

Sea Stars And Sea Otters Work Together To Maintain Canadian Kelp Forests

The North American Fur Trade began in the 16th century when European colonizers arrived on the shores of what would later become Canada and the United States. While pelts were initially acquired by exchanging goods with indigenous peoples, a thriving industry emerged after the publication of The Voyages of Captain Cook in the mid-18th century and continued through the 19th century until sea otter populations spanning California, the Aleutian Islands and Japan, crashed along with the sales of their pelts. By the early 1900s, sea otter populations were in the hundreds, but through active recovery efforts, their populations are now in the thousands. It became clear during these recovery efforts that sea otters play a critical role in kelp forests as "keystone predators". However, a new study by PhD Candidate Jenn Burt indicates that in the waters of British Columbia, sea otters are not the only important players - sunflower stars are also responsible for maintaining kelp forest habitats.

海星和海獺共同維護加拿大海帶森林

北美毛皮貿易始於 16 世紀，當時歐洲殖民者抵達後來成為加拿大和美國的海岸。雖然毛皮最初是通過與土著人民交換商品獲得的，但在 18 世紀中葉庫克船長的航行出版後出現了一個繁榮的行業，並持續到 19 世紀，直到海獺種群遍布加利福尼亞、阿留申群島和日本，隨著他們的毛皮的銷售而崩潰。到 1900 年代初期，海獺種群數量已達數百隻，但通過積極的恢復工作，它們的種群數量現在已達到數千隻。在這些恢復工作中，很明顯海獺在海帶森林中扮演著“關鍵捕食者”的關鍵角色。然而，博士生 Jenn Burt 的一項新研究表明，在不列顛哥倫比亞省的水域中，海獺並不是唯一的重要參與者——向日葵星也負責維護海帶森林棲息地。

Along the coast of British Columbia, Canada, researchers have been able to document the impacts of sea otters on the ocean environment as their populations recover and move north (in what the researchers call "rafts of foraging otters"). Despite their low numbers, sea otters consume voracious kelp-eating sea urchins at a high enough rate that kelp forests continue to persist and provide habitat for numerous species. Without sea otters, sea urchins devour kelp forests and remove the high-quality habitat they provide, creating "barrens" in their place. Interestingly, Burt and colleagues found that sea otters only ate larger urchins, while sunflower stars specialized on medium-sized urchins. Therefore, kelp forests in British Columbia rely on both sea otters and sea stars to keep urchins at bay.

When the sea star wasting epidemic hit the waters of British Columbia, 96% of the sunflower star population was wiped out in 2015 and 2016. While sea otters were unaffected by wasting disease and continued to eat large urchins, the populations of medium-sized urchins exploded by over 300% and the density of kelp forests declined by 30%. Despite their consumption of the largest urchins, the sea otters alone could not control urchin populations. Sunflower stars play an integral role in these kelp forest communities by preying upon medium-sized urchins. As our oceans warm, sunflower stars will likely continue to be susceptible to wasting (the densovirus that causes wasting is facilitated by higher temperatures) and **kelp forests that thrive in cool temperate waters will also degrade**. If sunflower stars cannot keep urchin populations in check, these threatened kelps will become increasingly vulnerable to urchin consumption and the habitat they provide may no longer be suitable for the wide range of sea life they currently support.

在加拿大不列顛哥倫比亞省沿岸，研究人員已經能夠記錄海獺種群恢復並向北移動時對海洋環境的影響（研究人員稱之為“覓食的水獺筏”）。儘管數量很少，但海獺以足夠高的速度吞食貪婪的海帶海膽，以至於海帶森林繼續存在並為眾多物種提供棲息地。沒有海獺，海膽會吞噬海藻森林並移除它們提供的優質棲息地，在它們的位置上創造“貧瘠之地”。有趣的是，伯特及其同事發現海獺只吃較大的海膽，而向日葵星則專門吃中型海膽。因此，不列顛哥倫比亞省的海藻森林依靠海獺和海星來阻止海膽。

當海星消瘦流行病襲擊不列顛哥倫比亞省水域時，2015 年和 2016 年，96% 的向日葵星種群被消滅。雖然海獺沒有受到消瘦病的影響，繼續吃大海膽，但中型海膽的種群爆炸了 300% 以上，海帶森林的密度下降了 30%。儘管它們食用了最大的海膽，但僅靠海獺無法控制海膽的數量。向日葵星通過捕食中型海膽在這些海藻森林群落中發揮著不可或缺的作用。隨著我們的海洋變暖，向日葵星可能會繼續容易消瘦（導致消瘦的濃核病毒因溫度升高而加速），在**涼爽溫帶水域中繁衍生息的海藻林也將退化**。如果向日葵星不能控制海膽數量，這些受威脅的海帶將越來越容易受到海膽的消耗，它們提供的棲息地可能不再適合它們目前支持的各種海洋生物。