204905 |
| 230 | Min 39-42, Max 70-76 (days) | [40.5, 73] = 56.75 | 77.6 | 0.02636316 |
| 250 | Min 29-33, Max 52-65 (days) | [31, 58.5] = 44.75 | 62.4 | 0.02185846 |
| 280 | Min 22-24, Max 41-44 (days) | [23, 42.5] = 32.75 | 40.6 | 0.01590461 |
| 300 | Min 17-19, Max 33-54 (days) | [18, 43.5] = 30.75 | 38.3 | 0.01570362 |
| 310 | Min 17-19, Max 41-50 (days) | [18, 45.5] = 31.75 | 54.4 | 0.02473268 |
| 320 | Min 17-20, Max 35-48 (days) | [18.5, 41.5] = 30 | 54.5 | 0.0262486 |

W. Pflüger 1981, Biomphalaria glabrata with S. mansoni, constant temperature (This result from prepatent snails). This study has two experiments; the first is diurnally changing water temperature, and the second one is a sinusoidal variation of diurnal temperature.

|  |  |  |  |
| --- | --- | --- | --- |
| Temperature | Prepatent perioed | Average percent of mortality | Death rate |
| 24.30 | (25+27)/2 = 26 (days) | (46+49)/2 = 47.5 | 0.02478296 |
| 21.90 | 36 (days) | (43+65)/2 = 54 | 0.02157024 |
| 20.20 | 44 (days) | (75+68)/2 = 71.5 | 0.02852877 |
| 19.70 | 48 (days) | (66+73)/2 = 69.5 | 0.02473841 |

|  |  |  |  |
| --- | --- | --- | --- |
| Temperature | Prepatent period | Average percent of mortality | Death rate |
| 17.50 | 68 (days) | 30 | 0.00524522 |
| 17.90 | 57 (days) | 65 | 0.01841793 |
| 19.20 | 52 (days) | 40 | 0.00982357 |
| 21.10 | 38 (days) | 27 | 0.008281862 |
| 18.90 | 57 (days) | (75+77)/2 = 76 | 0.02503713 |
| 250 | 24 (days) | 28 | 0.01368767 |
| 29.90 | 17 (days) | 30 | 0.02098088 |
| 33.10 | 17 (days) | (18+79)/2 = 48.5 | 0.03903461 |

W. Pflüger 1980, Biomphalaria glabrata with S. mansoni, constant temperature (This result from prepatent snails)

|  |  |  |  |
| --- | --- | --- | --- |
| Temperature | Prepatent perioed | Average percent of mortality | Death rate |
| 160 | 140 (days) | (95+96+98)/3 = 96.3 | 0.02354884 |
| 170 | 92.5 (days) | (90+58)/2 = 74 | 0.01456296 |
| 180 | 70 (days) | (85+65)/2 = 75 | 0.01980421 |
| 190 | 55.5 (days) | (57+38)/2 = 47.5 | 0.01161004 |
| 220 | 34 (days) | (51+64+38)/3 = 51 | 0.02098088 |
| 250 | 24.8 (days) | (42+58+48+22+33+20)/6 = 37 | 0.01863046 |
| 280 | 19.2 (days) | (9+17+33)/3 = 19.6 | 0.01136229 |
| 300 | 16.3 (days) | 19 | 0.01292767 |
| 310 | 15.9 (days) | (12+13+27)/3 = 17.3 | 0.01194658 |
| 320 | 14.9 (days) | (29+7+3)/3 = 13 | 0.009346447 |
| 330 | 15.3 (days) | (43+8)/2 = 25.5 | 0.01923994 |
| 340 | 15.9 (days) | (62+79)/2 = 70.5 | 0.07677861 |
| 350 | 16 (days) | (47+50)/2 = 48.5 | 0.04147427 |

R. Foster, 1964 experiment with Biomphalaria pfeifferi invasion by S. mansoni

|  |  |
| --- | --- |
| Temperature | The mortality rate of infected snails |
| 22.850 | 0.006674626 |
| 24.010 | 0.01155245 |
| 26.260 | 0.0260108 |
| 28.070 | 0.03678792 |





# Transmission rate of snails

R. M. Anderson et al., 1982 experiment S. mansoni with B. glabrata

W. pfluger, 1981, S. mansoni with B. glabrata

M. A. Striwalt 1954, S. haematobium with Australorbis glabratus with

Gordon et al.,

S. K. Prah and C. James, B. pfeifferi with mansoni and B. globosus with S. haematobium

W. pfluger et al., 1984, S. haematobium with Bulinus truncatus

# Transmission rate of humans

R. E. Purnell 1966

M. A. Striwalt 1954, Australorbis glabratus with S. haematobium

R. Foster 1964, S. mansoni with B. pfeifferi

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ABSTRACTS

1. **Thermal sensitive mechanistic models of schistosomiasis: the devil is in the details**

Environmentally mediated diseases, especially those whose life cycle involves free-living phases and ectotherm hosts, like snails, are significantly influenced by temperature. An example of this is schistosomiasis, a parasitic disease of poverty that affects more than 200 million people worldwide, and results in 200,000 fatalities annually. Although several models have been constructed to investigate the relationship between temperature and schistosomiasis transmission, we still don't fully comprehend how temperature variations affect the dynamics of the disease. Based upon laboratory experiments and existing literature, we built a comprehensive, thermally sensitive mechanistic model of schistosomiasis transmission, whose demographic and epidemiological factors are recast as a function of temperature. The model was utilized to calculate the thermal optimum for the basic reproduction number R0 and the mean parasite burden. Next, the consequences of various environmental interventions that aimed to reduce transmission were evaluated on the thermal optimum. The thermal optimums for *Schistosoma. haematobium* and *Schistosoma* *mansoni* were founded and our results were validated by the data. i) the thermal optimum is higher than previously estimated, and the thermal optimum for the mean parasite burden differs from the thermal optimum for the basic reproduction number R0; ii) while increasing snail mortality through molluscicides or biological control may shift the thermal optimum, this is not the case when snail abundance is governed by removing vegetation. Our analysis shows that the dynamics of schistosomiasis are highly sensitive to temperature and some control programs may change the optimum temperature for the disease transmission.

**Keywords:** Schistosomiasis**,** Basic reproduction number, Mean parasite burden, Mechanistic models

1. **A Thermal sensitive, mechanistic model of schistosomiasis dynamics in the seasonal environment**
2. **Analysis of climate change and schistosomiasis through a thermal-sensitive, mechanistic model of disease dynamics”**

1. For the Frontiers Special topic managed by Thiago, Roberta et al., submit the SEASONAL version of the model, including also the comparison of bioclimatic variable BIO07 vs BIO01 (which I think is super cool, because the data support the idea that schisto might persist in a seasonal environment at temperatures at which, when constant, Ro would predict  natural fade out ). Ibrahim, this would require you to have the draft ready for Jan 30th, submitted right on time on Feb 28th

1. Ibrahim will then work on a climate change model including also thermal refugees (i.e., estivation/hibernation), with projections of climate change, with the support of Kamazima and Ping for that specific component  (target for submission: end of May 2023)