Decoding gigantic insect genome could help tackle devastating locust crises

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In between swarm outbreaks, desert locusts lead solitary lives that behave much like a harmless grasshopper. Credit: University of Leicester

A 'game changing' study deciphering the genetic material of the desert locust by researchers at the University of Leicester, could help combat the crop-ravaging behavior of the notorious insect pest which currently exacerbates a hunger crisis across many developing countries.

It is hoped that the study will provide the basis for developing 'intelligent pesticides', that act with surgical precision by tapping into locust-specific signals in the nervous system, to either kill or disable their swarming behavior, without harming other organisms.

The full set of genetic information for the desert locust could have major international implications for countries such as East Africa, the Arabian Peninsula and South-West Asia, which this year have been suffering the most devastating desert locust crises in decades despite wide-spread control operations that are still ongoing.

According to the Food and Agricultural Organisation (FAO), a swarm of locusts can contain around 40 million insects per square kilometer, which each day can eat the same amount of food as 35,000 people. The FAO estimates that 42 million people are currently facing severe food insecurity caused specifically by the desert locust.

Dr. Tom Matheson said:"The incredible devastation that these voracious insects can cause to food crops and pastures affects the livelihoods of hundreds of thousands of farmers and exacerbates the risks of starvation for the wider population in already vulnerable regions.

"The desert locust genome provides key information that could be a complete game-changer for the developing world, and a huge economic step forward for countries struggling to feed their populations.

"Tackling locust infestations and controlling swarms will never be easy because of the challenging conditions across the huge areas affected, but with the right information and research at hand, we hope that future approaches can become more effective."

He added:"If climate change causes locust plagues to become the 'new normal', we will need all hands on deck by way of in-depth research and

improved technology to help in the fight to control swarms."

Desert locust swarms are a major economic issue in more than 65 countries, across more than 20 per centof the world's total land surface. Authorities in affected countries have been carrying out aerial spraying of pesticides, but the scale of the infestation is often beyond local capacity as desert locusts can travel up to 150km (95 miles) in a day, crossing national borders and rugged terrain in regions with little road infrastructure.

While locust swarms are infamous for the great damage they inflict to agriculture, their genetic material ('genome') is famed amongst researchers for its enormous size. At more than 8.8 billion base pairs of DNA (8.8 'giga-bases'), the desert locust genome is the largest insect genome sequenced to date and over 2.8 times larger than the human genome.

Dr. Swidbert Ott added:"We do not yet understand the genetic instructions that make locusts behave so differently from ordinary grasshoppers, and to such damaging effect. Until now, a major stumbling block has been the lack of the desert locust genome sequence that holds the answer to what makes a grasshopper a locust.

"We hope that our data can facilitate the development of novel, more sustainable methods of managing swarm outbreaks. With the information in our research now available, there is a unique opportunity for innovators to create an intelligent pesticide that targets locusts, but not other insects crucial to the ecosystem, such as pollinators."

More information: Heleen Verlinden et al, First draft genome assembly of the desert locust, Schistocerca gregaria, *F1000Research* (2020). DOI: 10.12688/f1000research.25148.1

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