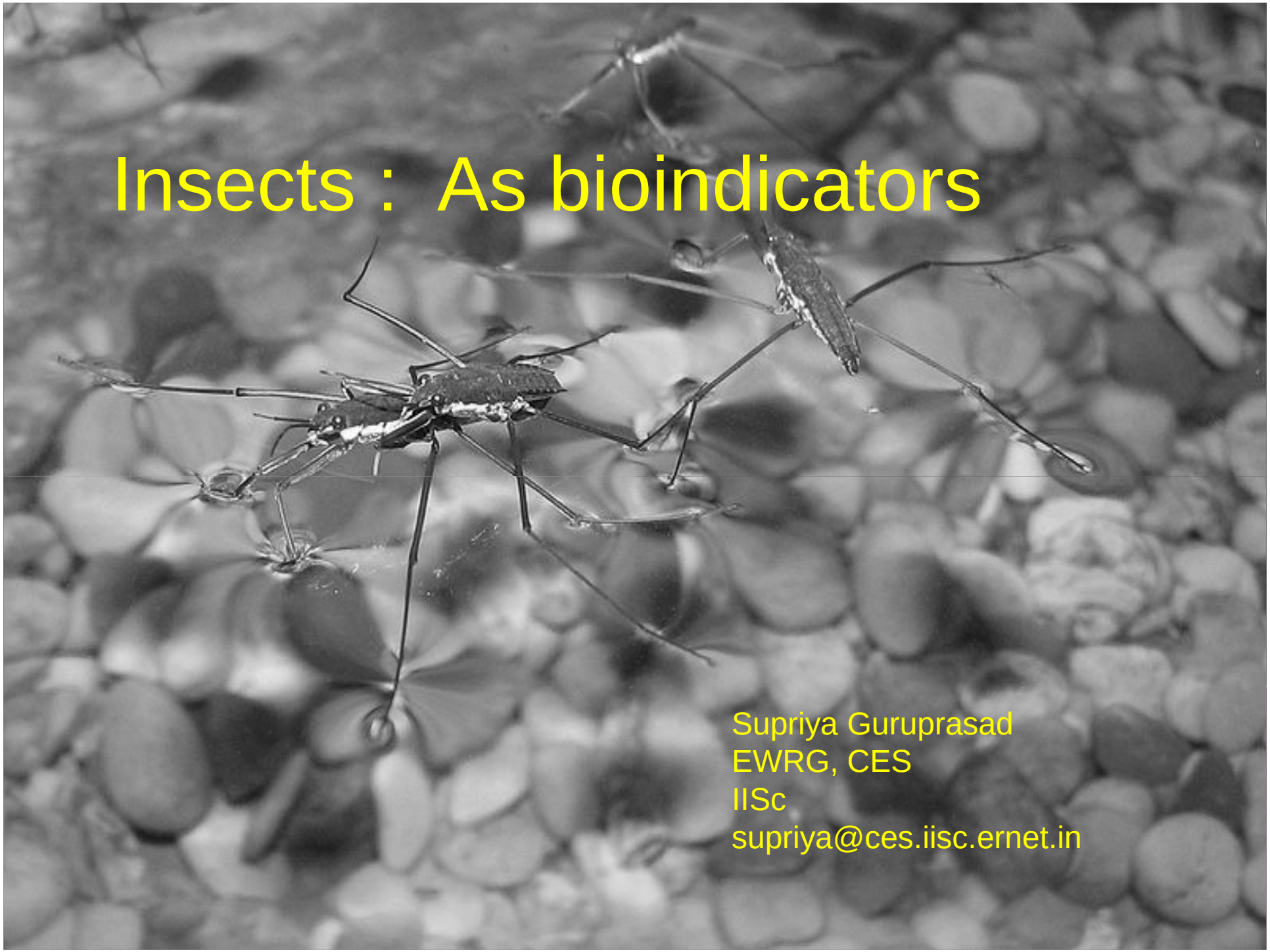
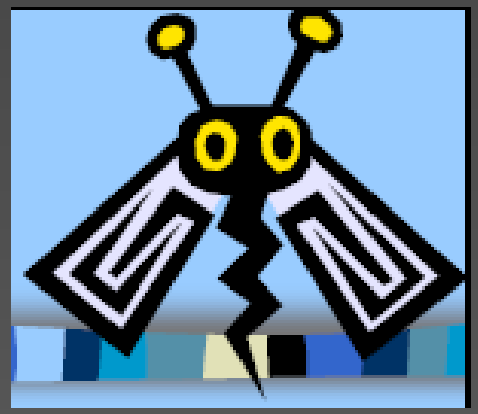


Insects : As bioindicators

Supriya Guruprasad
EWRG, CES
IISc
supriya@ces.iisc.ernet.in



What are insects?

- Insects are the most species-rich form of animal life on Earth due to their ability to adapt
  - Morphologically and
  - Behaviorally to specific environments
- It is estimated that there are 1.5 million to 30 million around the world.

Classification

Kingdom : **ANIMAL**

Phylum: **ARTHROPODA**

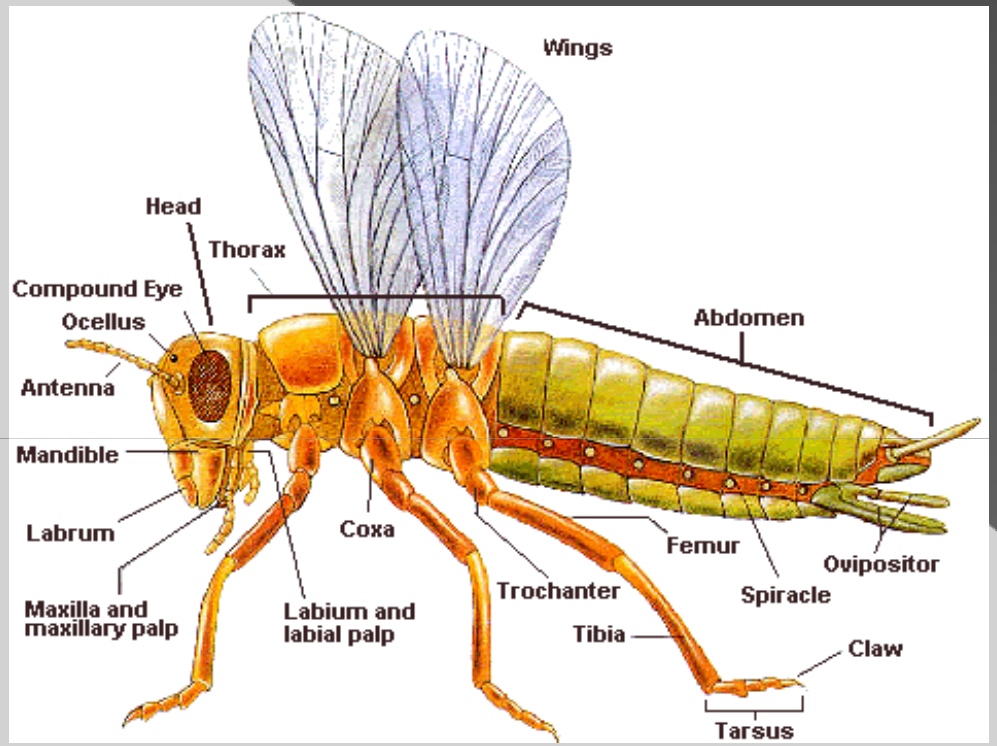
Class: **INSECTA**

- Generally sub divided into 29 orders

ORDER	COMMON NAME
1. Thysanura	Bristletails
2. Diplura	Two-pronged Bristletails
3. Protura	-
4. Collembola	Springtails
5. Ephemeroptera	Mayflies
6. Odonata	Dragonflies
7. Plecoptera	Stoneflies
8. Grylloblattodea	-
9. Orthoptera	Crickets, Grasshoppers and Locusts
10. Phasmida	Stick and Leaf Insects
11. Dermaptera	Earwigs
12. Embioptera	Web-spinners
13. Dictyoptera	Cockroaches and Mantids
14. Isoptera	Termites
15. Zoraptera	-

ORDER	COMMON NAME
16. Psocoptera	Psocids or Booklice
17. Mallophaga	Biting Lice
18. Siphunculata (= Anoplura)	Sucking Lice
19. Hemiptera	True Bugs
20. Thysanoptera	Thrips
21. Neuroptera	Alder Flies, Snake Flies and Lacewings
22. Coleoptera	Beetles
23. Strepsiptera	Stylopids
24. Mecoptera	Scorpion Flies
25. Siphonaptera	Fleas
26. Diptera	True Flies
27. Lepidoptera	Butterflies and Moths
28. Trichoptera	Caddis Flies
29. Hymenoptera	Bees, Wasps and Ants

External Anatomy



Three major body regions:

- Six legs
- One pair of Antennae
- Usually two pairs of wings

What is biomonitoring?

"Since water pollution is essentially a biological problem, making chemical measurements will be like taking snapshots of the ecosystem, whereas biological measurements will be like taking a videotape"

Why insects as a bioindicator?

(1) common, diverse and abundant groups

(2) ubiquitous incidence favors comparative studies

(3) life cycles in wetlands

(4) taxonomy is well studied

(5) stationary nature help to determine the result of pollution

(6) react with a range of sensitivities to numerous kinds of stressors

(7) crucially important for the overall functioning of wetland ecosystems

(8) routine monitoring can be relatively inexpensive

Parameters that affect Aquatic insects

- Change in pH level
- Change in Dissolved oxygen level in lakes
- Phosphates and nitrates content

Morphological Adaptations to Aquatic Environment

Burrowers:

- Broadened fore legs
- Shovel-like head processes

Floaters:

- Buoyancy organs
- Swallow air bubbles

Swimmers:

- Often green if cling onto vegetation

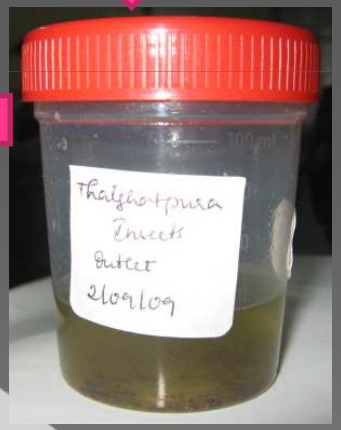
Sprawlers:

- Camouflage using sediments in setae


Bird
(tertiary and quaternary consumer)
Bird
(secondary consumer)
Grass (producer)
Snake
(tertiary consumer)
Bird
(secondary and tertiary consumer)
Cricket
(primary consumer)
Frog
(secondary consumer)
Large fish
(tertiary consumer)
Duck
(secondary consumer)
Diatoms
(producers)
Snail
(primary consumer)
Algae
(producer)
Small fish
(secondary consumer)
Decomposing cordgrass
Zooplankton
(primary consumers)
Bacteria
(decomposers)

Methodology and Preservation

(P.J. Gullan and P.S. Cranston, The Insects: An Outline of Entomology, © 2005, Blackwell Publishing Ltd)


Thaltej-tpura
Insects
Butter
21/09/09

Analysis

- Identification of the segregated sample under a stereo-zoom microscope.
- Carrying out the required statistical analysis as per your objective.

A case study: Bangalore lake

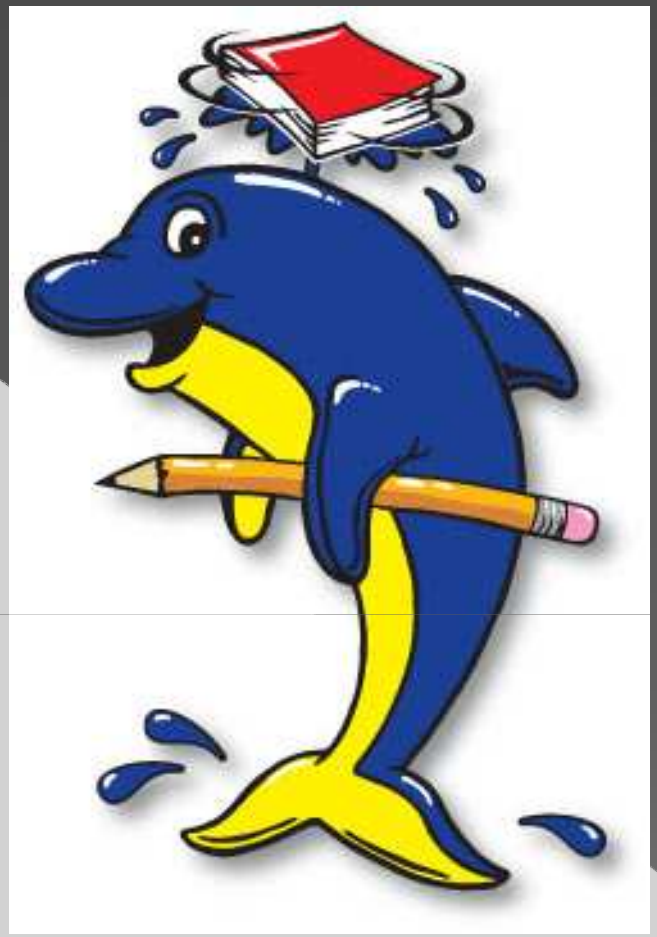
Physico – chemical parameters

	Malathahalli
pH	9.98
DO(mg/l)	9.04
Nitrates(mg/l)	0.07
Phosphates(mg/l)	0.08

Order	Abundance
Hemiptera 1	289
Hemiptera 2	1
Hemiptera 3	1
Diptera	1
Hemiptera 4	4
Odonata 1	12
Odonata 2	1
Hemiptera 5	1
Odonata 3	2
Coleoptera	6

Conclusion

- Dominant insect order - Hemiptera
- Tolerate wide ranges of pH and DO. Life doesn't depend entirely on water quality. Some remain under water.



Thank you

supriya@ces.iisc.ernet.in