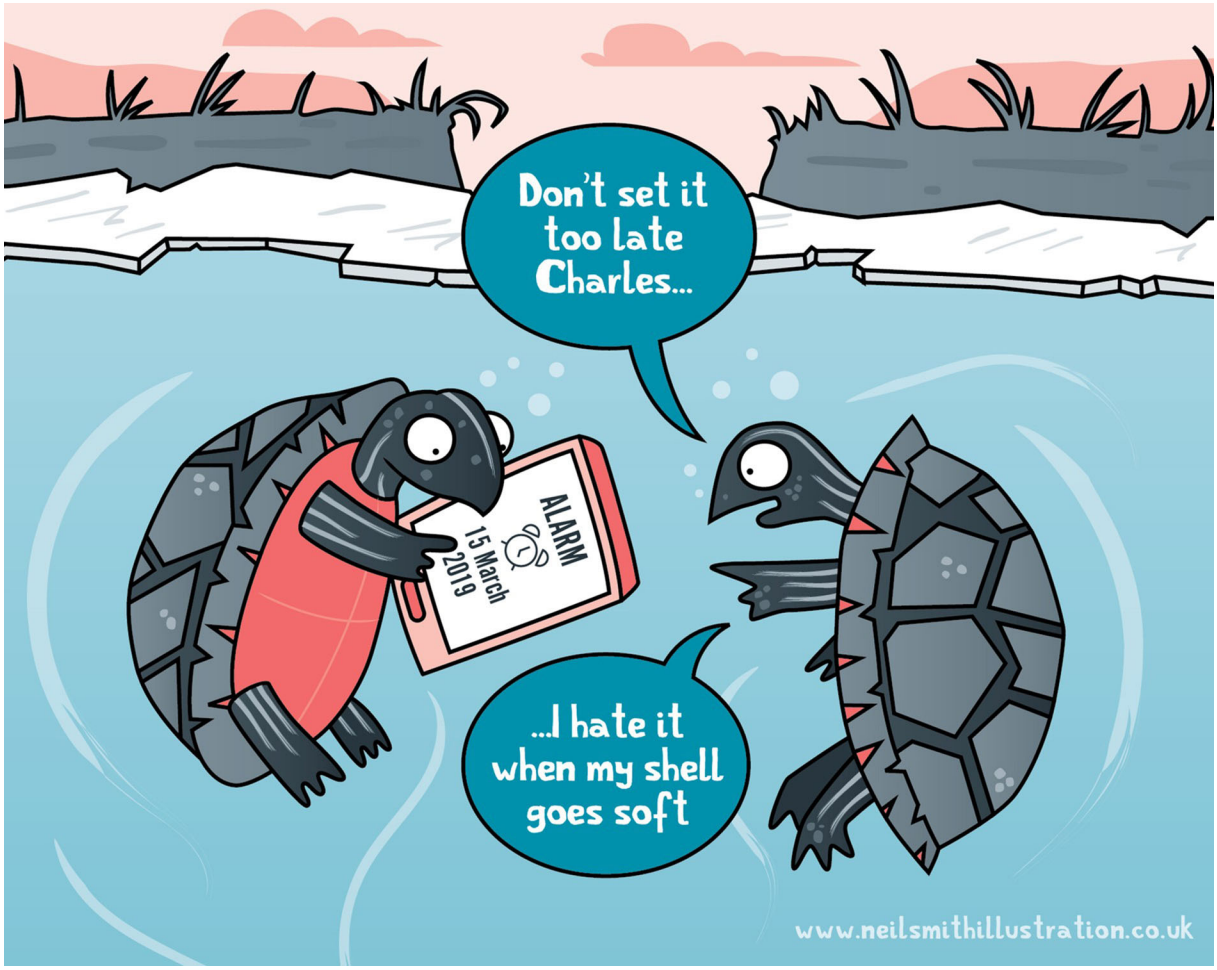
INSIDE JEB

Overwintering painted turtles only suffer weakened shells after 23 weeks without oxygen



At first glance, western painted turtles (*Chrysemys picta bellii*) may not look like your archetypal record breaker. However, although they are not particularly large or fast, they have a remarkable talent for survival, emerging unscathed from iced-over puddles after several months during winter. To protect themselves from the effects of the acid that builds up in their bodies during this period, the reptiles leach magnesium and calcium from their shells and bones. In addition, the acid, which is produced by anaerobic respiration, is also adsorbed onto the surface of the bony structures to remove it from their body fluids. But it was unclear how much of an effect demineralization and lactic acid accumulation have on the strength of the reptile's bony shell.

Testing the strength and composition of the underside of the shells of painted turtles that had been overwintering in deoxygenated and oxygenated water, Daniel Warren and colleagues from Saint Louis University, USA, discovered that the shells of the oxygen-deprived turtles were relatively unaffected after 60 and 130 days (~8 and ~18 weeks). However, the team found a marked deterioration when the turtles had been overwintering without oxygen for 165 days (~23 weeks): the shells were weaker and easier to deform.

After searching the literature for information about the duration of a turtle's average winter submersion, the team suspects that the ice thaws and the turtles can access air long before they risk damaging their shells. However, they say, 'The changes to strain tolerance and elastic modulus after ~26 weeks of submergence, regardless of oxygenation level, may be ecologically relevant'.

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Odegard, D. T., Sonnenfelt, M. A., Bledsoe, J. G., Keenan, S. W., Hill, C. A. and Warren, D. E. (2018). Changes in the material properties of the shell during simulated aquatic hibernation in the anoxia-tolerant painted turtle. *J. Exp. Biol.* **221**, jeb176990.

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