

MOSQUITO BIRTH CONTROL

A NEW TOOL TO SAVE HAWAI'I'S FOREST BIRDS



Left to right: A southern house mosquito laying a raft of eggs (PC: Sean McCann); A mosquito attacking an 'Apapane (PC: Jack Jeffrey); Bottom right: 'Akikiki, an endangered forest bird (PC: Robby Kohley).

SUMMARY

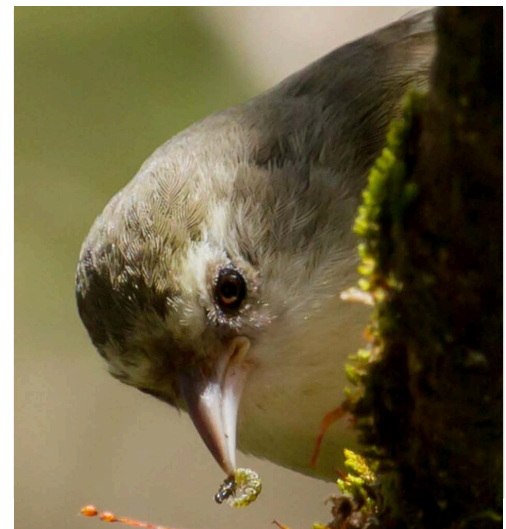
Mosquitoes carry serious diseases including avian malaria, which threatens to drive many forest bird species to extinction in the next few years. To combat this problem, scientists have developed a method to transfer a naturally-occurring "birth control" bacteria to local mosquitoes in a lab. Only male mosquitoes, which don't bite birds or people and therefore don't transmit diseases, would be released. These male mosquitoes would mate with wild female mosquitoes, but their eggs would not hatch. This safe, targeted technique could drastically reduce mosquitoes in our forests and potentially save our birds from extinction.

PROJECT DESCRIPTION

Hawai'i's native wildlife evolved over millions of years prior to the introduction of mosquitoes in the early 1800s. There are now six types of mosquitoes found in Hawai'i, one of which, *Culex quinquefasciatus*, severely threatens our native forest birds by transmitting avian malaria, a disease not native to Hawai'i. As our climate warms, this mosquito is able to invade higher elevation habitats, potentially driving some of our mauka forest birds to extinction. Scientists from the DLNR Division of Forestry and Wildlife, the U.S. Fish and Wildlife Service, and universities in Hawai'i and Michigan are partnering with American Bird Conservancy, the Department of Health, the Coordinating Group on Alien Pest Species, and the Nature Conservancy to adapt a "birth control" method to reduce mosquito numbers using a bacteria that is naturally-occurring in Hawai'i. It is called *Wolbachia*, and the research, which will be done in controlled laboratory settings, involves giving the male mosquitoes a different strain of *Wolbachia* than is normally found in them, to prevent them from producing offspring. This method safely reduces the population on a landscape scale without the use of pesticides and without harming any other species. The technique will not impact the other five mosquito species present in Hawai'i, though researchers hope to learn more in the process about control methods that could be applied to the mosquito species that affect human health. If the research is successful, the team will evaluate how to safely apply this method to Hawai'i's remote native forests where birds still reside, potentially saving our forest birds from extinction.

EXPECTED BENEFITS

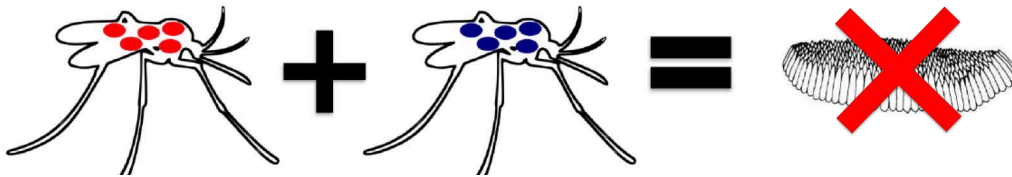
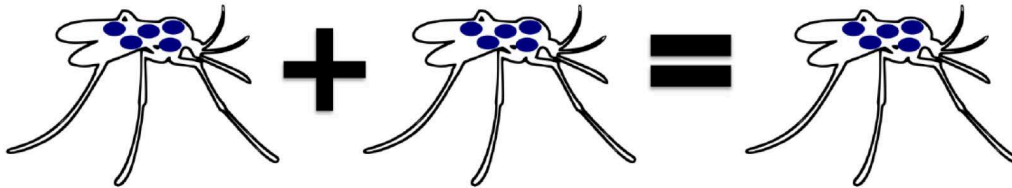
- Reduced mortality in our native forest birds due to avian malaria
- Potential rescue from extinction for several critically endangered birds, including 'Akeke'e and 'Akikiki
- Enhanced ecosystem resilience to changes in mosquito distribution due to climate change
- Insight into potential strategies to safely protect humans from mosquito-borne diseases like Zika, dengue, and chikungunya





LANDSCAPE-SCALE MOSQUITO CONTROL

Steering Committee



Top: two mosquitoes with the same strain of *Wolbachia* mate to produce offspring. Bottom: By using Incompatible Insect Technique, the males have a different strain of *Wolbachia* (symbolized by red dots). The eggs are now unviable and will not hatch.

CONTACT PERSON

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LEARN MORE

To get more information on mosquitoes, the Incompatible Insect Technique, and our efforts to save Hawai'i's native forest birds, visit dlnr.hawaii.gov/mosquito

FREQUENTLY ASKED QUESTIONS

What do mosquitoes have to do with Hawai'i's native birds?

Hawai'i's native birds evolved in the absence of mosquitoes and avian malaria. While introduced birds species have some immunity to avian malaria and can continue living alongside mosquitoes at low elevations, our native birds are more susceptible to the disease. Twenty-six species of honeycreepers have gone extinct in Hawai'i since the first arrival with Europeans, from causes including disease. Most of the remaining native forest birds are now only found at high elevations where it is too cold for *Culex* mosquitoes and the avian malaria parasite. As our climate warms, mosquitoes are moving to higher elevations and the available habitat for our native forest birds is disappearing.

What is Incompatible Insect Technique?

Incompatible Insect Technique interrupts reproduction and is used to reduce insect populations. It functions like birth control by making it impossible for male mosquitoes to produce viable offspring. Most mosquitoes (and many other insects) carry a type of bacteria called *Wolbachia* in their system. Males and females must carry the same strain in order to reproduce. By giving lab-reared mosquitoes a different strain of *Wolbachia*, any eggs produced with wild mosquitoes would not hatch.

Is this "birth control" method commonly used to control mosquitoes or has it been used previously?

Yes, this method has United States Environmental Protection Agency (EPA) approval and is currently being used elsewhere in the U.S. and in other countries to reduce mosquito populations and disease transmission while enhancing public health and quality of life. A similar method has been used safely and effectively to control fruit flies in Hawai'i.

Isn't this the same as GMO mosquitoes?

No. It is like birth control: the animal cannot reproduce, but none of the mosquitoes' gene sequences, nor those of the *Wolbachia* bacteria, are altered.

Could a similar program help prevent public health problems related to mosquitoes, such as dengue, chikungunya, Zika viruses?

Yes. While dengue, Zika, and chikungunya are spread by different mosquito species – the ones called *Aedes albopictus* and *Aedes aegypti*, the same "birth control" techniques being developed for *Culex* have already been used elsewhere in the United States for these *Aedes* species. The Hawai'i Department of Health is exploring these techniques and they could potentially be implemented in the future.

Can this "birth control" process be reversed?

Yes. Since this tool is not self-perpetuating in the wild, we can reverse the process simply by no longer releasing lab-reared mosquitoes with *Wolbachia*.