BIOECOLOGY AND CONTROL OF EYE GNATS IN CALIFORNIA

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Taxonomy

Diptera – Chloropidae – Eye Gnats, Eye Flies

***Hippelates (Liohippelates*) spp. :**
W. hemisphere, North & South America, Caribbean Islands, etc

About 50+ species

Sabrosky (1980) split Hippelates into Liohippelates (Pest spp) and Hippelates (Non pest spp)

***Siphunculina* spp. : Oriental region and SE Asia About 30+ species**

HISTORICAL (W Hemisphere)

- Schilling (1770) in Dutch Guiana, eye gnats vectors of yaws, locally known as yaw flies

- Loew (1863) - genus *Hippelates (pusio)*

- Townsend (1895) described *H. collusor as Oscinis collusor* from San Jose del Cabo Baja CA- very annoying, called " bovito "

- Schwartz (1895) plagues of eye gnats in FL

- Nichols (1912) West Indies, eye gnats as vectors of yaws

HISTORICAL (W Hemisphere)

- Johnson (1913), Bermuda : *H. pusio, dorsalis*
- Mulla and Hughes (1970s), Bermuda : *H. pusio, dorsalis*

- Wilson and Mathis (1930) Haiti reported enormous numbers of eye gnats on wounds of man and animals, suspected them as vectors of yaws

HISTORICAL (W Hemisphere)

- Kumm et al. (1935) Jamaica : *H. pallipes* = *flavipes* as vectors of yaws. Studied yaws and eye gnats extensively

- Spielman (1957) Cuba : *H. dorsalis,* others
- Dow et al. (1950s) Georgia studied pink eye and eye gnats
- Axtell et al. (1960-80) N. Carolina, extensively studied eye gnats

HISTORICAL (CA)

- Herms et al. (1926) – Studied eye gnats in Coachella Valley
  Coachella Valley MAD formed 1928 for eye gnat control
- Schneider (1927) reported pseudo- trachoma-salton sea region-eye gnats
- Burgess and Parman (1930-35) Studied eye gnats in Coachella Valley
- UCR Research (Mulla et al.) started in 1956

HISTORICAL (CALIFORNIA- etc)

- **San Diego County : *H. collusor***

  * **Rancho Santa Fe, San Diegito flood plain with agriculture, golf courses (Arthur Lee, SD County Health Dept, 1961)**

  * **Borrego Springs : *H. collusor* (Mulla et al. 1958), SD County Health Dept.**

  * **Borrego Springs MAD formed in 1955**

HIPPELATES - LIOHIPPELATES (Distribution)

Problem species in USA and Vicinity

H. collusor :

Southwest USA and North Mexico

H. pusio :

SE USA, Bermuda, Caribbean islands

H. bishoppi :

East and Southeast USA

H. impressus :

Mountains San Diego, CA, AZ, New Mexico, Texas

HIPPELATES - LIOHIPPELATES (Distribution)

Problem species in USA and Vicinity

H. pallipes : **Eastern USA, Caribbean**

H. flavipes : **Caribbean**

H. dorsalis : **Bermuda, Cuba, Caribbean, Neotropical, CA**

HIPPELATES – BREEDING HABITATS (Most species)

- Agriculture and tillage → heavy populations
- Requisites :
  - * Sandy friable soils
  - * Moisture – irrigation or rains
  - * Organic matter – plants or animals
  - * Tillage – incorporate organic matter into soil
  - * Moist tillage

HIPPELATES – BREEDING HABITATS (Most species)

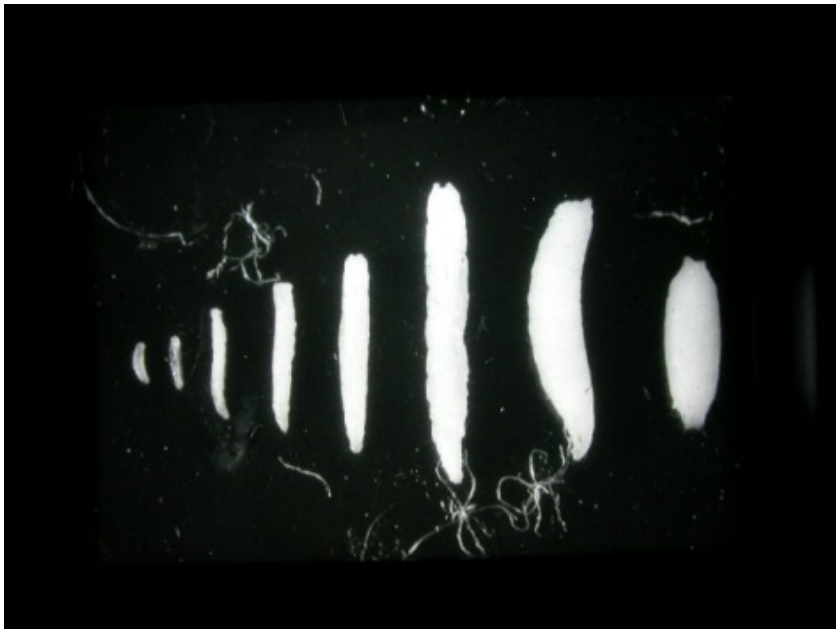
Some species :

- **In non-agriculture and forested areas**
- **Golf courses, lawn, landscaped areas**
- **Seeps and springs in mountains**
- **Summer rains bring out heavy populations in San Diego, Riverside, SB Counties, AZ , New Mexico and other SW USA**



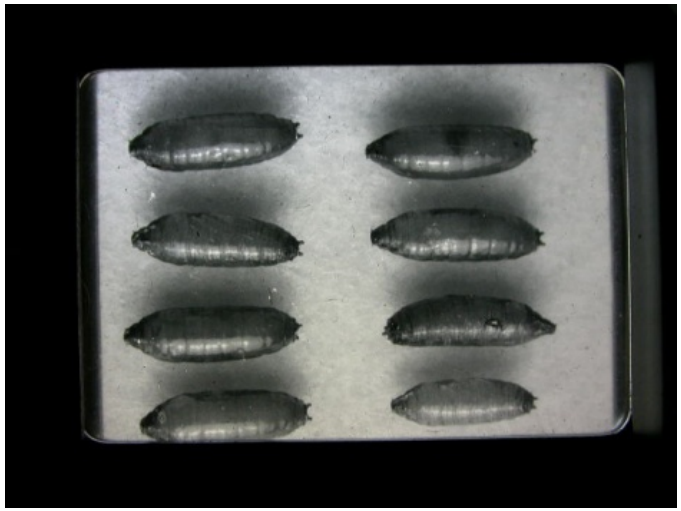
HIPPELATES COLLUSOR – Most important Life history

* Eggs laid on soil surface
* Incubation 2-4 days
* Larvae on hatching go down
* Larvae feed on organic matter-plant root exudates
* Larval period 5-10 days



HIPPELATES COLLUSOR – Most important Life history

* Pupate near surface of soil
* Pupal period 3-10 days, longer in cool
* Adults emerge, disperse 3-4 miles
* Adults live 3-4 wks, female lays 200- 400 eggs
* Adults anthropophilic & zoophilic
* Only females attracted and feed on hosts



HIPPELATES EYE GNATS
Public health importance

* Annoyance
* Feed on eyes, ears and other body openings
* Feed on sweat, and wounds and blood
* Feed and crawl on skin
* Feed voraciously on scratches and wounds
* Specific to body part
* Do not have piercing mouth parts


HIPPELATES EYE GNATS
Economic and Public Health Importance

* Labor efficiency decreased
* Economic development impacted
* In CV, only 6 golf courses in 1960, today > 125
* Golf and country club use and recreation impaired
* Farm workers walk away and not willing to work under heavy eye gnats annoyance
* To prevent eye gnats from entering eyes, ears & nose, workers wave their hands frequently

HIPPELATES EYE GNATS : Disease involvement

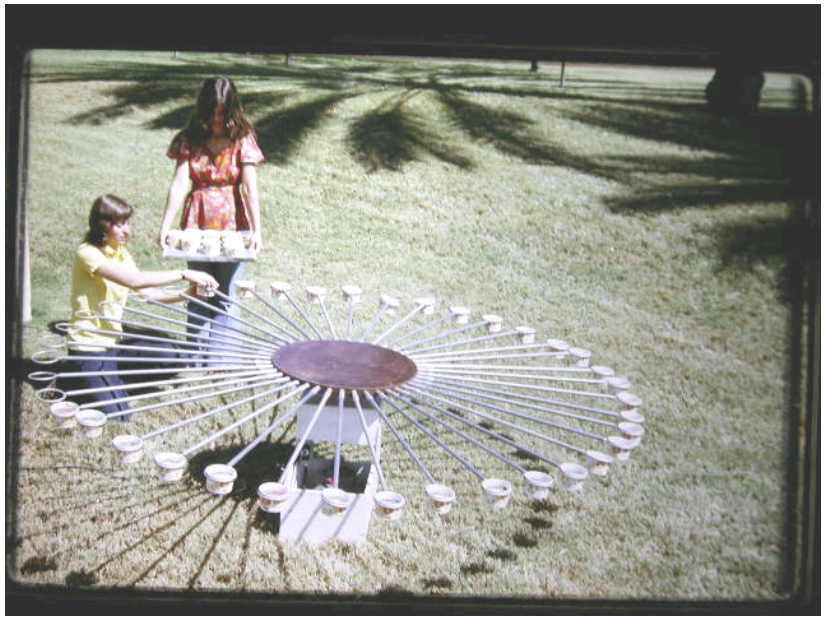
* Mastitis in bovines
* Mal del pinto (*Treponerma* sp.)
* Conjunctivitis (pink eye),
  Haemophilis aegyptius, and *H. influenzae*
* Streptococcal infection (acute nephritis)
* Yaws or tropical ulcer (*Treponema* sp.)
* Staph infections
* Purpuric fever- children in Brazil, kill 3-12 months
  in 3-12 hrs, *H. aegyptius*

PINK EYE

CONTROL TACTICS

Tillage crops

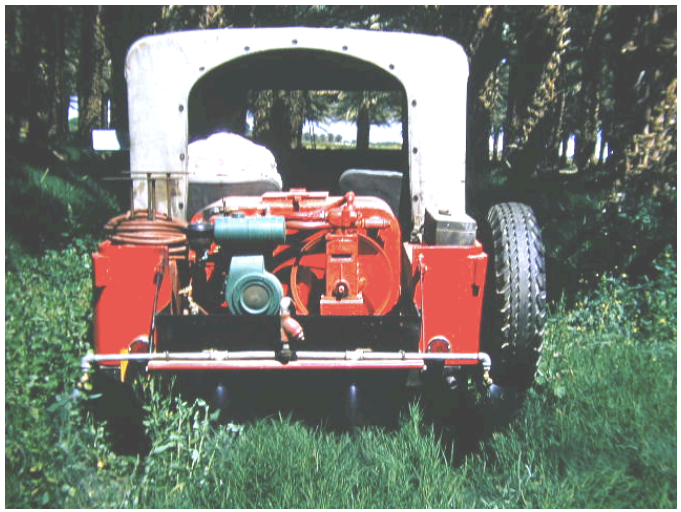
* Non-cultivation
* Increase interval between irrigation and disking
* Attractant + Toxicants (limited success)
* Trapping / baits – localized success



CONTROL TACTICS

Perennial crops

* Residual insecticides in soil. Resistance prevalent, very fast
* Herbicidal oil a day or several days before disking
* Herbicidal oils 20-30 gal / acre soon after disking
* Mowing of cover crops & weeds (do not disk)
* Insecticides / adult eye gnats (limited success)



Eye gnats – JACUMBA, San Diego County

Eye gnat problem different than ;

Coachella Valley , Borrego Valley, Pauma Valley
San Diegieto flood Pl, Yuma in AZ
Unique farming practices
Control tactics effective in other areas
not practical in Jacumba

More research needed on :

- Eye gnat ecology and behavior
- Alternative and novel control strategies
- Manipulation of crop management tactics

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