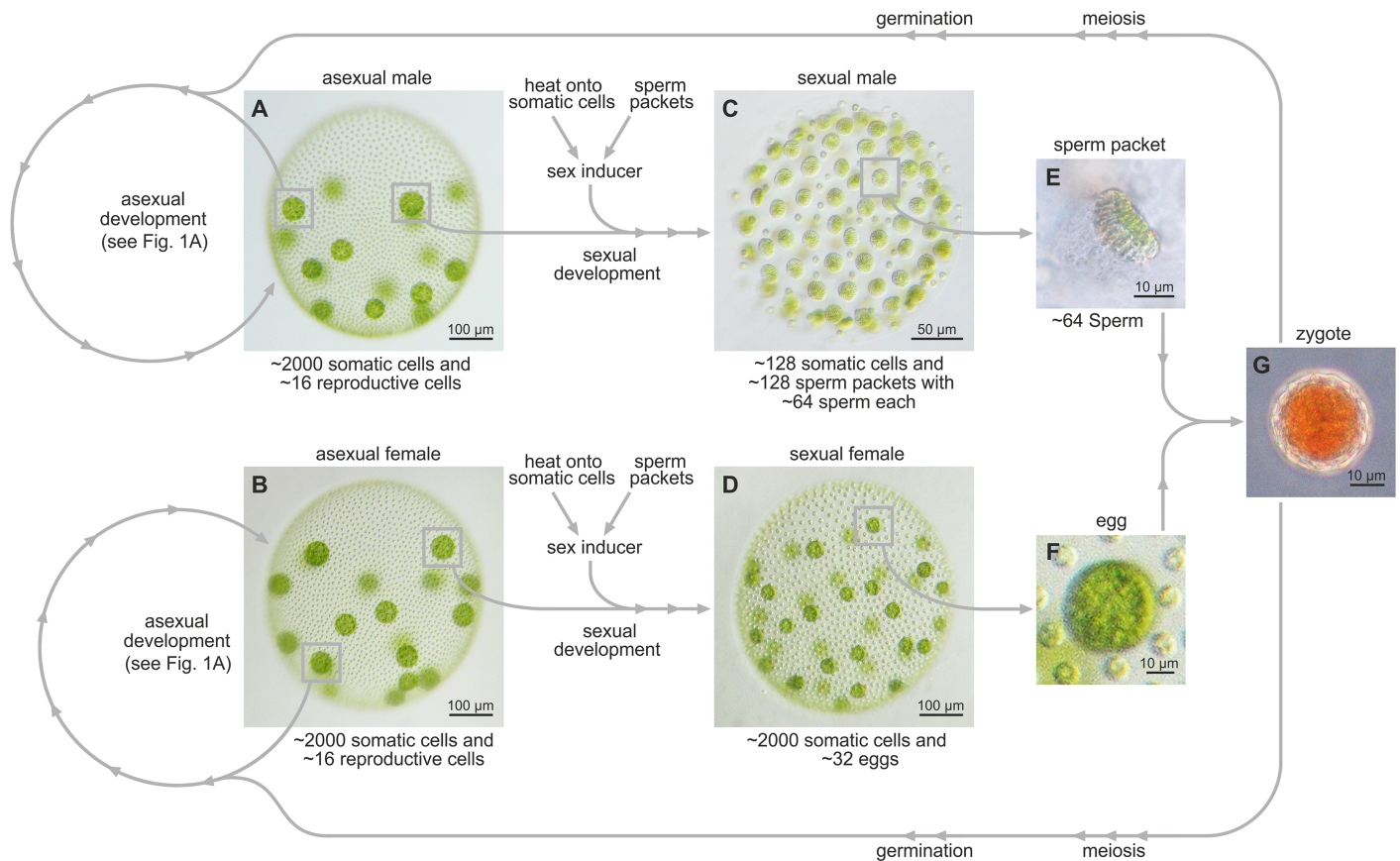


Additional file 1: Figure S1. Complete life cycle of *V. carteri*.



In nature, *V. carteri* lives in freshwater ponds, puddles and ditches. *Volvox* algae exist as distinct males and females, which can reproduce both asexually and sexually (Hallmann 2011; Hallmann et al. 1998; Kirk 1998). *V. carteri* reproduces asexually as long as the conditions are favorable and during this asexual development the males (A) look just like the females (B). For details of the asexual development see Fig. 1A. However, when their habitat begins to dry out, e.g., in the heat of late summer, they switch to the sexual reproduction. Asexual *Volvox* algae would die quickly once the habitat dried out but zygotes survive the drought and also the upcoming winter. Actually, the sexual development is initiated by heat that causes the somatic cells of the asexual *Volvox* spheroids to produce a highly efficient 32-kDa sex-inducing glycoprotein, the sex inducer (Hallmann et al. 1998; Kirk and Kirk 1986; Mages et al. 1988; Starr 1970; Starr and Jaenicke 1974; Tschochner et al. 1987). When the sex inducer is present, the reproductive cells of both sexes undergo a modified embryogenesis, which is also different in males and females. In males, embryonic cleavage divisions (including asymmetric cell division) result in juveniles with somatic cells and sperm packets in a 1:1 ratio (C). In females, juveniles with ~32 eggs arise (D). Mature sperm packets (E) are released and swim around until they contact a sexual female with mature eggs. The sperm packets also cause an amplification effect regarding induction of sexual development because they produce and liberate large amounts of sex inducer, which triggers

induction of sexual development in all the other *V. carteri* algae of the surrounding water area. As soon as the sperm packets come upon a female with mature eggs, the sperm cells penetrate the extracellular matrix of the female and fertilize the eggs (**F**). The resulting diploid zygotes (**G**) develop an orange coloration and secrete a thick, crenellated cell wall, which enables them to survive even if their habitat dries out completely and the cold of winter comes. The dormant zygote is the only diploid stage in the otherwise haploid life-cycle of *Volvox*. As soon as favorable conditions return in next spring and rain fills their habitat, the zygotes undergo meiosis and germination. The developing embryos then perform an asexual development. Each zygote either produces a single haploid female or a single haploid male.

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