

NATULAR™ G AERIAL LARVICIDE INTERVENTIONS IN CENTRAL MASSACHUSETTS (2022 UPDATE)

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ABSTRACT

Following unparalleled Eastern Equine encephalitis levels in central Massachusetts during the summer of 2019, the Central Massachusetts Mosquito Control Project was directed to address the potential for a similar situation in 2020. Through discussions with other mosquito control districts, as well as Commonwealth officials, it was decided that expanded larval control for both *Coquilleltidia perturbans* and *Culiseta melanura* was the appropriate course of action. Two different formulations of spinosad were chosen, one for each species and their specific larval habitat. Natular™ G30 was selected for *Cs. melanura* crypt habitats, while Natular™ G was designated for *Cq. perturbans* emergent vegetation habitats. A similar aerial operation was conducted in 2021 and 2022, except that the most recent operation was much more focused, dropping the Natular™ G30 portion for *Cs. melanura* in part due to inconclusive results. Once the application of Natular™ G was conducted for *Cq. perturbans*, emergence traps and larval surveillance was undertaken within the treatment area and a neighboring untreated area to observe the relative efficacy of the operation.

BACKGROUND

In 2019 Massachusetts experienced extraordinary levels of Eastern Equine encephalitis in the local mosquito population, leading to numerous cases of human infection. For CMMCP specifically, the 2019 season resulted in twelve district communities to be categorized as being of “Critical” risk for EEE infection, with another eleven as “High” risk by the Massachusetts Department of Public Health (MDPH 2019). Following the season, Commonwealth officials gathered and discussed possible interventions to reduce the potential for another year of human infection. It was determined that early season aerial larvicide operations in these “Critical” and “High” risk communities would most appropriately

address two important mosquito vectors of EEE.

The two specific mosquito species targeted in this initial operation, both considered to be significant factors in EEE amplification and transmission, are *Cs. melanura* and *Cq. perturbans*. *Cs. melanura* overwinters as larvae in very specialized habitats, the root systems of white cedar and red maple swamps. These “crypts” are traditionally difficult to treat due to their protective structure. This species has been indicated primarily as an amplification vector of EEE, contributing increasing virus levels within the local avian population (Andreadis 2005).

Emerging in significant numbers every season in central Massachusetts, *Cq.*

perturbans is another unique mosquito species. Overwintering as larvae, this single generation species attaches themselves to the root systems of emergent vegetation, breathing through it using a specialized siphon tube (Andreadis 2005). This special larval characteristic of this species creates difficulty when trying to apply traditional control measures because they do not have to surface to obtain air (Johnson 2017). Being a somewhat indiscriminate feeder, and long lived as an adult, *Cq. perturbans* have been implicated as a potential transmission vector of EEE (Andreadis 2005). This pestiferous species may acquire EEE from infected birds and later transmit it to “dead end” hosts such as humans or horses.

With these target species identified, CMMCP staff decided to use the active ingredient spinosad to reduce adult emergence. Created from the fermentation of the soil bacteria *Saccharopolyspora spinosa*, spinosad has been shown to control developing mosquito larvae. Natular™ G and Natular™ G30 are currently available commercial formulations of spinosad. The Environmental Protection Agency has identified spinosad as a “Reduced Risk” pesticide and both of these commercial products are listed by OMRI (Organic Materials Review Institute) as certified organic pesticides (CMMCP 2022). Although Clarke Mosquito Control Products, Inc., has designed Natular™ G to release immediately, Natular™ G30 has been formulated for granules to provide larval control for up to 30 days, as implied by the product name. Natular™ G could be used on *Cq. perturbans* larvae and their open habitats, while Natular™ G30 would be better utilized in and around the protected crypt habitat of *Cs. melanura*.

In 2020, with the assistance of North Fork Helicopters (Cutchogue, NY), CMMCP was able to treat approximately 551 acres of *Cs. melanura* habitat with Natular™ G30 in six CMMCP member communities. Another 1937.5 acres of *Cq. perturbans* habitat was treated with Natular™ G in twenty-one CMMCP member communities. After this successful initial operation, it was determined that these aerial larvicide interventions would continue in the 2021 season, but focus only on towns that were designated as “Critical” EEE risk at the end of 2019 season. Methodology would be similar to 2020, with the addition of *Cq. perturbans* larval surveillance to help observe the impact of Natular™ G treatments. The decision was made to continue targeting and monitoring *Cq. perturbans* in these twelve CMMCP member communities for 2022, although the *Cs. melanura* portion of the operation would be discontinued.

MATERIALS & METHODS

The 2022 operation again only focused on the twelve CMMCP member communities of “Critical” EEE level designation at the end of the 2019 season by the Massachusetts Department of Public Health. The major difference in the 2022 operation is that the Natular™ G30 portion targeting *Cs. melanura* was discontinued after inconclusive results from the previous two applications. Once again potential targets over 5 acres were included in these operations, while any suitable habitat under 5 acres were held for potential ground treatment by CMMCP staff. After application targets for 2022 were prepared for the aerial contractors, 1500.1 acres of *Cq. perturbans* habitat were treated with Natular™ G from May 24th to May 25th (Appendix 1). This

application was conducted at a rate of 10lbs/acre by North Fork Helicopters, with CMMCP providing ground support.

Following the aerial application of Natular™ G, adult *Cq. perturbans* emergence traps were placed in a treated and untreated “control” area to attempt to gauge the effectiveness of the operation (Appendix 2). Effort was made to sample from these emergence traps weekly until collections of new adult *Cq. perturbans* specimens ceased. Comparing the adult emergence collections from the treated areas to the untreated area would help indicate the level of control achieved from the aerial application of Natular™ G. Larval sampling of *Cq. perturbans* also occurred at these sites and was performed weekly to assist evaluating the treatments (Appendix 3).

2022 RESULTS

Sampling of *Cq. perturbans* larvae began in mid-May prior to the May 24th-25th applications of Natular™ G. As with the adult emergence surveillance, these larval observations continued weekly until drought conditions and corresponding low collection results prompted the conclusion. The untreated “control” area produced more *Cq. perturbans* larvae than the area treated with Natular™ G. Towards the end of the surveillance period, both locations did not produce substantial specimens (Figure 1).

Adult emergence trap collections of *Cq. perturbans* began in early June, with weekly collections ending late-July. Towards the end of the surveillance period, adult specimens were becoming scarce, and additionally the advanced drought in the region prompted the termination of collections. The

emergence traps placed in the Natular™ G treated area produced a traditional *Cq. perturbans* population curve, while the emergence traps placed in the untreated setting had a smaller emergence and peak (Figure 2).

DISCUSSION

The larval and adult *Cq. perturbans* surveillance around the 2022 Natular™ G aerial intervention produced mixed, somewhat opposing results. The *Cq. perturbans* larval surveillance indicated that the Natular™ G treatments impacted the larvae present as the treated areas had consistently lower numbers of larvae following the application. Despite this finding, the adult emergence traps from the treated area produced adult specimens with a traditional *Cq. perturbans* population curve, while the emergence traps from untreated “control” locations produced a significantly lower, nontraditional curve. Additional larval samples would have been taken but the drought conditions eventually made sampling impractical.

Surveillance from the previous aerial interventions using Natular™ G produced larval and adult population curves that indicated much more positive control in the treatment areas, in relative contrast to the corresponding untreated areas. If these Natular™ G applications continue to be conducted, similar monitoring can take place to further evaluate the impact these treatments have on *Cq. perturbans*. However, if these aerial interventions do not continue, resources from the *Cq. perturbans* adult and larval surveillance can be utilized to evaluate ground

applications of Natular™ G to their emergent vegetation habitats.

ACKNOWLEDGEMENTS

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REFERENCES

Andreadis TG, Thomas MC, Shepard JJ. 2005. Identification guide to the mosquitoes of Connecticut. Bulletin of the Connecticut Agricultural Experiment Station 966:1–173.

CMMCP [Central Massachusetts Mosquito Control Project]. 2022. Spinosad (Saccharopolyspora spinosa) [Internet]. Available from the Central Massachusetts Mosquito Control Project,

Northborough, MA [accessed December 16, 2022]. <https://www.cmmcp.org/pesticide-information/pages/spinosad-saccharopolyspora-spinosa>

Johnson, LR, Cuda JP, Burkett-Cadena, N. 2017. Cattail mosquito: *Coquillettidia perturbans* [Internet]. Available from the University of Florida [accessed December 16, 2022]. http://entnemdept.ufl.edu/creatures/aquatic/Coquillettidia_perturbans.htm

MDPH [Massachusetts Department of Public Health]. 2019. Arbovirus Surveillance in Massachusetts, 2019 [Internet]. Available from the Massachusetts Department of Public Health, Boston, MA [accessed December 16, 2022]. <https://www.mass.gov/doc/summary-of-arbovirus-surveillance-in-massachusetts-2019>

Figure 1: *Cq. perturbans* Larval Sampling

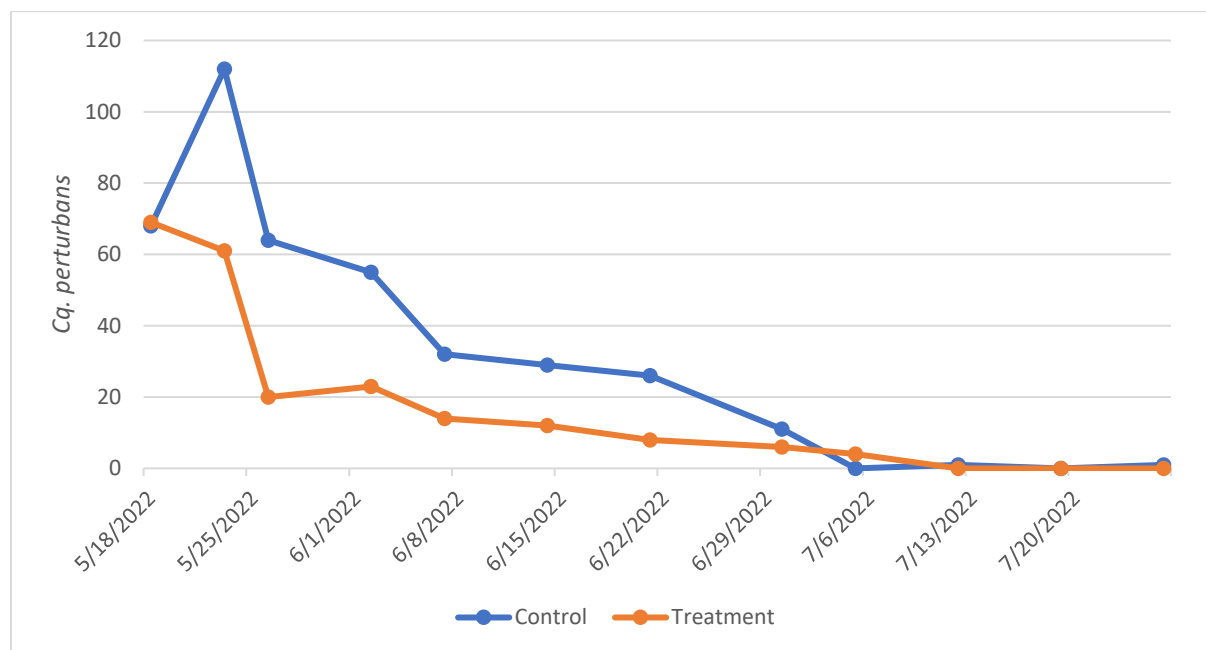
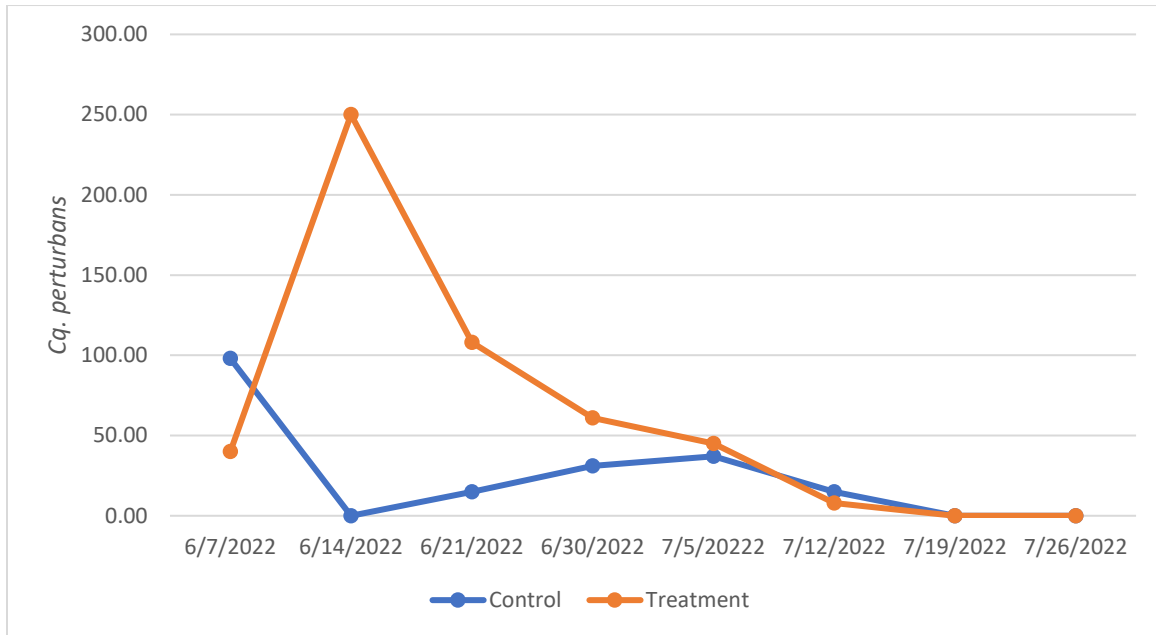


Figure 2: *Cq. perturbans* Emergence Trap Collections



APPENDIX

Appendix 1: Natular™ G Acres Treated by Town

Town	Acres
Ashland	158.1
Grafton	80.0
Holliston	207.0
Hopedale	31.9
Hopkinton	150.3
Marlborough	80.3
Milford	129.7
Northborough	250.8
Northbridge	39.2
Shrewsbury	58.4
Southborough	13.3
Westborough	301.1
Total	1500.1

Appendix 2: *Cq. perturbans* Adult Emergence Trap



Appendix 3: *Cq. perturbans* Larvae Sampling

