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(abstract)

RUNNING COOLS A DESERT BEETLE

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Omymacris plana is a black wingless beetle which lives on the sand dunes of the Namib Desert. It sprints across the sand surface when ambient heat stress is high, behaviour which seems counteradaptive for thermoregulation. We investigated whether running bestowed any thermoregulatory advantage.

In the laboratory, we simulated the dune microclimate, imposing two air temperatures (25 °C, 36 °C), three levels of radiant flux (200, 500, 1000 W/m^2 using a quartz halogen lamp, and four crosswind speeds (0, 0.4, 1.0, 1.6 m/s) using a fan. We simulated the convective effects of running on stationary beetles by inducing a headwind of 1 m/s using another fan. At high radiant flux, low air temperature and low crosswind speed, typical of many momings in the Namib, the simulated running dropped the thoracic temperature of beetles (n = 6), measured by fine indwelling thermocouple, by up to 13°C. We also measured the thoracic temperature of beetles running on the dunes, comparing their temperatures with those of dead beetles of the same mass in the same environment; the temperature of running beetles fell significantly below that of the dead beetles when environmental conditions were appropriate. The convective cooling induced by running, in the high radiant flux environment, therefore exceeded the extra metabolic heat generation.

Cooling induced by swimming and by flying has been reported in different animal species previously. We believe that ours is the first report of cooling induced by running.