**Distributions of tropical bee colonies**

**热带蜜蜂群落的分布**

In 1977 ecologists Stephen Hubbell and Leslie Johnson recorded a dramatic example of how social interactions can produce and enforce regular spacing in a population. They studied competition and nest spacing in populations of stingless bees in tropical dry forests in Costa Rica. Though these bees do no sting, **rival** colonies of some species fight fiercely over potential nesting sites.

1977年生态学家SH和LJ记录了一个例子关于社会联系怎么产生和加强人口中的规律性间隔。他们研究竞争和CR热带干旱深林的无刺蜜蜂的人口巢穴间隔。虽然这些蜜蜂不蛰人，但是一些与之竞争的物种往往在潜在的栖息地大打出手。

Stingless bees are abundant in tropical and subtropical environments, where they gather nectar and pollen from a wide variety of flowers. They generally nest in trees and live in colonies made up of hundreds to thousands of workers. Hubbell and Johnson observed that some species of stingless bees are highly aggressive to members of their species from other colonies, while other species are not. Aggressive species usually forage in groups and feed mainly on flowers that occur in high-density clumps. Nonaggressive species feed singly or in small groups and on more widely distributed flowers.

无刺蜜蜂广泛分布于热带和亚热带环境，他们在此地收集多种花蜜和花粉。他们逐渐地栖息在树上和由成千上万的工蜂组成的群体。H和J观察到一些无刺的蜜蜂对于其他种群的蜜蜂有较强的攻击性，而其他的种群没有该特性。侵略性的物种常常群体觅食且主要食用高浓度块状花蜜。而非侵略性的蜜蜂则单独或小团体觅食且食用更广泛分布的花。

Hubbell and Johnson studied several species of stingless bees to determine whether there is a relationship between aggressiveness and patterns of colony distribution. They predicted that the colonies of aggressive species would show regular distributions, while those of nonaggressive species would show random or closely grouped (clumped) distribution. They concentrated their studies on a thirteen-hectare tract of tropical dry forest that contained numerous nests of nine species of stingless bees.

Hubbell和Johnson 研究一些种类的无刺蜜蜂去决定是否在侵略性和群体分配模式上有联系。他们预测侵略性物种会有规律性的非配而非侵略性的物种会随机或是集群分配。他们把他们的研究集中于13热带干燥森林公顷的土地，这块地上包括多个九种无刺的蜜蜂的巢穴。

Though Hubbell and Johnson were interested in how bee behavior might affect colony distributions, they recognized that the availability of potential nest sites for colonies could also affect distributions. So as one of the first steps in their study, they mapped the distributions of trees suitable for nesting. They found that potential nest trees were distributed randomly through the study area. They also found that the number of potential nest sites was much greater than the number of bee colonies. What did these measurements show the researchers? The number of colonies in the study area was not limited by availability of suitable trees, and a clumped or regular distribution of colonies was not due to an underlying clumped or regular distribution of potential nest sites.

然而Hubbell和Johnson 对蜜蜂的行为如何影响殖民地的分布感兴趣，他们意识到潜在可筑巢树的可得性也影响分布。因此作为他们研究的第一步，他们绘出了适合筑巢的树的分布地图。他们也发现潜在的筑巢的树是胡乱地分布在他们的研究区域。他们也发现潜在的可筑巢树的数量远远大于蜂群的数量。这些测量值向研究员表面了什么？蜂群的数量不是被适宜树的可得性所限制并且成群的或有规律的蜂群分布不是由于潜在的大量的或有规律的适宜筑巢树的分布。

Hubbell and Johnson mapped the nests of five of the nine species of stingless bees accurately, and the nests of four of these species were distributed regularly. All four species with regular nest distributions were highly aggressive to bees from other colonies of their own species. **The fifth species was not aggressive, and its nests were randomly distributed over the study area.**

Hubbell和Johnson准确地绘制了9个无刺蜜蜂种群的5个巢的地图，并且4个这种种群的巢是规律的分布。4个有着这种有规律巢的分布的种群都是对相同种群来自不同蜂群具有高度攻击性的。第5种种群是没有攻击性的，并且他们的巢都胡乱地分布在研究区域中的。

The researchers also studied the process by which the aggressive species establish new colonies. Their observations provide **insights into** the mechanisms that establish and maintain the regular nest distribution of these species. Aggressive species apparently mark prospective nest sites with pheromones, chemical substances secreted by some animals for communication with other members of their species. The pheromone secreted by these stingless bees attracts and aggregates members of their colony to the prospective nest site; however, it also attracts workers from other nests.

研究者们同样研究具有攻击性物种建立新殖民地的过程。他们的观察提供了对那个建立和维持这些物种有规律的巢穴侵略的机制的理解。 这些具有攻击性的物种更喜欢用信息素去标记那些有发展前景的巢穴，这种信息素是一些动物分泌的为了与同种物种不同成员之间交流的化学物质。 这些被无刺的蜜蜂分泌的信息素吸引着并且聚集他们“殖民军”中的其他成员到那些有发展远景的巢穴上。 然而，他们也吸引了来自其他巢穴的工蜂。

If workers from two different colonies arrive at the prospective nest at the same time, they may fight for possession. Fights may be **escalated** into protracted battles. The researchers observed battles over a nest tree that lasted for two weeks. Each dawn, fifteen to thirty workers from two competing colonies arrived at the contested nest site. The workers from the two colonies faced off in two swarms and displayed and fought with each other. In the displays, pairs of bees faced each other, slowly flew vertically to a height of about three meters, and then grappled each other to the ground. When the two bees hit the ground, they separated, faced off, and performed another aerial display. Bees did not appear to be injured in these fights, which were apparently ritualized. The two swarms abandoned the battle at about 8 or 9 A.M. each morning, only to re-form and begin again the next day just after dawn, While this contest over an unoccupied nest site produced no obvious mortality, fights over occupied nests sometimes kill over 1, 000 bees in a single battle.

如果那些来自其他殖民军的工蜂同事到达了那些有发展远景的巢穴，他们可能会为了所有权而战斗。这些战斗可能会升级为长时间的战争。这些研究者们研究巢穴所在的树上的战争长达两周。每次黎明，来自两个不同殖民军当中的十五到三十只工蜂到达那些会发生战争的巢穴。那些来自两个殖民军的职蚁分成两个蜂群，战列，然后彼此之间争斗。在战列时，一堆蜜蜂面对面，竖直慢慢的飞刀大概三米的高度，然后把对方打击到地上。当两个蜜蜂都掉落在地上，他们分开，面对面，然后再一次空中的战列。蜜蜂不会再这些打斗当中受伤，这些打斗很明显就是程序化的。两个蜂群在每天早上大概8,9 点离开战争，仅仅隔天的黎明又再次组队。当这样的战斗通过一个没有被占领的巢穴的时候不会留下明显的战斗痕迹的时候，那些在已经被占领的巢穴的战争有时仅仅一场战争就要死超过一千只蜜蜂。