

Development of a predictive degree-day model for the Lacanobia fruitworm

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<http://entomology.tfrec.wsu.edu/jfbhome/growerarticles/lacanobiamodel99.pdf>

Laboratory threshold development methods

- 🍏 Placed newly hatched larvae individually on apple foliage in small petri dishes with a 1 cm cube of artificial diet
- 🍏 Dishes were placed in growth chambers at constant temperature (10, 12.5, 15, 20, 25, 27.5, 30°C) and 16:8 L:D
- 🍏 Development from oviposition to egg hatch, each larval molt, pupation and finally to adult eclosion was recorded
- 🍏 If development was not complete at time of this publication estimates were made based on preliminary data

Threshold and degree-day development

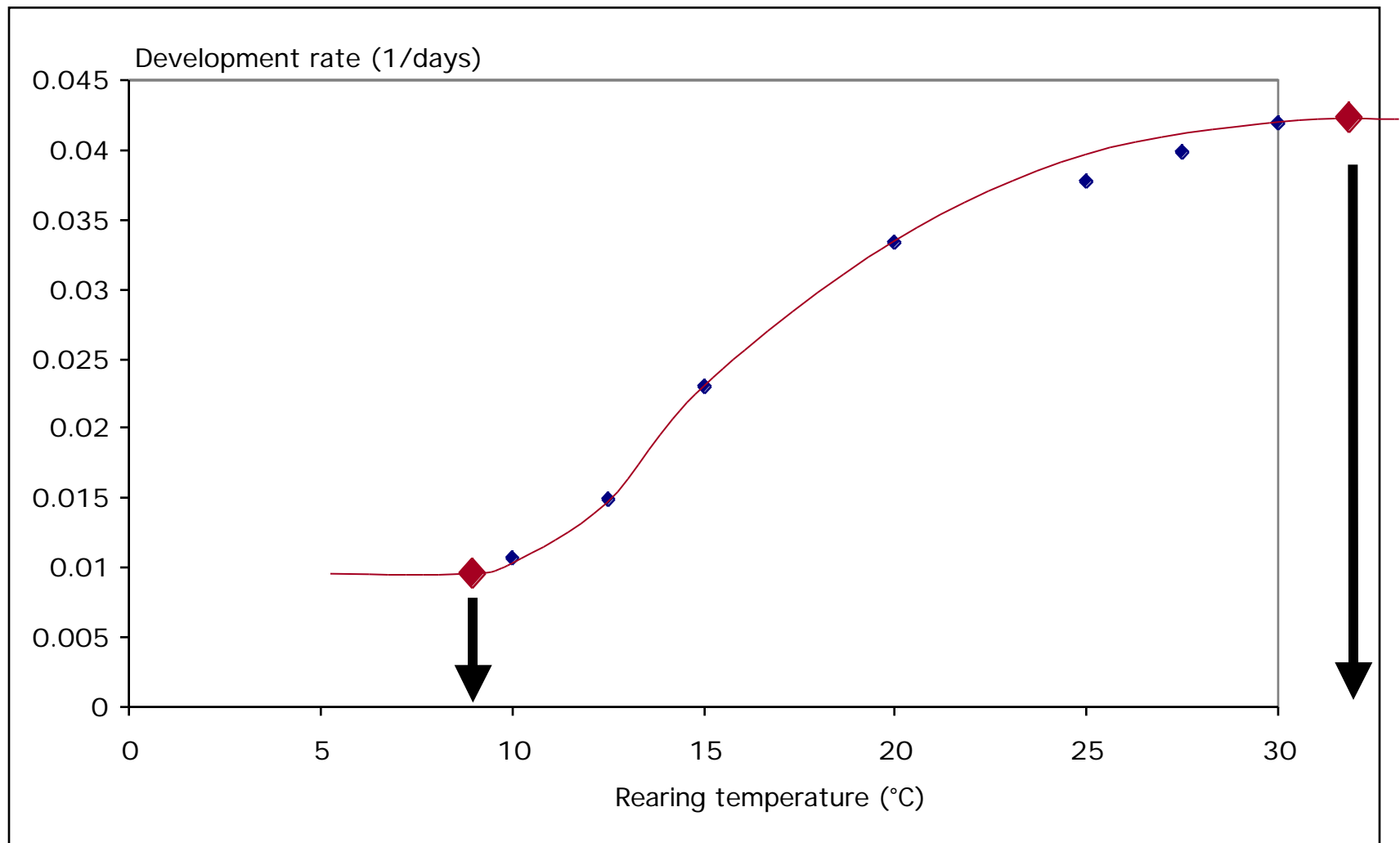
Days for development at constant temperature*

Stage	10.0	12.5	15.0	20.0	25.0	27.5	30.0
Preoviposition	24.7	17.6	11.5	7.9	7.0	6.3	5.3
Egg hatch	19.0	13.9	8.7	6.0	5.3	4.8	4.0
Hatch to pups	9.0	67.0	43.5	30.0	26.5	25.1	23.9
Pupa to adult	62.0	44.2	28.5	19.8	15.4	13.5	13.7
Adult to adult	200.0	142.7	92.0	63.7	54.2	50.0	46.9

Time from Biofix to:	Predicted degree days based on thresholds of 50-88						Estimated total DD
	12.5	15.0	20.0	25.0	27.5	30.0	
Hatch	140	181.0	270.0	324.0	346.0	324.0	275.0
2nd flight	636.0	830.0	1130.0	1650.0	1575.0	1692.0	1250.0
2nd hatch	779.0	1011.0	1400.0	1975.0	1921.0	2016.0	1525.0

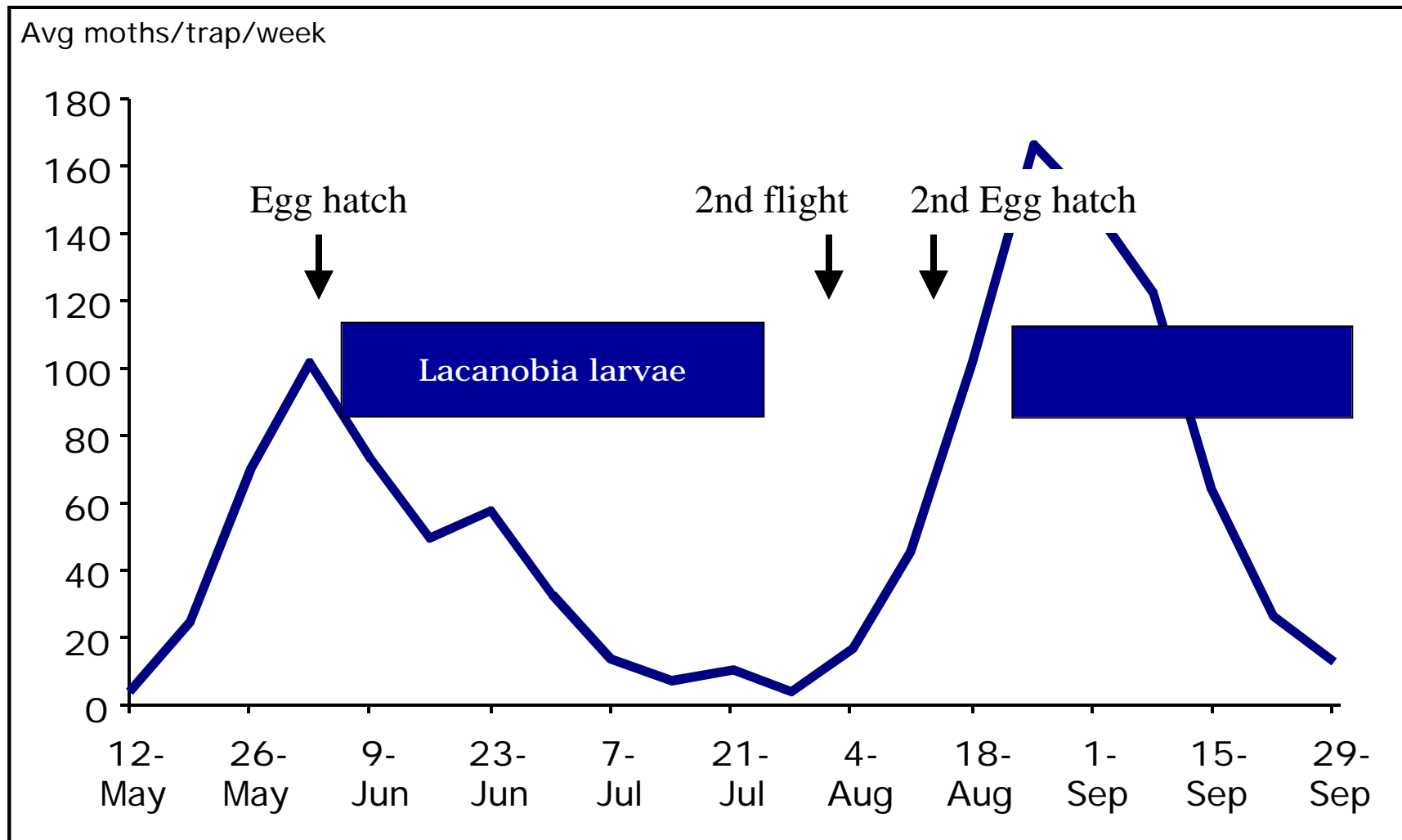
*Completed development test indicated with black ink, estimates based on preliminary data in red

Threshold and degree-day development



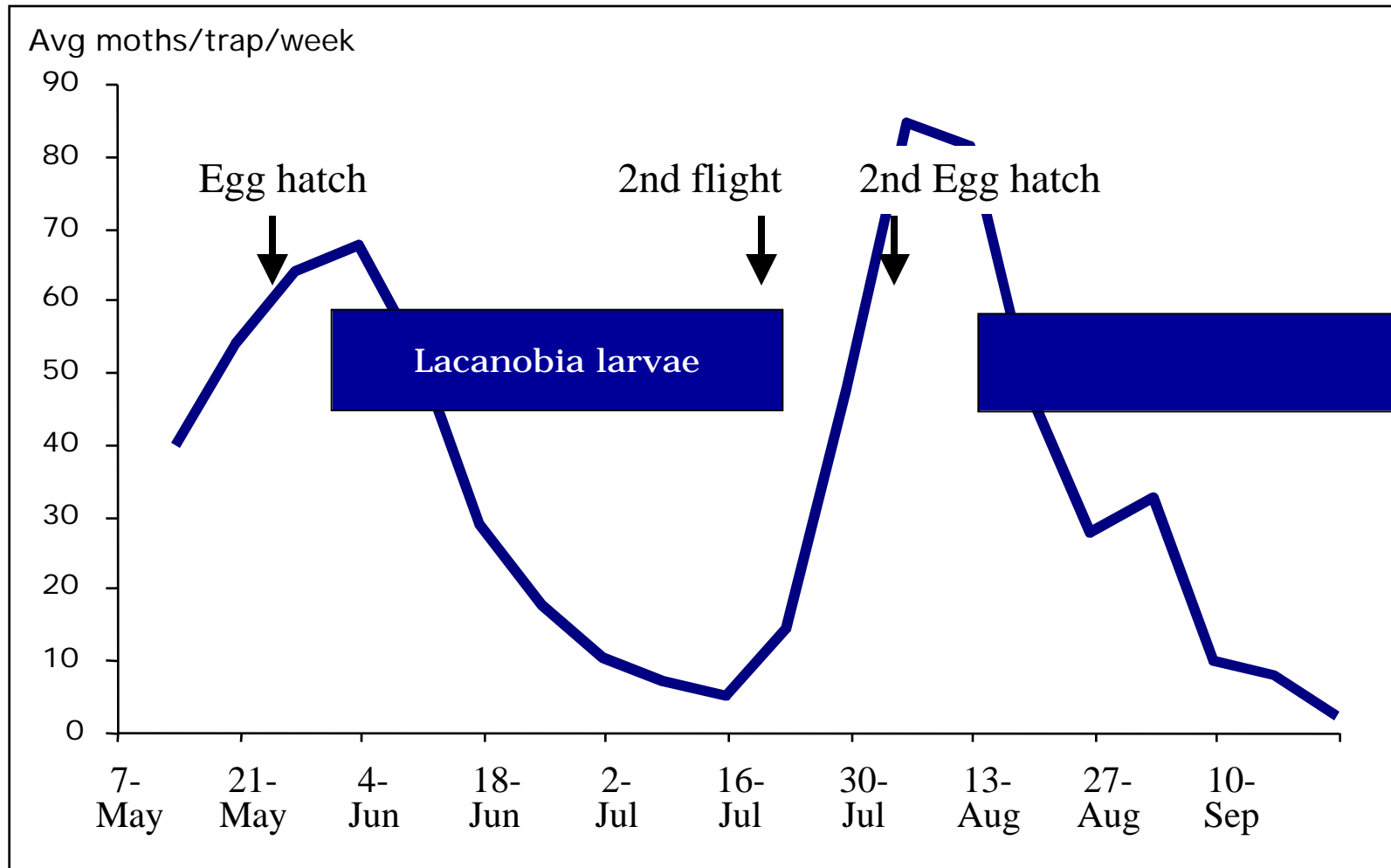
◆ Predicted lower and upper thresholds of 48-50°F and 88-90°F

1999 *Lacania* Phenology, and Model Predictions of Critical Stages



* 1999 flight started at 215 DD from Mar 1

1998 Lacanobia Phenology, and Model Predictions of Critical Stages



* 1998 flight started at approximately 210 DD from Mar 1

Model Development Summary

🍏 Rearing of all stages of *Lacanobia* at constant temperatures nearly complete

🍏 Preliminary data suggests thresholds for development similar to codling moth at 50-88°F

–It appears that *lacanobia* has one more larval instar and a longer preoviposition period than codling moth

🍏 Predictions of critical stages of phenology roughly set at

–First flight- 200-225 DD from Mar 1

–First egg hatch- 275 DD from Biofix

–2nd flight- 1300 DD from Biofix

–2nd egg hatch- 1525 DD from Biofix

🍏 Egg hatch prediction seems to be early, this may change as more is learned about preoviposition behavior

🍏 CAUTION- Data is preliminary, therefore thresholds and stage predictions will likely change as data collection is completed

Goals for year 2000

- 🍏 Complete rearing of all life stages at constant temperature to pinpoint threshold temperatures
- 🍏 Intensely monitor high pressure orchards for oviposition and egg hatch as well as adult phenology
- 🍏 Observe mating behavior in laboratory as well as ovarian development in field to enhance understanding of preoviposition behavior
- 🍏 Monitor temperatures at individual test sites to reduce variability in data
- 🍏 Validate model
 - 1999 preliminary data based on “pooled” or averaged data
 - Model validation will entail analysis of individual orchards

