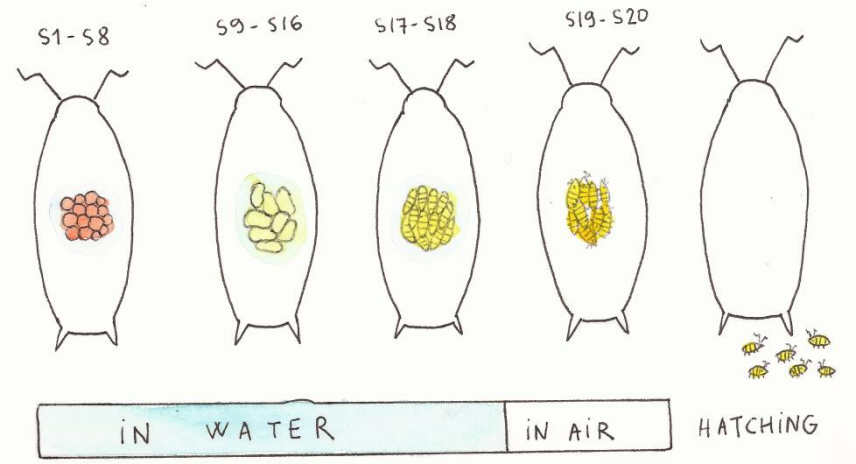


**Fig. S1** Early ontogenetic development of the terrestrial isopod *Porcellio scaber*. Progeny development starts after oviposition within the brood pouch (*marsupium*), which is filled with marsupial liquid (Hoese and Janssen, 1989; Yoshizawa and Wright, 2011). The marsupium is formed by five pairs of oostegites during parturial molt (Csonka et al., 2015; Hatchett, 1947). Oostegites are leaf-like overlapping appendages, lateral extensions of the coxae of the walking legs (Akahira, 1956). Milatovič et al. (2010) described twenty discrete stages (S1-S20) of brood pouch development in *P. scaber* based on microscopic anatomy. Development in water phase lasts from S1 to S18 (88-96% development). During this period, the color of the brood changes from red (eggs, S1-S8) to green (embryos, S9-16) and then to yellow (manca stage, S17-S18; Milatovič et al., 2010). The yolk sac (green in color) is gradually reduced and at S15 is completely enclosed inside the hepatopancreatic glands that appear as two green stripes extending from the cranial to the caudal side of the body. Individual offspring are in contact with special protrusions within marsupial cavity, the *cotyledons*, through which the female provides oxygen (Csonka et al., 2015; Hoese and Janssen, 1989). The brood pouch conspicuously swells during S18 due to water uptake, through which offspring acquire calcium ions for cuticle mineralization (Ouyang and Wright, 2005). Characteristic setae and spines on appendages and cuticular scales can be observed during S18 (see also Mrak et al., 2012). By the end of the water phase (aqueous phase), the brood pouch appears milky (blurry) in color; cotyledons are considerably reduced and are no longer in contact with a brood (Hoese and Janssen, 1989). The last two stages (S19 and S20) are characterized by the lack of marsupial liquid (gaseous phase). Oostegites are transparent, and mancae show active leg movement (Milatovič et al., 2010). Additionally, hepatopancreatic glands are reduced and do not extend to the caudal part of body. Cuticular scales have a rough surface (S20). At this developmental stage, the mancae are ready to hatch from the brood pouch. The manca stage differs from the juvenile stage in the lack of the seventh pair of legs, which form during post-marsupial development (Montesanto et al., 2012; Zimmer, 2002).

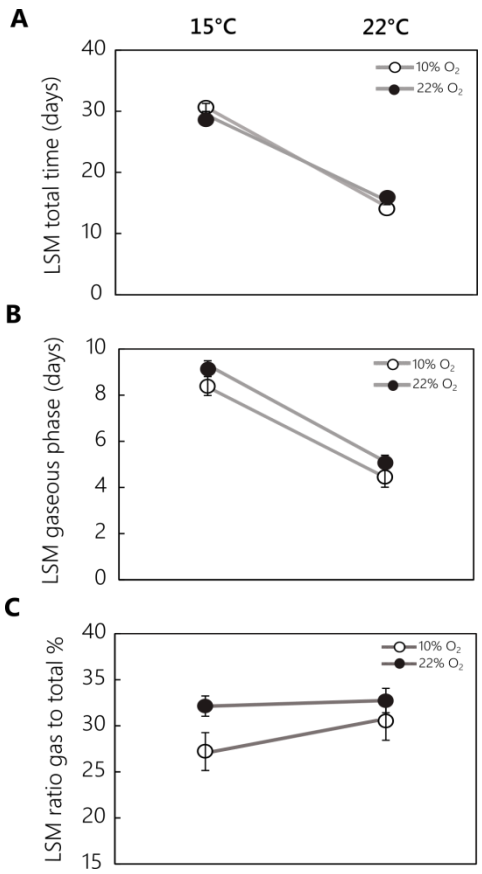


**Fig. S2** The combined effect of ambient temperature (15°C and 22°C) and oxygen level (10% and 22%) on developmental phases within the brood pouch of the terrestrial isopod *Porcellio scaber*. (A) Total developmental time. (B) Length of gaseous phase. (C) Proportion of gaseous phase to total length of brood pouch development. Data show least-square means ± SE from the final models with interaction between temperature and oxygen.

**Tab. S1** The effect of ambient temperature (15°C and 22°C) and oxygen level (10% and 22% $O_2$) on the duration of first 12 stages of intramarsupial development of terrestrial isopod *Porcellio scaber*. Our study employs a more conservative approach to determine the onset of marsupial development, starting from the stage 13 that can be precisely associated with a single developmental event (Milatovič et al., 2010).

| | **22% oxygen** | | **10% oxygen** | |
|---|---|---|---|---|
| | **22°C** | **15°C** | **22°C** | **15°C** |
| | duration in days (sample size) | | | |
| Marsupial development first 12 stages | 3-16 (60) | 1-16 (26) | 15-31 (87) | 7-41 (39) |

**Tab. S2** The effect of ambient temperature (15°C and 22°C) and oxygen level (10% and 22% $O_2$) on mortality of progeny developing in aqueous and gaseous phase within motherly brood pouch of terrestrial isopod females *Porcellio scaber*.

| | **22% oxygen** | | **10% oxygen** | | | **oxygen** | **temperature** | **temperature x oxygen** |
|---|---|---|---|---|---|---|---|---|
| | **22°C** | **15°C** | **22°C** | **15°C** | | | | |
| | mortality % (sample size) | | | | df | F value p | | |
| Aqueous phase | 36.7 (60) | 38.5 (26) | 37.9 (87) | 61.6 (39) | 1,208 | 2.52 0.114 | 2.76 0.098 | 2.01 0.158 |
| Gaseous phase | 13.6 (60) | 0 (26) | 3 (87) | 0 (39) | 1,118 | 0 0.999 | 0 0.977 | 0 0.999 |

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