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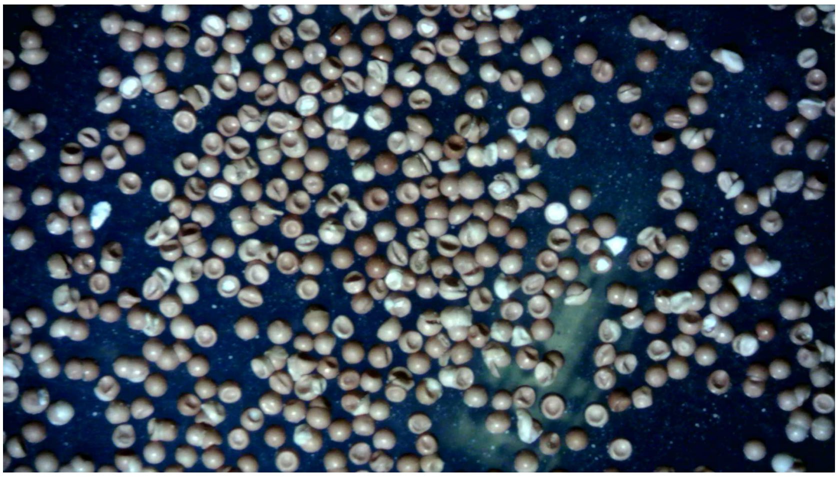
Martian habitats in the classroom: testing *Artemia*

Artemia info sheet

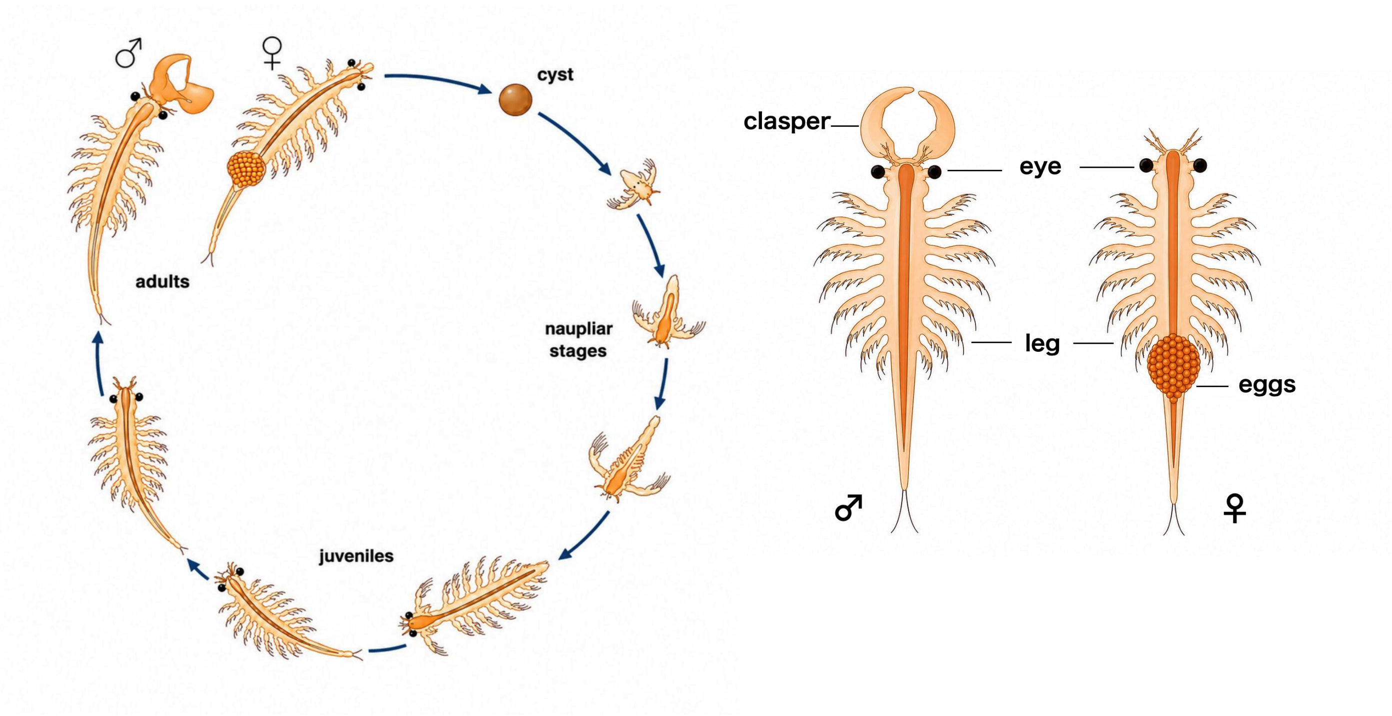
Artemia belong to the class Branchiopoda, which also includes water fleas (*Daphnia*), and possess gills integrated with their limbs.[1,2] Like *Daphnia*, they are non-selective filter feeders, that use specialised feeding appendages to generate water currents, enabling the efficient capture of a wide range of microorganisms, including microalgae and bacteria.[1,3]

Artemia can reproduce in two different ways depending on environmental conditions. Under favourable conditions artemia reproduces ovoviviparously, directly generating free-living *nauplii*[4]. Under unfavourable conditions such as low temperature, dehydration, high salinity, low oxygen levels and/or food scarcity, artemia reproduces oviparously, producing encysted, dormant embryos (cysts).[1,2] The cysts are highly resistant to severe conditions and have a cup-shaped structure with a diameter ranging from 0.18 to 0.6 mm.



Artemia cysts
Image courtesy of the authors

The cysts not only survive adverse environmental conditions but also help disperse *Artemia* populations widely, carried by wind and transported by migrating birds.[5] The larva grows and differentiates through about 15 molts.[2,6,7] Under optimal conditions, brine shrimp can grow from the nauplius stage to adulthood in just 15 days, live for several months and reproduce at a rate of up to 300 nauplii or cysts every 4 days.[1,2]



Left: Artemia life cycle. Right: male (♂) and female (♀) artemia anatomy
Images generated using ChatGPT (OpenAI, 2026); later adapted and modified by the authors

Artemia is a foundational live feed in global aquaculture, renowned for its adaptability, ease of production, and favourable nutritional profile.[4,8] Zooplankton organisms such as artemia are widely used as live food during the early life stages of many farmed species (fish and crustacean).[8,9]

Artemia are remarkable extremophiles whose capacity to survive hostile environmental conditions has made them key organisms in astrobiology research,[1,10] including multiple missions aboard of the International Space Station[11,12] and the Apollo programme,[13] where they have provided valuable insights into how multicellular life copes with the stressors of space flight. As a classroom model organism, *Artemia* can be used to create “bottle ecosystems”, self-contained mini worlds that mimic simple trophic interactions, nutrient recycling and gas exchange processes fundamental to bioregenerative life-support systems. These accessible models allow you to explore the functioning of closed ecological systems, mirroring the self-sustaining habitats designed for future colonies in which marine resources may support oxygen production, wastewater treatment and food supply. By experimenting with *Artemia* in these simulated environments, learners gain first-hand experience of the biological challenges involved in sustaining human life beyond Earth.

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