

生物策略表

類別	生物策略 (Strategy)
生物策略 STRATEGY	裸鼹鼠女王僱用保姆來照顧幼小 (Naked mole-rat queens hire babysitters to care for young)
生物系統 LIVING SYSTEM	裸鼹鼠 <i>Heterocephalus glaber</i> (Naked mole-rats)
功能類別 FUNCTIONS	#相同物種之間合作 #透過自我組織維持群落協調 #分配固體 #保護免受動物危害 #Cooperate within the same species #Coordinate by self-organization #Distribute solids #Protect from animals
作用機制標題	裸鼹鼠透過分工及支持單一的生育女王來確保族群的生存率 (Naked mole-rats ensure colony survival by dividing work and supporting a single breeding queen)
生物系統/作用機制 示意圖	

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

蜜蜂常常因為牠們有效率及有組織的群體而被稱讚。但牠們並不是動物界中唯一因為合作行為而值得被稱讚的動物。裸鼹鼠 (naked mole-rats) 同著表現出超級社會行為 (super-social behavior)。

蜜蜂跟裸鼹鼠都是真社會性動物 (eusocial)。牠們生活在多世代 (multigenerational) 的家族群體中，並有一位女王。所有其他的個體都有特定的工作，支援蜂后的繁育或是滿足蜂群日常的生存所需，例如覓食或防禦。這種集體策略幫助族群在牠們獨特的生態棲位 (ecological niche) 中存活。

裸鼹鼠是一個明顯無毛的齧齒動物物種，在肯亞、衣索比亞及索馬利亞最乾旱的地區中完全生活在地面下。生活在多達 300 位成員組成的龐大群體中，牠們演化出驚人的能力以致能在密閉空間中生存。牠們能夠在沒有氧氣下生存達 18 分鐘，以及在比地面上多好幾倍的二氧化碳濃度下仍然不受傷害。

在單一群體中，通常只會有一隻佔優勢的繁殖雌性，以及少數幾隻繁殖雄性。牠們分工合作，因此非繁殖個體成為了覓食者、巢穴防禦者或是異親 (alloparents)，亦即照顧幼小的成年個體，但並不是這些小孩生物學上的父母。

異親在巢穴中緊擠在一起，製造溫暖給裸鼴鼠的幼獸 (pups)、銜回掉出巢穴外的幼獸、當群體遷移到新巢穴時運送牠們，以及在群落受到騷擾時帶牠們避難。異親亦會以非常不尋常的方式幫忙餵養幼獸。剛斷奶的年幼裸鼴鼠會吃掉異親的盲腸便 (caecotrophes)，或部分消化的糞便團粒。是的沒錯，裸鼴鼠會吃掉異親的大便！

一些研究人員認為裸鼴鼠演化成真社會性，是因為這有利於生活在食物稀少難尋環境中的動物。試想像在一大堆泥土中以隨機方向挖掘直到你發現了一個塊莖，如果有同胞 (compatriots) 會在其它地方搜尋並當找到好東西時會呼喊你就好了。其它的解釋是真社會性使非繁殖工作鼴鼠留守在家中照顧幼獸，能增加整個巢穴內的生存機率。這確保了即使有部分成員不繁殖，牠們整個族群仍然能興旺發展。然後最近的理論則把重點放在女王上：當一隻雌性繁殖裸鼴鼠可以留守在家而不用冒險出外覓食，牠可以在不會遇到掠食者的情況下放心進食並生育。

不論是怎樣的演化解釋，真社會性對於裸鼴鼠明顯地是一個有效的生存策略。或許我們也可以向牠們學習。作為獨立個體，牠們為了全體利益著想而將合作放在競爭之上。然後在空間逐漸變得狹小而資源快要短缺的世界之中，人類應該開始將較高社會價值放在那些拋棄繁殖而選擇以其它方式支持我們這個物種延續的人們。能夠共同合作的家庭才會變得興旺繁榮的。

Honey bees are often praised for their efficient, organized colonies. But they're not the only ones in the animal kingdom that deserve admiration for their commitment to cooperation. Naked mole-rats show the same super-social behavior.

Both bees and naked mole-rats are eusocial. They live in multigenerational family groups with a single queen. All other individuals have specific jobs, either supporting the queen's reproduction or fulfilling the colony's daily survival needs, such as foraging and defense. This communal strategy helps the population survive in their unique ecological niche.

The naked mole-rat is a conspicuously hairless species of rodent that lives entirely underground in the driest regions of Kenya, Ethiopia and Somalia. Living in large colonies of up to 300 members, they have evolved remarkable abilities to survive in closed spaces. They can live for up to 18 minutes without oxygen and are unharmed by carbon dioxide levels many times higher than what's found aboveground.

In a single group, there is usually only one dominant breeding female and a handful of breeding males. They divide their labor so that nonbreeding individuals become foragers, nest defenders or alloparents—adults that care for the young but are not the biological parents of those young.

Alloparents huddle in the nest to create warmth for the mole-rat “pups”, retrieve pups that fall out of the nest, transport them when the colony moves to a new nest and evacuate them during colony disturbances. They also help feed the pups in a most unusual way. Young mole-rats that are weaned off their true mother’s milk will eat their alloparents’ caecotrophes, or partially digested fecal pellets. That’s right—mole-rat pups eat their alloparents’ poop!

Some researchers argue that naked mole-rats evolved eusociality because it is advantageous for animals living in an environment where food is scarce and hard to find. Imagine digging in random directions through loads of dirt until you stumble upon a tuber—better to have compatriots who will search in different areas and give a holler when they find something good. Others explain that eusociality increases the nest’s overall survival rate when nonbreeding workers stay at home to look after the pups. This ensures that their whole population continues to thrive even if some members don’t reproduce. And a recent theory puts more emphasis on the queen: When a breeding female can stay home instead of venturing out to find food, she can eat and give birth without risk of encountering a predator.

Whatever the evolutionary explanation, it is clear that eusociality is an effective survival strategy for naked mole-rats. Perhaps we could take a few lessons from them, too. As individuals, they put cooperation above competition for the betterment of everyone. And in a world of dwindling space and limited resources, humans might begin to place higher social value on those who forgo reproduction and choose to support the continuation of our species in other ways. A family that works together is a family that thrives.

文獻引用 (REFERENCES)

「有了這些裸鼹鼠工作者，真社會性的女王被認為比起非群居 (solitary) 的母親有兩個適應性的益處：牠有較高的繁殖力及較低的死亡率。當女王的工作者們覓食和餵食幼小時，牠可以留在家中，這減少了牠遇到掠食者的風險，增加了牠的生育率並確保牠（以及部分工作者）可以保衛巢穴。」 (Nowak et al. 2010: 1061)

“In the presence of workers, the eusocial queen is expected to have two fitness advantages over solitary mothers: she has increased fecundity and reduced mortality. While her workers forage and feed the larvae, she can stay at home, which reduces her risk of predation, increases her oviposition rate and enables her (together with some workers) to defend the nest.” (Nowak et al. 2010: 1061)

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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/heterocephalus_glaber
https://www.onezoom.org/life/@heterocephalus_glaber
<https://eol.org/pages/326232>

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<https://asknature.org/strategy/naked-mole-rat-queens-hire-babysitters-to-care-for-young/>