

Potential Impacts of Climate Change on the Entomofauna of the Florida Keys

Lawrence J. Hribar

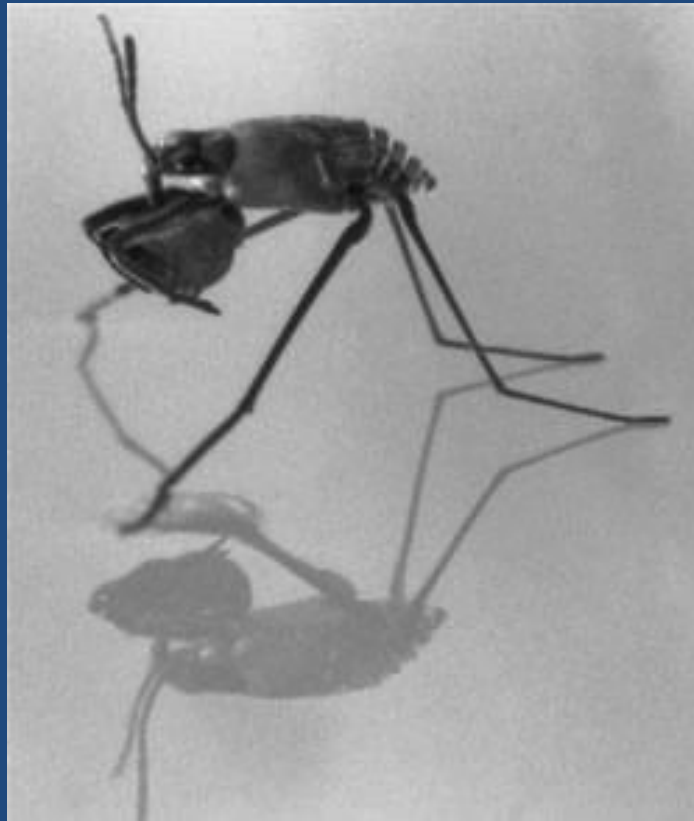
Senior Entomologist

Florida Keys Mosquito Control District



Are there any exclusively marine insects?

Heteroptera: Gerridae: *Halobates* spp.



Sea Level Rise

Flooding of Previously Unflooded Land

Coastal Northeast England

Epigeal Coleoptera

Increase in sea level may result in lower species diversity of Carabidae (Ground Beetles) but not Staphylinidae (Rove Beetles) or various phytophagous beetles

There were more Carabidae restricted to salt marshes, whereas the other beetles were not so restricted in habitat

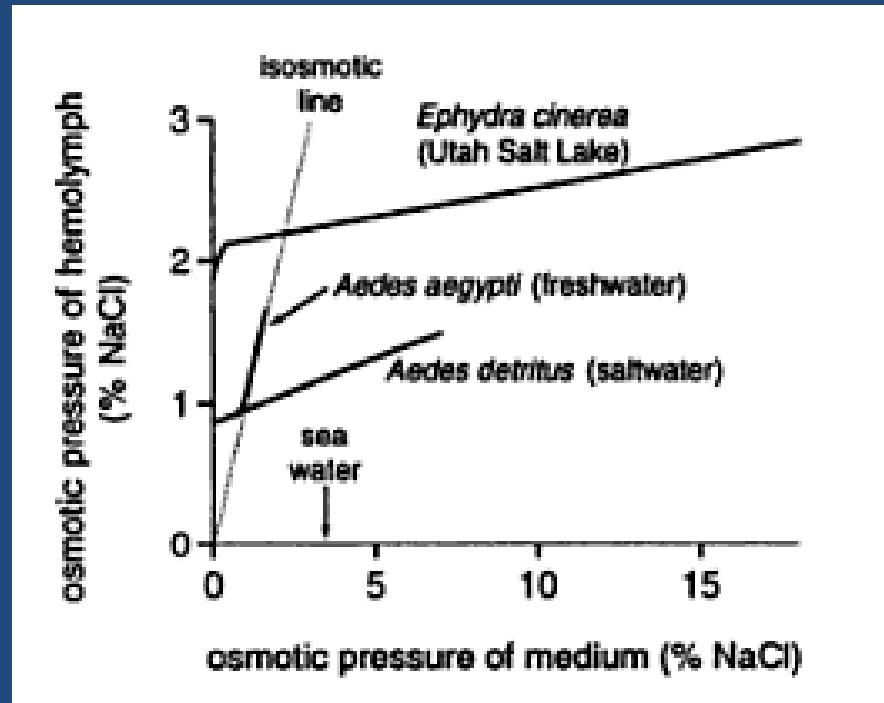
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- Habitat for *Deinocerites cancer*

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- Maybe the crabs will just move to higher ground

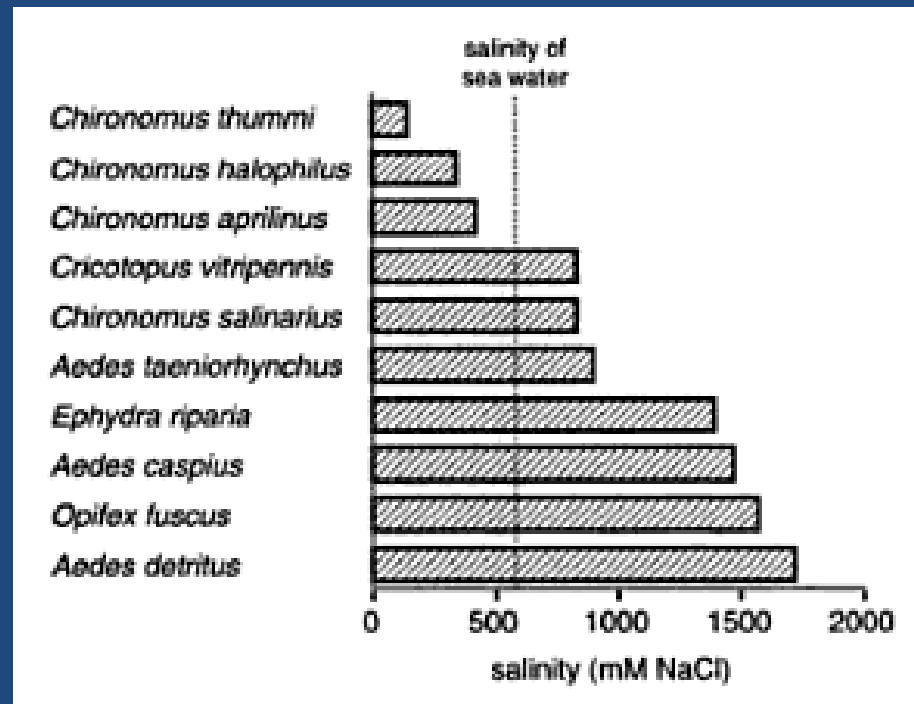
Increase of Salinity

Osmotic Regulation by Three Aquatic Dipterans



Experiments conducted in the 1930s (Wigglesworth) revealed that *Aedes aegypti* larvae die if salinity of larval medium is changed drastically, but can survive in 50% sea water if concentration is changed gradually.

Tolerance to Salinity for Various Aquatic Diptera



Increase in Temperature

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- *Bactrocera oleae* (olive fruit fly) is being “decoupled” from fruiting of olive trees
- *Leptinotarsa decimlineata* (Colorado potato beetle) is slowly recoupling with potato plants – possibly resulting in longer feeding period and thus more severe damage

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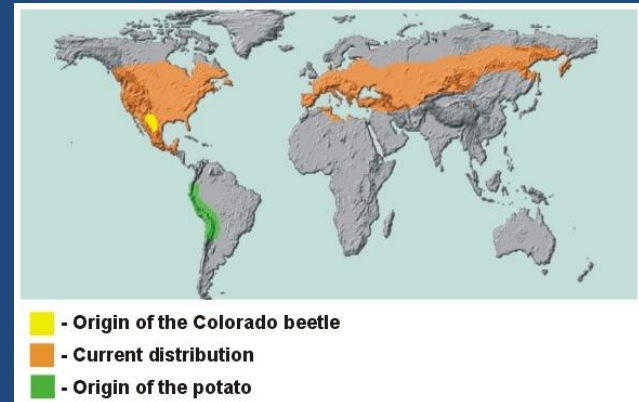
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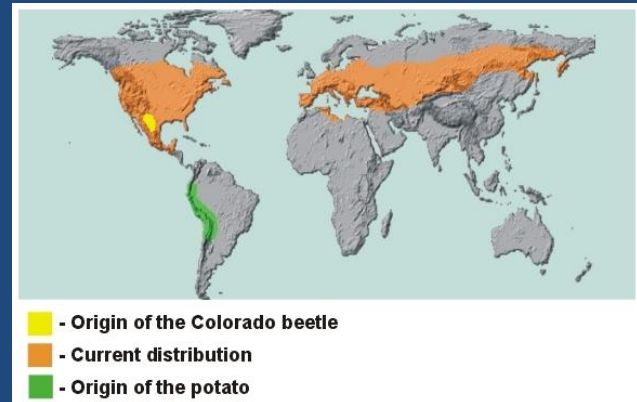
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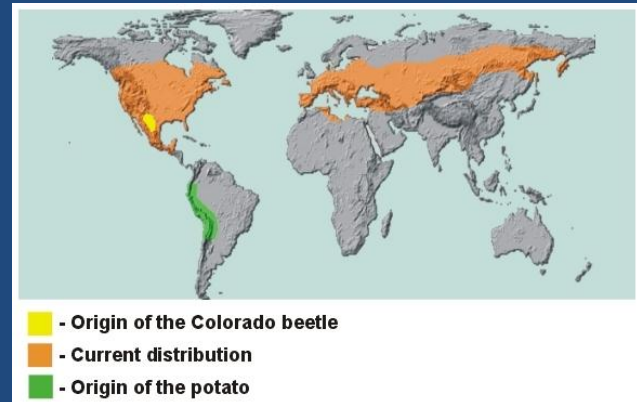
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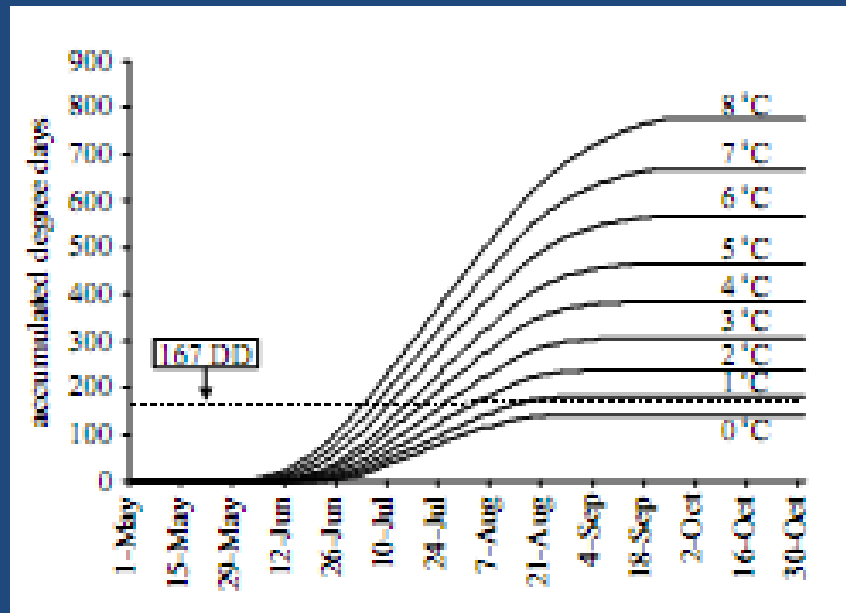
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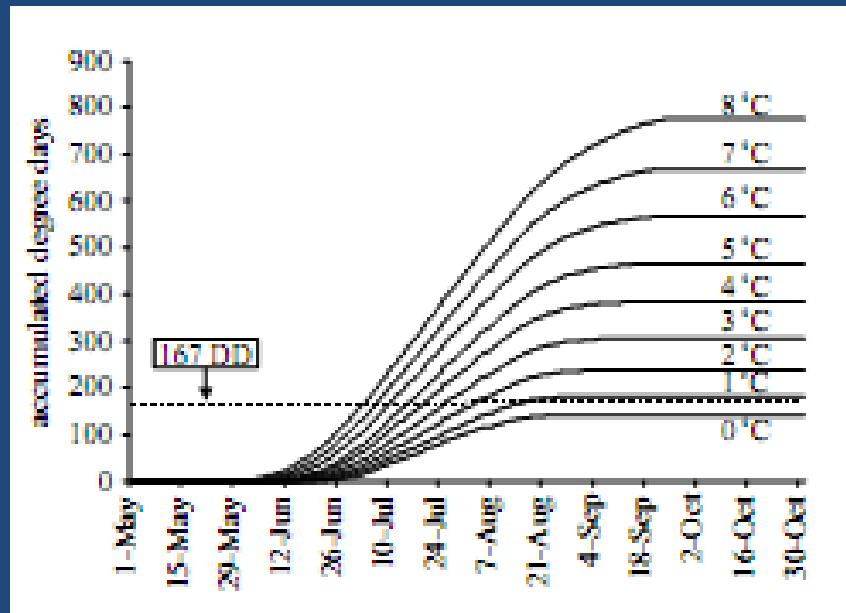
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Why? Slug intermediate host!

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- Tick distribution predicted to expand north

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- Implies little or no change in global distribution of malaria.

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- *An. gambiae s.s.*

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- Calliphoridae, Drosophilidae, Muscidae, Phoridae, Sarcophagidae

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- Northward and southward changes seen for European butterflies
- European species, *Araschnia levana* (Nymphalidae), is expanding in all directions
- Is the southern expansion climate-mediated or is something else going on?

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- In this case a change in forestry practices likely accounts for the disappearance

Decrease in Temperature

With a decrease in temperature:

More cold-induced mortality of insects, to include pests and disease vectors (with the possible exceptions of lice and fleas)

Cold stress may result in loss of host plants, with related loss of insect species

Increase in Number and Severity of Storms

Winds and Rain

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- Most likely due to survival of larvae and pupae, oftentimes in protected locations

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- Very rarely collected now

Mortality of Host Plants

- Storm-induced mortality of hardwood trees has resulted in outbreaks of wood-destroying beetles and termites

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- Obligate herbivores and phytoparasites lose food sources

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- More frequent storms may result in more host plant growth

The Problem With The Problem

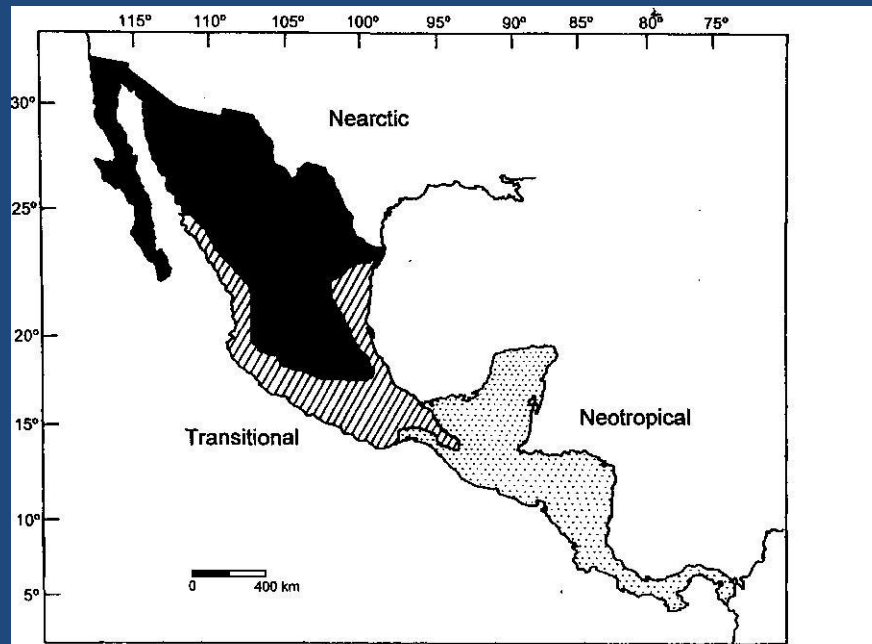
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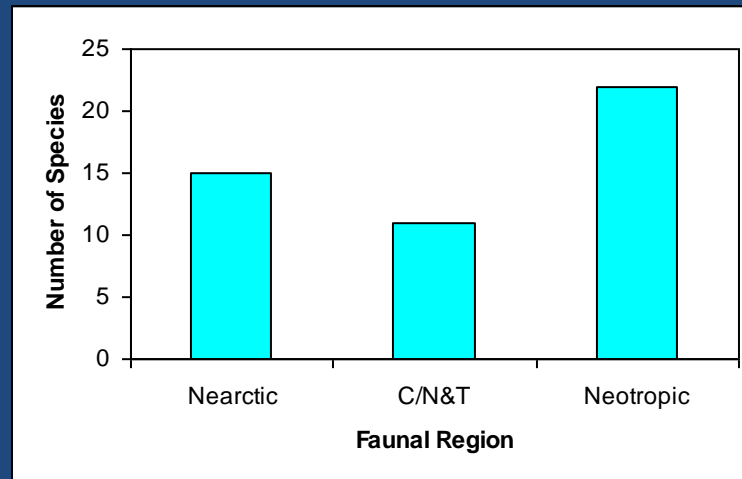


3.—Biogeographic zones in Middle America determined by distributions of bats.

The Problem With The Problem

- Are the Florida Keys a transitional zone?
- Mosquito fauna
- 48 species recorded
- Assigned to one of three groups:
- Cosmopolitan or Nearctic/Neotropical
- Nearctic
- Neotropical

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The Problem With The Problem

Recent records of Neotropical species
in the Florida Keys

Culicidae	Mycetophilidae
Ceratopogonidae	Phoridae
Chironomidae	Reduviidae
Cecidomyiidae	Lepidoptera
Scatopsidae	Copepoda
Sciaridae	Millipedes

The Problem With The Problem

Recent records of Nearctic species
in the Florida Keys

Bibionidae

Cecidomyiidae

Ceratopogonidae

Culicidae

Muscidae

Psychodidae

Tabanidae

Lepidoptera

Copepoda

The Problem With The Problem

Recent records of Neotropical and
Nearctic species in the Florida Keys

Are these new introductions, range
expansions (for whatever reason), or
were they always here and no one
was looking for them?

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We don't know enough to say with any certainty what that effect will be