**Supplementary material for:** Zawierucha K., Podkowa P., Marciniak M., Gąsiorek P., Zmudczyńska-Skarbek K., Janko K. & Włodarska-Kowalczuk M. 2018. Temperature (latitude) and nutrient (seabird guano) effects on limno-terrestrial Tardigrada (*Testechiniscus spitsbergensis* and *Pilatobius recamieri*) body size. *Polar Research 37.* Contact: Krzysztof Zawierucha, Department of Animal Taxonomy and Ecology, Faculty of Biology, Adam Mickiewicz University, Umultowska 89, PL-61-614 Poznań, Poland. E-mail k.p.zawierucha@gmail.com

**Supplementary Table S1.** Details of locations where *Testechiniscus spitsbergensis* and *Pilatobius recamieri* were sampled. Average temperatures were calculated for periods (months with temperatures during days and nights above 0°C) when the soil is not frozen and snow cover is reduced and so the animals may be active. Temperature data sources are noted beneath the table.

| Locality (abbreviation) | Latitude (°N) | GPS coordinates | Sample type | Sea-birds | Sampling date | m a.s.l. | Average temp. (°C) | Tardigrade species collected | Number of individuals |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Graian Alps, Italy (NI)f | 45 | ca. 45°29'01''N 7°22'21''E | moss | – | 07 May 2017 | 1897 | max.15.7 min. 7a | *T. spitsbergensis* | 54 |
| Tatra Mountains, Poland (Tat)f | 49 | ca. 49°14'N19°54'E | moss | – | 26 September 2016 | ca. 1750 | max. 11.6 min. 3.8a | *T. spitsbergensis* | 25 |
| Tatra Mountains, Poland (Tat)f | 49 | ca. 49°14'N19°53'E | moss | – | 24 September 2016 | 1822 | max.11.6 min. 3.8a | *T. spitsbergensis* | 17 |
| Aberdeenshire, Scotland, UK (Sco)  | 57 | 57°18'31''N 2°57'18''W | moss | – | 15 June 2015 | 427 | 9.3b | *T. spitsbergensis* | 28 |
| Tromsø, Norway (Tro) | 69 | 69°37'54"N19°7'52"E | moss | – | August 2015 | 62 | 6.27c | *T. spitsbergensis* | 26 |
| Bjørnøya, Svalbard (SvB)  | 74 | ca. 74°38’N19°03’E | moss/soil | – | 28 July 2008 | 40 | 4.4d | *T. spitsbergensis* | 3 |
| Bjørnøya, Svalbard (SvB) | 74 | ca. 74°38’N 19°03’E | moss/soil | – | 28 July 2008 | 150 | 4.4d | *T. spitsbergensis* | 5 |
| Bjørnøya, Svalbard (SvB) | 74 | ca. 74°38’N 19°03’E | moss/soil | – | 28 July 2008 | 150 | 4.4d | *T. spitsbergensis* | 5 |
| Bjørnøya, Svalbard (SvB) | 74 | ca. 74°38’N 19°02’E | moss/*Salix* sp. | + | 21July 2008 | 50 | 4.4d | *T. spitsbergensis* | 16 |
| Hornsund, Svalbard (SvH) | 77 | ca. 77°00'25''N15°32' 50E | moss | – | 14 August 2011 | 25 | 3.5e | *T. spitsbergensis* | 39 |
| Hornsund, Svalbard (SvH) | 77 | 77.00'7''N15.14'8''E | moss | + | 29 June 2010 | 100 | 3.5e | *T. spitsbergensis* | 3 |
| Hornsund, Svalbard (SvH) | 77 | 77.00'16''N15.23'25''E | moss | + | 29 June 2010 | 201 | 3.5e | *T. spitsbergensis* | 14 |
| Hornsund, Svalbard (SvH) | 77 | 77°00'17''N15°23'21''E | moss | + | 29 June 2010 | 250 | 3.5e | *T. spitsbergensis* | 1 |
| Nordaustlandet, Svalbard (SvN) | 79 | 79°46'34''N21°44'00''E | moss/soil | – | July 2009 | ca. 34 | 2.5e | *T. spitsbergensis* | 21 |
| Hornsund, Svalbard (SvH) | 77 | ca. 77°00'24''N15°32' 53''E | moss | + | 14 August 2011 | 7 | 3.5e | *P. recamieri* | 10 |
| Hornsund, Svalbard (SvH) | 77 | ca. 77°00'21''N15°33' 38''E | moss | – | 14 August 2011 | 11 | 3.5e | *P. recamieri* | 2 |
| Hornsund, Svalbard (SvH) | 77 | ca. 77°00'21''N15°33' 38''E | moss | – | 14 August 2011 | 11 | 3.5e | *P. recamieri* | 2 |
| Hornsund, Svalbard (SvH) | 77 | ca. 77°00'21''N15°33' 38''E | moss | – | 14 August 2011 | 11 | 3.5e | *P. recamieri* | 2 |
| Hornsund, Svalbard (SvH) | 77 | ca. 77°00'21''N15°33' 38''E | moss | – | 14 August 2011 | 11 | 3.5e | *P. recamieri* | 2 |
|  |  |  |  |  |  |  |  |  |  |
| Fuglesongen, Svalbard (SvF)  | 79 | ca. 79°51'00''N 11°19'59''E | moss | + | 29 July 2013 | ca. 40 | 3.5e | *P. recamieri* | 21 |
| Phippsøya, Svalbard (SvP)  | 80 | 80°42'18''N20°50'29''E | moss/lichen | + | 30 July 2013 | 31 | 2.0-2.5e | *P. recamieri* | 20 |
| Phippsøya, Svalbard (SvP) | 80 | 80°41'33''N20°52'048''E | moss | – | 30 July 2013 | 3 | 2.0-2.5e | *P. recamieri* | 10 |

a Meteoblue: <https://www.meteoblue.com/en/weather/forecast/modelclimate/valsavarenche_italy_6534765>, <https://www.meteoblue.com/pl/pogoda/prognoza/modelclimate/kasprowy-wierch_polska_3059558> . b World weather online: <https://www.worldweatheronline.com/aberdeen-weather-averages/aberdeen-city/gb.aspx> . c Norwegian Meteorological Institute: <https://www.yr.no/place/Norway/Troms/Troms%C3%B8/Troms%C3%B8/statistics.html> . d Monthly normal values accessed in July 2014 from eKlima: <http://sharki.oslo.dnmi.no>. e Przybylak R., Araźny A., Nordli Ø., Finkelnburg R., Kejna M., Budzik T., Migała K., Sikora S., Puczko D., Rymerg K. & Rachlewicz G. 2014. Spatial distribution of air temperature on Svalbard during 1 year with campaign measurements. *International Journal of Climatology 34*, 3702–3719. f For the Graian Alps and the Tatra Mountains we found climatic data for the location closest to the sampling sites: the Aosta Valley (923 m a.s.l., the Graian Alps) and Kasprowy Wierch (1961 m a.s.l, the Tatra Mountains). However, the values were only limited to maximum and minimum average temperatures, with no general averages.

**Supplementary Table S2.** Basic statistics for *T. spitsbergensis* and *P. recamieri* body size (given in µm): L – locality, Age – all individuals or adults only, N-number of specimens measured, CI – 95% confidence interval of mean, SE - standard error, MIN- minimum, MAX – maximum. Student’s *t-*test in last columns presents no differences between two approaches (all individuals vs adults only) in average body size.

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|   | Locality (abbreviation) | Age | Latitude (°N) | No. individuals | Mean (± 0.95 CI) | SE | Min. | Max. | Student's *t*-test |
| *t* | *df* | *p* |
| *T. spitsbergensis* | Graian Alps, Italy (NI) | Adults | 45 | 54 | 328.63 (317.65-339.61) | 5.47 | 247.0 | 410.0 | – | – | – |
| Tatra Mountains, Poland (Tat)  | All individuals | 49 | 42 | 281.95 (265.65-298.26) | 8.07 | 149.0 | 378.0 | -0.817 | 79 | 0.416 |
| Adults | 39 | 290.67 (276.8-304.53) | 6.85 | 216.0 | 378.0 |
| Aberdeenshire, Scotland, UK (Sco) | All individuals |  57 | 28 | 325.07 (304.09-346.05) | 10.22 | 193.0 | 404.0 | -0.353 | 53 | 0.726 |
| Adults | 27 | 329.96 (310.81-349.11) | 9.32 | 234.0 | 404.0 |
| Tromsø, Norway (Tro)  | Adults | 69 | 26 | 278.58 (266.55-290.61) | 5.84 | 221.0 | 324.0 | – | – | – |
| Bjørnøya, Svalbard (SvB)  | Adults | 74 | 29 | 300.45 (284.55-316.35) | 7.76 | 211.0 | 380.9 | – | – | – |
| Hornsund, Svalbard (SvH)  | All individuals | 77 | 57 | 318.60 (304.39-332.8) | 7.09 | 163.0 | 405.0 | -0.286 | 111 | 0.776 |
| Adults | 56 | 321.38 (308.07-334.68) | 6.64 | 207.0 | 405.0 |
| Nordaustlandet, Svalbard (SvN)  | All individuals | 80 | 21 | 287.80 (266.88-308.73) | 10.03 | 185.8 | 359.7 | -0.745 | 38 | 0.461 |
| Adults | 19 | 297.58 (280.34-314.82) | 8.2 | 227.5 | 359.7 |
|  |  |  |  |  |  |  |  |  |  |  |  |
| *P. recamieri* | Hornsund, Svalbard (SvH)  | Adults | 77°N | 18 | 300.08 (274.08-326.08) | 12.32 | 218.6 | 407.4 |   |   |   |
| Fuglesangen, Svalbard (SvF) | Adults | 79°N | 21 | 310.46 (286.31-334.6) | 11.57 | 205.0 | 406.2 | – | – | – |
| Phippsøya, Svalbard (SvP) | Adults | 80°N | 30 | 323.7 (308.18-339.22) | 7.59 | 253.8 | 401.8 | – | – | – |

**Supplementary Table S3**. The general linear models used in the analysis with different approaches (all individuals versus adults only).

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Source | Type III sum of squares | df | Mean square | F | *p* value |
| *T. spitsbergensis* adults only |
| Altitude | 4829.4 | 1 | 4829.4 | 2.655 | 0.105 |
| Locality | 87025.7 | 6 | 14504.3 | 7.974 | 0.000 |
| Seabird | 9331.7 | 1 | 9331.7 | 5.130 | 0.024 |
| Locality \* Seabird | 4038.8 | 1 | 4038.8 | 2.220 | 0.138 |
| Intercept | 726.8 | 1 | 726.8 | 0.400 | 0.528 |
| Error | 436561.0 | 240 | 1819.0 |  |  |
| Adjusted R2 = 0.143 |  |  |  |  |  |
| Altitude | 821.6 | 1 | 821.6 | 0.449 | 0.503 |
| Locality | 84332.6 | 6 | 14055.4 | 7.688 | 0.000 |
| Seabird | 5416.5 | 1 | 5416.5 | 2.963 | 0.086 |
| Intercept | 40273.5 | 1 | 40273.5 | 22.029 | 0.000 |
| Error | 440599.8 | 241 | 1828.2 |  |  |
| Adjusted R2 = 0.139 |  |  |  |  |  |
| *T. spitsbergensis* all individuals |
| Altitude | 4829.4 | 1 | 4829.4 | 2.199 | 0.139 |
| Locality | 103808.6 | 6 | 17301.4 | 7.877 | 0.000 |
| Seabird | 8110.1 | 1 | 8110.1 | 3.692 | 0.056 |
| Locality \* Seabird | 3668.4 | 1 | 3668.4 | 1.670 | 0.197 |
| Intercept | 681.1 | 1 | 681.1 | 0.310 | 0.578 |
| Error | 542508.2 | 247 | 2196.4 |  |  |
| Adjusted R2 = 0.134 |  |  |  |  |  |
| Altitude | 1370.7 | 1 | 1370.7 | 0.622 | 0.431 |
| Locality | 101140.6 | 6 | 16856.8 | 7.654 | 0.000 |
| Seabird | 4585.2 | 1 | 4585.2 | 2.082 | 0.150 |
| Intercept | 36304.6 | 1 | 36304.6 | 16.485 | 0.000 |
| Error | 546176.6 | 248 | 2202.3 |  |  |
| Adjusted R2 = 0.132 |  |  |  |  |  |
| *P. recamieri* all individuals |
| Locality | 8753.1 | 2 | 4376.6 | 2.070 | 0.134 |
| Seabird | 15404.9 | 1 | 15404.9 | 7.286 | 0.009 |
| Intercept | 4487656.5 | 1 | 4487656.5 | 2122.424 | 0.000 |
| Error | 137436.1 | 65 | 2114.4 |  |  |
| Adjusted R2 = 0.098 |  |  |  |  |  |
| Seabird | 12344.270 | 1 | 12344.270 | 5.866 | 0.018 |
| Locality | 5866.687 | 2 | 2933.344 | 1.394 | 0.256 |
| Seabird \* Locality | 2758.470 | 1 | 2758.470 | 1.311 | 0.257 |
| Intercept | 5182645.925 | 1 | 5182645.925 | 2462.839 | 0.000 |
| Error | 134677.625 | 64 | 2104.338 |  |  |
| Adjusted R2 = 0.102 |  |  |  |  |  |
| Locality | 11340.9 | 2 | 5670.5 | 2.695 | 0.075 |
| Seabird | 2761.3 | 1 | 2761.3 | 1.312 | 0.256 |
| Altitude | 2758.5 | 1 | 2758.5 | 1.311 | 0.257 |
| Intercept | 485893.0 | 1 | 485893.0 | 230.901 | 0.000 |
| Error | 134677.6 | 64 | 2104.3 |  |  |
| Adjusted R2 = 0.102 |  |  |  |  |  |
| Seabird | 6764.894 | 1 | 6764.894 | 3.215 | 0.078 |
| Altitude | 4534.608 | 1 | 4534.608 | 2.155 | 0.147 |
| Latitude | 5724.814 | 1 | 5724.814 | 2.720 | 0.104 |
| Seabird \* Latitude | 7033.463 | 1 | 7033.463 | 3.342 | 0.072 |
| Intercept | 1536.742 | 1 | 1536.742 | 0.730 | 0.396 |
| Error | 134677.625 | 64 | 2104.338 |  |  |
| Adjusted R2 = 0.102  |  |  |  |  |  |

**Supplementary Fig. S1** (following two pages).Histograms of analysed populations of water bears: (a) – (c) *Pilatobius recamieri*; (d) – (j) *Testechiniscus spitsbergensis*. N is number of individuals in each population. Means are presented with standard deviations (SD) of body length in μm.

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