# Computerized system for simulation of arthropods population dynamics and management

Edelstein[1,2], J.D.; Bartó[3], C.A.; Pons[1], D.H.; Trumper[1], E.V.
1 Instituto Nacional de Tecnología Agropecuaria (INTA) - EEA Manfredi - Sección Entomología; Ruta Nacional N° 9, Km 636 (5988) Manfredi;
2 Universidad Nacional de Córdoba – Facultad de Cs. Exactas Físicas y Naturales - Esc. Biología - Problemática Ambiental;
3 Universidad Nacional de Córdoba – Facultad de Cs. Exactas Físicas y Naturales - Depto. Informática, Córdoba, Argentina
Email: jedelstein@manfredi.inta.gov.ar

## INTRODUCTION

Simulation modelling is a useful method for identifying knowledge gaps and generating new hypothesis.

We developed a computerized system for implementing both population dynamics and tactical simulation models.

We assumed that the central process for population abundance and age-structure change is temperature-dependent development through different life stages.

Developmental rates are accumulated and distributed based on the Extended von Föerster equations.

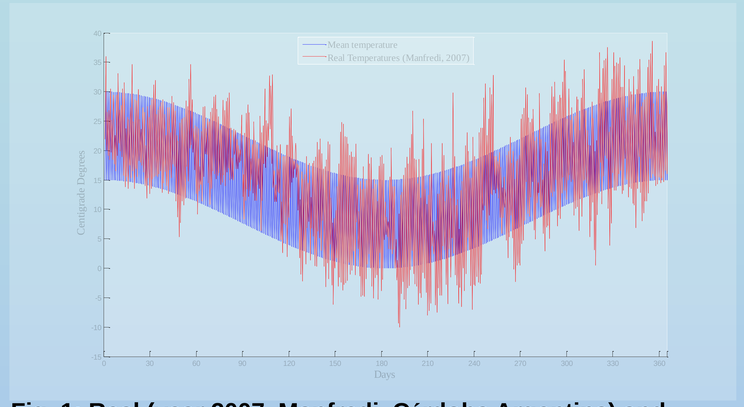



**Fig. 1: Real (year 2007, Manfredi, Córdoba Argentina) and simulated thermal regimes.**

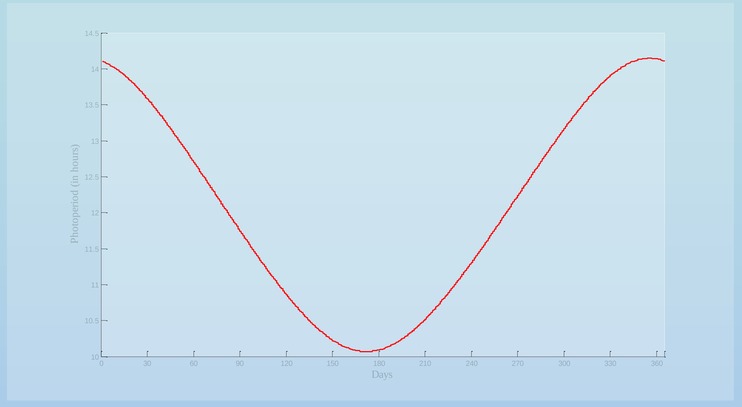



**Fig. 2: Simulated photoperiod regime (lat.: -32, long: -63).**

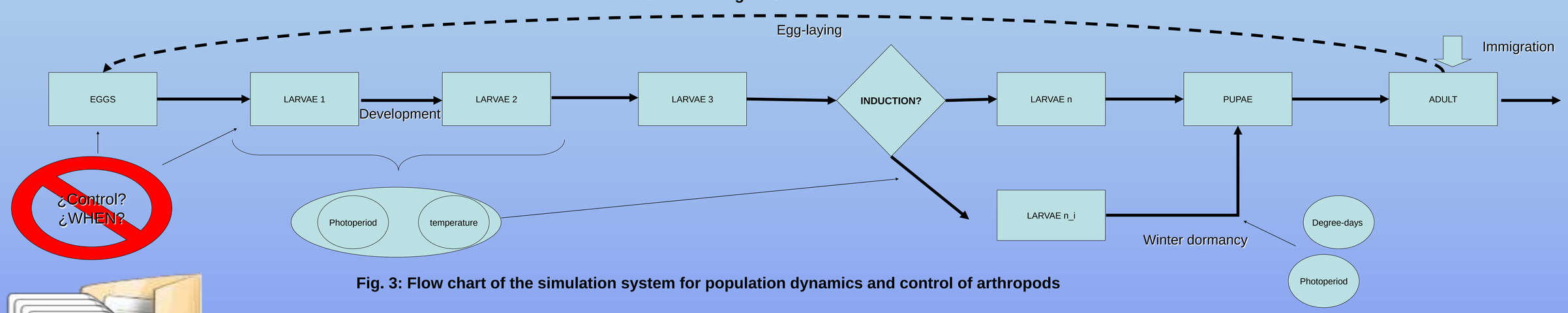



**Fig. 3: Flow chart of the simulation system for population dynamics and control of arthropods**

Libraries containing the particular developmental rate functions and parameters for each species.

As study cases:

- *Anticarsia gemmatalis*

(Johnson et al., 1983; Moscardi et al., 1981)

- *Diatraea saccharalis*

(King et al., 1975; Pereira de Melo, 1984; Greco, 1995; Pons & Trumper, 2006; Pons et al., 2008).

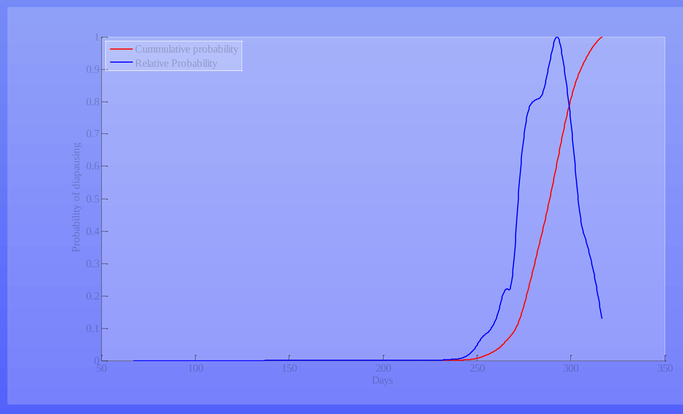



**Fig. 4: Simulated probability of diapausing in *Diatraea saccharalis* larval populations.**

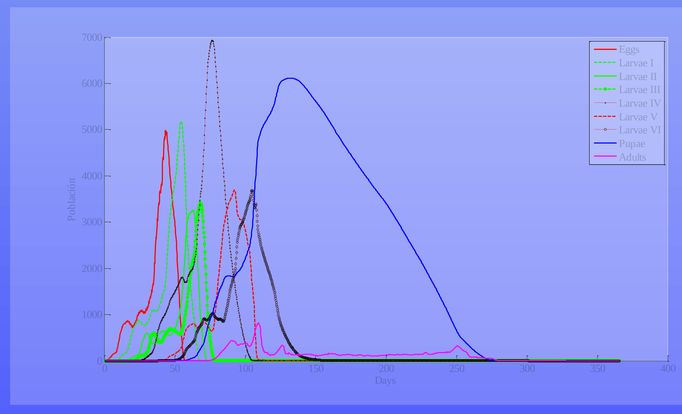



**Fig. 5: Simulated dynamics, one generation, of *Diatraea saccharalis* populations under real thermal regime.**

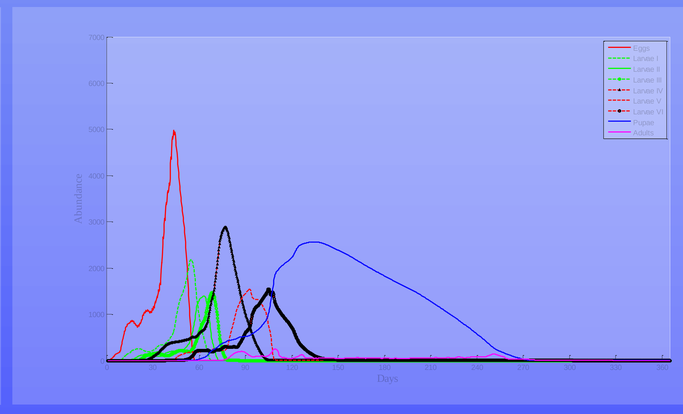
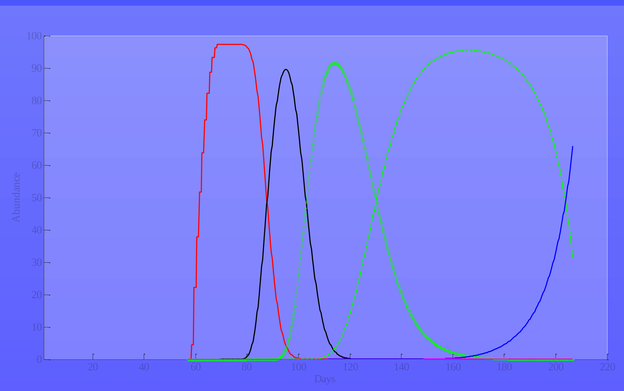



**Fig. 6: Population dynamic of *Diatraea saccharalis* with optimum date estimation for pesticide treatment (initital max. Mortality: 80%; decline rate: 1%; estimated date: 17-Jan-2007**

Control of populations at optimum date represent a decrease of 60% of uncontrolled situation.

a




b

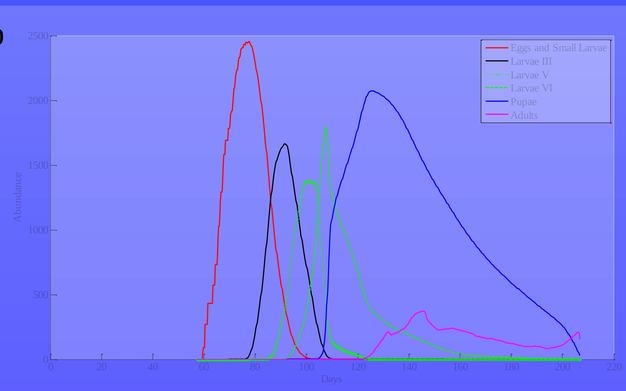



**Fig. 7: Simulated dynamics of *Anticarsia gemmatalis* populations under (a) normal temperatures and (b) real thermal regime.**

Populations are sensitive to temperature oscilations; no adults result from mean regime.

**Aknowledgements:** This work was financially supported by
AEPV 1542 INTA
GRF MINCyT Pcia. Córdoba