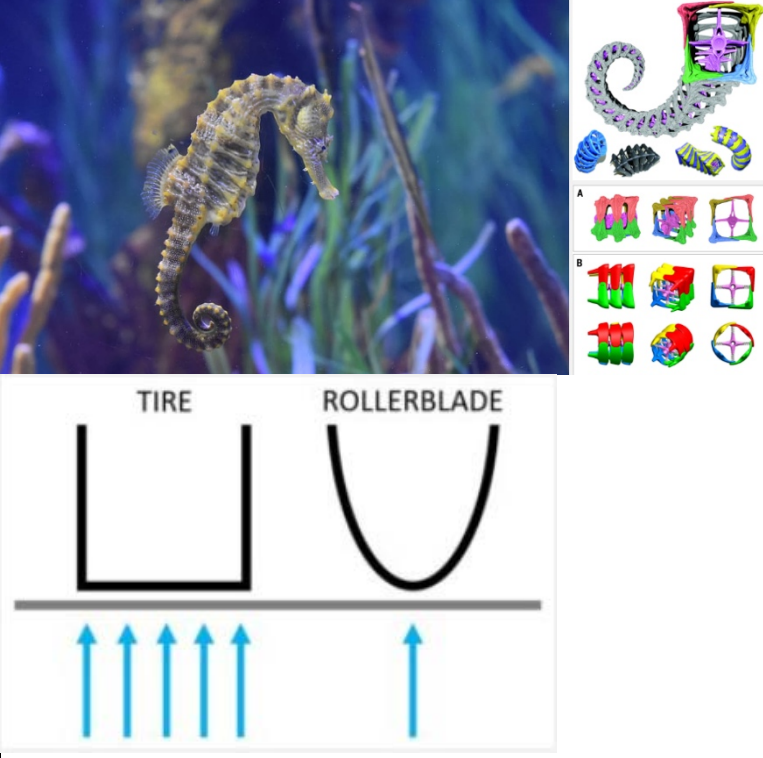


生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	海馬有方形尾巴能幫助握住物件 (The seahorse has a square tail to help it grip objects)
生物系統 LIVING SYSTEM	管海馬 <i>Hippocampus kuda</i> (Spotted Seahorse)
功能類別 FUNCTIONS	#應付撞擊 #防止變形 #防止破裂/斷裂 #Manage impact #Prevent deformation #Prevent fracture, rupture
作用機制標題	海馬的方形尾巴在捕捉獵物時幫助提供額外的抓握 (The square tail of the seahorse helps give it extra grip when hunting for prey)
生物系統/作用機制 示意圖	
作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)	
<p>儘管大多數的魚類使用尾巴來游泳，海馬，一種在熱帶淺水域中發現的魚類，卻將尾巴作為他用。牠們的長尾巴非常適合用來抓取或握住東西。海馬會抓住如海藻或是一塊珊瑚之類的物體，並用尾巴抓握其上，以躲避掠食者或進行獵食。牠們很容易融入周遭的珊瑚或海藻之中，當浮游生物或小魚等食物漂游靠近時，便能輕易將其抓住。海馬尾巴的設計旨在幫助海馬抓緊這些物體，使牠們能停留在固定地方而不會疲累。儘管海馬的尾巴從側面看起來是捲曲而圓形的，但當近距離觀察時，其骨骼結構卻是正方形的，這有助於產生額外的抓握力。</p> <p>海馬尾巴的正方形是由四個 L 形的小骨板 (plates) 所排列而成。這些正方形相互堆疊，形成長尾巴。由於正方形具有扁平的長邊，因此海馬可以使用尾巴的更多部分來緊</p>	

握並更牢固地抓住物體。我們可以聯想的其中一個例子就是汽車的輪胎。汽車輪胎從側面看是圓形的，但與道路的接觸面是平坦的，因此有更多的輪胎部分可以接觸道路並有助於控制汽車，如同下圖所示。假如汽車輪胎接觸道路的部分更圓，那麼輪胎便只有一小部分會接觸到地面，因而將無法幫助控制汽車。換作海馬也是如此：如果它的尾巴是由圓形骨頭組成，那麼用來握住物體的接觸面就更少了。

當海馬緊握住物體時，尾巴的四片骨板會收縮並相互滑動。這種靈活性還能使海馬更輕易地調整或緊束抓握。當牠從握緊狀態放鬆時，骨板便會滑回原始位置。這種能更加緊握的能力使海馬在強烈的海流中能更牢固地握緊，從而能更有效地捕捉獵物。

While most fish use their tails for swimming, seahorses, a type of fish found in shallow, tropical waters, use their tails in another way. Their long tail is excellent for grabbing and holding onto things. Seahorses will grab an object, like seaweed or a piece of coral, and hold on with their tail when they want to hide from predators or hunt for food. They easily blend in with the coral or seaweed and when food such as plankton or a small fish floats by, they can easily grab it. The seahorse tail is designed to help the seahorse grip onto these objects, allowing the seahorse to stay in one place without tiring itself out. Even though a seahorse's tail looks curly and round from the side, when viewed up close, its bone structure is square shaped, which helps create extra grip.

The seahorse tail is made up of four small "L" shaped plates that are arranged to form a square. These squares are stacked on top of each other, creating the long tail. Because the square shape has flat, long sides the seahorse can use more of its tail to grip around an object and hold it more firmly. One way to imagine this is a car tire. A car tire is a circular shape from the side, but is flat where it contacts the road, so that more of it can touch the road and help control the car, as shown in the sketch below. If a car tire was more rounded where it touched the road, only a small point of the tire would touch the ground, and the tires would not help control the car as well. This is also true of the seahorse: if its tail was made up of circular bones, there would be less contact area for it to grip onto objects with.

When the seahorse grips onto an object, the four plates contract and slide past each other. This flexibility also makes it easier for the seahorse to adjust or tighten its grip. As it releases its grip, the bones slide back into their original position. The ability to have a tighter grip allows the seahorse to hold on more securely when the ocean currents are strong, allowing it to hunt for prey more effectively.

文獻引用 (REFERENCES)

「與圓形橫切面相比，正方形橫切面的平坦外表面可以增加與纏繞物件之間的接觸面積與穩定性…。正方形結構的扁平拓撲特徵具有與彎曲及扭轉相關的幾個功能性優勢，能使海馬具有更高的抓握控制性。」

“The flat exterior surfaces of the square cross section increase contact area and stability when wrapped around an object, as compared with a circular cross section...the flattened topology of the square architecture has several functional advantages related to bending and twisting that could allow seahorses to grasp objects with more control”

參考文獻清單與連結 (REFERENCE LIST)

Porter, M. M., D. Adriaens, R. L. Hatton, M. A. Meyers, J. McKittrick. (2015). Why the seahorse tail is square. *Science* 349: aaa6683.

(<https://science.sciencemag.org/content/349/6243/aaa6683>)

延伸閱讀

生物系統延伸資訊連結 (LEARN MORE ABOUT THE LIVING SYSTEM/S)

https://en.wikipedia.org/wiki/hippocampus_kuda

https://www.onezoom.org/life/@hippocampus_kuda

<https://eol.org/pages/218966>

撰寫/翻譯/編修者與日期

譚國銓翻譯 (2021/03/22)；紀凱容編修 (2021/04/27)

AskNature 原文連結

<https://asknature.org/strategy/the-seahorse-has-a-square-tail-to-help-it-grip-objects/>