


生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	同伴之間的學習迅速傳播新事物 (Peer-to-Peer Learning Spreads Innovations Rapidly)
生物系統 LIVING SYSTEM	寬吻海豚 <i>Tursiops truncatus</i> (Bottlenose dolphin)
功能類別 FUNCTIONS	#獲取、吸收、或過濾生物 #保護免受塵土/固體危害 #適應行為 #學習 #相同物種之間合作 #Capture, Absorb, or Filter Organisms #Protect From Dirt/solids #Adapt Behaviors #Learn #Cooperate Within the Same Species
作用機制標題	新一代的寬吻海豚不僅透過母親也透過同伴學習，以適應不斷變化的環境 (New generations of bottlenose dolphins adapt to changing situations by learning from peers and not just mothers.)
生物系統/作用機制 示意圖	
作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)	

想想您上一次從朋友那裡學到的東西，是遊戲？很酷的把戲？求生技能？事實證明，寬吻海豚也向同伴 (peer) 學習。這可能不令人意外，但到目前為止，科學家在海豚中觀察到的唯一學習方式只有親子學習 (parent-child learning)，即「做母親所做」的策略。現在，似乎有年輕的海豚發現了一種新的方式來捕獲食物，而且這種從朋友到朋友，沒有母親參與的模式像網路 (online trend) 一樣傳播。

一種新的覓食技術被稱為「貝殼捕獵」(shelling)。海豚追逐魚到巨大的貝殼(例如海螺的外殼)中，使用其口鼻部 (snout) 或吻突 (rostrum) 將其帶到水面，然後將水從殼中倒出，如此一來魚正好落入海豚張開的嘴巴。這是海豚中唯二使用工具的案例。另一種稱為「海綿捕獵」(sponging) 的技術，是海豚以其吻突的頂端帶著一塊海綿，並以其翻找海床上的岩石和破碎的珊瑚。撥弄刺戳會攪動藏在沉積物和砂礫中的魚，而海綿則像防護手套一樣，防止海豚的吻突在此過程中被刮傷。有趣的是，此「海綿捕獵」技術傾向於從母親傳給孩子。另一方面，對「貝殼捕獵」的統計分析顯示，估計有57%的海豚透過「社會傳播」(social transmission)，從同伴或較年長之非父母個體處學習該技術。

隨著我們的地球經歷越來越迅速的環境變化，人類可能要向海豚學習，鼓勵不同及相同世代之中的新事物和知識共享。雖然父母給孩子的智慧對於個體的生存至關重要，但是當新的想法也能在同伴之間傳播時，族群的適應力將指數級增加。

Think of the last time you learned something from a friend. Was it a game? A cool trick? A lifesaving skill? Turns out, bottlenose dolphins learn from their peers too. This may not seem all that surprising, but up until recently, the only type of learning scientists had observed in dolphins was parent-child learning—the “do as mother does” strategy. Now, it seems some young dolphins have found a new way of capturing food, and it’s spreading like any online trend—from friend to friend, without (too many) moms involved.

The hip new foraging technique is called “shelling.” A dolphin chases a fish into a large shell (such as that of a sea snail), carries the shell up to the surface of the water using its snout, or rostrum, then dumps the water out of the shell in such a way that the fish falls right into the dolphin’s open mouth. This is only the second reported case of tool usage in dolphins. The other technique, called “sponging,” is where a dolphin carries a sea sponge on the tip of its rostrum and uses it to sift through rocks and broken coral on the seafloor. The poking and prodding stirs up fish that normally hide amongst the sediments and debris, and the sponge, worn like a protective glove, prevents the dolphins’ rostra from being scraped up in the process. Interestingly, knowledge of the sponging technique tends to be passed on consistently from mother to child. Statistical analysis of shelling, on the other hand, indicated that an estimated 57% of dolphins learned the technique through “social transmission,” from peers or older non-parent individuals.

As our planet experiences more and more rapid environmental change, humans may need to take one from the dolphins, encouraging innovation and knowledge sharing both between and within generations. Wisdom passed from parent to child is crucial for an individual’s survival, but when new ideas can also be introduced and spread from peer to peer, a population’s resilience will increase exponentially.

文獻引用 (REFERENCES)

平均群體大小(族群中每個個體的平均群組成員數目)約為15.6(95%置信區間[CI] 2.06-145)的個體,代表每單位與見識廣博個體聯繫的比率中,社交學習效率相對於非社交學習(asocial learning)的基準(baseline level)增加了15.6倍。這相當於估計有57%(95%CI 41%–74%)的海豚透過社交傳播而學習了貝殼捕獵。即使將環境和/或基因網(genetic network)加入到模型計算中,社會傳播強度也會保持不變。

這種高度特別化(specific)的工具使用對鯨豚類(cetacean)的認知和大腦演化有影響,甚至被認為是解決問題的案例,這種現象在野外很難記錄,但在圈養(captive)寬吻海豚的研究中已得到證實。我們的研究表明寬吻海豚如何在自然環境中運用這些技能,解釋了促進更高層次認知的生態和演化壓力。海綿捕獵可能已經透過使用柔軟的海綿工具探測海床,從而解決了在尖銳而粗糙的基底(substrate)探索並獲得無魚鰾獵物(swimbladderless prey)的問題。

For an individual with average group size (each individual's average number of group members averaged across the population), s was estimated to be 15.6 (95% confidence interval [CI] 2.06–145), indicating a 15.6-fold increase in the social learning rate per unit connection with informed individuals relative to the baseline level of asocial learning. This corresponds to an estimated 57% (95% CI 41%–74%) of dolphins learning shelling by social transmission. The estimated strength of social transmission stayed the same even if the environmental and/or genetic networks were added to the best model.

This highly specific tool use has implications for cognition and brain evolution among cetaceans and could even be considered a case of problem solving, a phenomenon difficult to document in the wild, but well established in studies of captive bottlenose dolphins [48]. Our study demonstrates how bottlenose dolphins might use these skills in their natural environment and provides insight into the ecological and evolutionary pressures that promote higher-level cognition. Spongers may have solved the problem of detecting and extracting swimbladderless prey from below a sharp and rough substrate by probing the seafloor with a soft sponge tool.

參考文獻清單與連結 (REFERENCE LIST)

Wild, S., W. J. E. Hoppitt, S. J. Allen, and M. Krützen. (2020). Integrating genetic, environmental, and social networks to reveal transmission pathways of a dolphin foraging innovation. *Current Biology* 30: 3024-3030. (<https://doi.org/10.1016/j.cub.2020.05.069>)

Patterson, E. M. and J. Mann. (2011). The ecological conditions that favor tool use and innovation in wild bottlenose dolphins (*Tursiops* sp.). *PLoS One* 6: e22243. (<https://royalsocietypublishing.org/doi/10.1098/rsif.2014.0273>)

延伸閱讀

AskNature Team. (21 January, 2021). Juvenile Friendships Help Throughout Life. *AskNature*. Retrieved from:

<https://asknature.org/strategy/juvenile-dolphins-choose-friends-to-help-through-life/>

Stier, S. (8 October, 2020). Engaged Teaching Passes on Complex Lessons. *AskNature*.

Retrieved from: <https://asknature.org/strategy/education-sustains-technological-complexity/>

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

<https://asknature.org/system/mammals?post-type=Biological%20Strategies>

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