

生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	鯊魚的眼睛最大化立體視覺 (Shark Eyes Maximize Stereoscopic Vision)
生物系統 LIVING SYSTEM	路式雙髻鯊 (<i>Sphyrna lewini</i>)
功能類別 FUNCTIONS	#感知來自環境的光 (可見光譜) #Sense Light (Visible Spectrum) From the Environment
作用機制標題	水平眼柄讓眼睛向前旋轉，創造更廣闊的雙眼視野。 (Horizontal eye stalks allow eyes to rotate forward, creating a wider field of binocular vision.)
生物系統/作用機制 示意圖 (確認版權、註明出處；畫質)	<div></div> <div>https://en.wikipedia.org/wiki/Great_hammerhead</div>
作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)	
<p>大多數掠食者的眼睛都朝前，因此每隻眼睛的視野都是重疊的。重疊的視野被大腦同化，創造出 3D 世界感，可以幫助掠食者準確判斷與獵物的距離，從而進行準確的攻擊。透過將眼睛長在頭部兩側，獵物物種犧牲了立體視覺，但獲得了近 360 度的視野，有助於檢測從任何角度接近的潛在掠食者。</p> <p>所有鯊魚都是掠食者，但一般來說，它們頭部的形狀和眼睛的位置只能在它們面前提供一個很小（約 10 度）的立體視野。扇貝鋸頭鯊（<i>Sphyrna lewini</i>）的視力是其三倍，並且可以在 32 度的範圍內進行立體觀察。這是因為，雖然雙髻鯊物種的眼睛位於「錘子」的側面，但隨著錘子寬度的增加，隨著一代又一代，它們的眼睛已經移動到稍微更向前的位置。這為鋸頭鯊提供了兩全其美的優勢：保持寬闊的視野，同時將精確深度感知的面積增加兩倍。這可能有助於鋸頭鯊更好地追蹤和捕獲它們捕食的快速移動的魚類。</p>	
<p>Most predators have their eyes facing forward, so that each eye’s visual field overlaps. The overlapping visual fields are assimilated by the brain to create a 3D sense of the world that can help predators accurately judge the distance to their prey for an accurate strike. By having their eyes on the sides of their head, prey species sacrifice stereoscopic vision but gain a nearly 360-degree visual field, useful for detecting potential predators approaching from any angle.</p> <p>All sharks are predators, but in general, the shape of their heads and position of their eyes provide only a small (about 10-degree) stereoscopic visual field in front of them. The scalloped hammerhead (<i>Sphyrna lewini</i>) triples that and sees stereoscopically across a sweep of 32 degrees. This is due to the fact that while hammerhead species’ eyes are on the sides of their “hammers”, they have moved into a slightly more forward-facing position over the generations as the hammer increased in width. This gives hammerheads the best of both worlds: maintaining a wide field of view while tripling their area of precision depth perception. This may help hammerheads to better track and capture the fast-moving fish species they prey upon.</p>	

文獻引用 (REFERENCES)
<p>「這些發現表明，隨著鰲頭的橫向擴張，前雙眼重疊也增加了。隨著頭部的擴張，扇形雙髻鯊和翼頭鯊的眼睛已經遷移到頭葉遠端的更靠前的位置，並有利於增強雙眼重疊。」</p> <p>「我們確定翼頭物種表現出最極端的橫向頭部擴展，具有 48 度。雙眼重疊，比本研究中的所有物種都大，幾乎是類蟲中測量的四倍。扇形鰲頭鯊的角度為 34 度。重疊度比窄頭鯊、檸檬鯊和黑鼻鯊都要大。為翼頭鯊和扇形雙髻鯊確定的相對較大的雙眼重疊有助於實現出色的深度感知。」</p> <p>“These findings indicate that the anterior binocular overlap has increased concomitant with the lateral expansion of the hammerheads. With head expansion the eyes of the scalloped hammerhead and winghead sharks have migrated into a more anterior position on the distal tips of the cephalofoil and facilitates the enhanced binocular overlap.”</p> <p>“We determined that the winghead species exhibited the most extreme lateral head expansion, possessing a 48deg. binocular overlap, which was greater than all species in the present study and nearly fourfold that measured in the carcharhinids. The scalloped hammerhead possessed a 34deg. overlap, which was larger than the bonnethead, lemon and blacknose sharks. The relatively large binocular overlaps determined for the winghead and scalloped hammerhead sharks facilitate excellent depth perception.” (D. Michelle McComb, Timothy C. Tricas, Steven M. Kajiura 2009:4010-4018)</p>
參考文獻清單與連結 (REFERENCE LIST) Harvard 或 APA 格式
<p>Enhanced visual fields in hammerhead sharks <i>Journal of Experimental Biology</i> Dec. 15, 2009 D. Michelle McComb, Timothy C. Tricas, Steven M. Kajiura https://journals.biologists.com/jeb/article/212/24/4010/9615/Enhanced-visual-fields-in-hammerhead-sharks)</p>
延伸閱讀: Harvard 或 APA 格式 (取自 AskNature 原文; 若為翻譯者補充, 請註明)
生物系統延伸資訊連結 (LEARN MORE ABOUT THE LIVING SYSTEM/S)
<p>https://oceana.org/marine-life/great-hammerhead-shark/ https://www.sharks.org/great-hammerhead-shark-sphyrna-mokarran</p>
撰寫/翻譯/編修者與日期
<p>呂冠毅排版 (2024/03/26); 陳柏宇編修 (2024/11/30)</p>
AskNature 原文連結
<p>https://asknature.org/strategy/shark-eyes-maximize-stereoscopic-vision/</p>

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