


生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	混合物種的鳥群帶使效益最大化 (Mixed-species Bird Flocks Optimize Benefits)
生物系統 LIVING SYSTEM	短嘴半蹼鶻 <i>Limnodromus griseus</i> 、 長嘴半蹼鶻 <i>Limnodromus scolopaceus</i> 、 小斑背潛鴨 <i>Aythya affinis</i> 、綠頭鴨 <i>Anas platyrhynchos</i> 、 北美鶻 <i>Tringa semipalmata</i> (Short-billed Dowitcher, Long-billed Dowitcher, scaup hen, mallard, willet)
功能類別 FUNCTIONS	#透過自我組織維持群落協調 #Coordinate by Self-Organization
作用機制標題	簡單規則容許混合物種鳥群找到食物且使掠食減到最少 (Simple rules allow mixed-species bird flocks to find food and minimize predation.)
生物系統/作用機制示意圖	

作用機制摘要說明 (SUMMARY OF FUNCTIONING MECHANISMS)

看到蜜蜂和烏鴉或其他單一物種 (species) 的動物生活在一起是常見的景象。看到由不同物種鳥類組成的鳥群 (flock) 則比較罕見，因此更加神秘。研究人員發現混合物種鳥群有很多好處，舉例來說，牠們可以一同尋找覓食場所 (food patch)，但在覓食場所中攝食不同的食物。這樣牠們在覓食需求與減少競爭的需求之間取得了平衡。許多不同的物種亦能以不同方式和不同時間監控掠食者 (predator) 帶來的危險。

但是每個混合物種鳥群中的個體如何做出決定，以令該鳥群能更好地合作呢？混合物種鳥群中的鳥類個體顯示出幾種不同趨勢：(1) 一種趨勢是從鳥類密度低的區域移動到鳥類密度較高的區域。(2) 另一種趨勢是從鳥類密度低的區域移動到密度中等的區域。(3) 最後一種趨勢是避免停留在同一物種少於三分之一或多於一半的地點。

這些行為規則平衡了鳥群之中的相互競爭。總括來說，這些規則是：(1) 幫助鳥群維持在一起。(但如果這是唯一的規則，則鳥群將會全部聚集在一個小地方，而造成過多的競爭。)(2) 將鳥群維持在一起，同時減少覓食時遇到掠食者的風險和覓食競爭。(3) 幫助將鳥安置在適合覓食的地方，以及具有足夠多樣性的地方，以減少競爭並將遇到掠食者的風險減至最少。因為第三條規則是基於鳥群比例而不是絕對數字，所以這些決策使規則可以隨著鳥群大小的變化而按比例調整。

Seeing bees, crows, or other animals of a single species living together is a common sight. Seeing flocks of birds made up of a mix of species is much rarer and so all the more intriguing. Researchers have discovered that flocks made up of a mix of species have many advantages. For example, they can locate food patches together but then eat different foods within the patches. This way they balance the need for finding food with the need to reduce competition. Many different species can also monitor risks from predators in different ways and at different times.

But how do the individuals in each flock of mixed species make decisions that help the flock work well together? Individual birds in a flock of mixed species show a few different tendencies: (1) One tendency is to move from areas with a low density of birds to areas with a higher density of birds. (2) Another tendency is to move from an area with a low density of birds to an area with a medium density. (3) A final tendency is to avoid sites that have less than one-third or more than half of the same species.

These behavioral rules balance competing interests among the flock. Overall, these rules: (1) Help keep the flock together. (However, if this was the only rule, flocks would all aggregate on one small site, creating too much competition.) (2) Keep the flock together, while reducing both the risk from predators and competition while foraging. (3) Help place birds in sites that are good for foraging and in sites with enough diversity to reduce competition and minimize the risk from predators. Because the third rule is based on flock proportions rather than absolute numbers, these decision making rules can scale with varying flock size.

文獻引用 (REFERENCES)

「但是，在群體大小多變的情況下，我們的規則似乎能歸納為「避免同種 (conspecific) 少於三分之一」，以及「避免異種 (heterospecific) 少於二分之一」...這推測鳥類可能以此決策規則來適應當地社交環境，以便在物種之間產生相似的反應。」(Farine et al. 2014: 179)。

「因此，利用定義最廣泛的社交資訊 (social information) (以他人行為作為下決定的基準或受大眾的選擇所吸引)，動物可能會使用一條普遍的規則滿足綜合的需求以降低風險，例如透過歸納篩選，獲取最佳覓食地點的環境信息。」(Farine et al. 2014: 179)

“However, where the group size varied, our rule seemed to generalize to ‘avoid sites below one-third’ for conspecifics and ‘avoid sites below one-half’ for heterospecifics... This suggests that birds may be adapting their decision-making rule to their local social environment in order to generate a similar response across species.” (Farine et al. 2014: 179).

“Thus, by exploiting social information in its broadest definition (basing decisions on the behavior of others or being attracted to popular choices), animals could be using a general rule that satisfies combined needs to reduce risk, such as through dilution, and gain information about the environment, such as finding the best sites in which to forage.” (Farine et al. 2014: 179).

參考文獻清單與連結 (REFERENCE LIST)

Farine, D. R., L. M. Aplin, C. J. Garroway, R. P. Mann, and B. C. Sheldon. (2014). Collective decision making and social interaction rules in mixed-species flocks of songbirds. *Animal behaviour* 95: 173-182. (<https://www.sciencedirect.com/science/article/pii/S0003347214002747>)

延伸閱讀:

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

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

撰寫/翻譯/編修者與日期

呂睿東翻譯 (2021/04/06); 譚國鏞編修 (2021/07/14); 林有駿編修 (2021/11/21); 陳柏宇編修 (2022/01/02)

AskNature原文連結

<https://asknature.org/strategy/mixed-species-bird-flocks-optimize-benefits/>