Spatiotemporal distribution patterns of the desert locust in Africa

The desert locust, *Schistocerca gregaria*, is one of the most destructive pests in the world. Sometimes, desert locust populations grow explosively, forming swarms and causing locust plagues. A plague can affect up to 20% of the earth’s surface across Africa, the Middle East, and Southwest Asia. Desert locusts can potentially damage the livelihoods of a tenth of the world’s population. The preventive approach involves monitoring and spraying of locust breeding areas. However, this is difficult in practice as many of the principal breeding zones are in remote areas and difficult to reach. Despite these constraints, we will keep studying the locust and aim for efficient and sustainable control measures with due consideration to environmental well-being. We have learned, for example, that gregarious locusts can form a dense group at certain sites within a day. If we can understand these spatiotemporal aggregation patterns, we can control locusts efficiently using only small amounts of pesticides. To obtain these ecological data, we have conducted field surveys in Mauritania in collaboration with the Mauritanian National Anti-Locust Center.

In the field, actively marching migratory bands of gregarious nymphs passed some plants before finally roosting and aggregating on patchily distributed trees around dusk (Fig. 1). Migratory bands formed the largest group on the largest tree within the local plant community (Fig. 2). They apparently chose the largest plants. Adults similarly roosted on large trees or medium-sized bushes (Fig. 3). Flight escape was the preferred defense when temperatures were above the minimum threshold for locust flight (22 °C) (Fig. 4). At low temperatures, defense response to predator threat varied with plant size and locust height off the ground: locusts in low bushes dropped to the center of the bush and hid, whereas those above 2 m in trees remained stationary. These alternative defense behaviors appear to be adaptive under the different environmental conditions. Flight escape is extremely effective but cannot be performed under 22 °C. Hence, alternative defenses (dropping or remaining stationary) are necessary. These defenses are effective at low temperatures because dynamic locomotion is not required.

Our results suggest that desert locusts integrate information about microhabitat, temperature, and threat characteristics to adaptively adjust defense tactics. Control operation and monitoring should consider these ecological characteristics especially because this plant-size-dependent roosting site choice during the night may contribute to the development of artificial trapping systems for locusts and a shift to a new environment-friendly, night control approach.

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