

Omkar *Editor*

Mosquitoes

Biology, Pathogenicity and
Management

 Springer



Mosquito Morphology: Anatomy to Adaptation in the Shadow of Evolution

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Abstract

Mosquitoes are critical to public health, because they often transmit various deadly diseases. Among a well-diverse mosquito population, some of them cause severe health risks, which may sometime turn into fatality. As a result, numerous strategies are used to manage and limit their populations worldwide. However, it is noteworthy that they can exhibit highly distinctive adaptive morphological modifications to cope with new environmental conditions and crises. In this context, understanding the morphological diversity and adaptability of morpho-organs becomes essential for developing successful management techniques of these tiny terrors. The present chapter addresses mosquitoes' structural variations and modifications, including the intricate sensory organs, such as antennae and compound eyes, and the changes in morphological features in the head, thorax, and abdomen. It discusses the differences between species in head structure, thoracic shape, abdominal changes, and appendicular articulation, such as the number, color, and arrangement of sensory hairs, bristles, setae, and papillae. The structural complexity of the compound eyes to day-night vision, the antennary Johnston's organ, and its chemosensitive and mechanosensitive functions, as well as the variations and modifications of the respiratory siphon, comb scales, feeding apparatus, and proboscis, are all compared among several mosquito species. The scales over their body, particularly on the legs, exhibit unique differences in appearance and hues among the species. In addition, the color, shape, and structure of their wings and the number and arrangement of wing veins are also highly unique among the species. All these characteristics play critical roles in distinguishing species for taxonomic purpose and cladistic analysis. Mosquito morphologies and their evolution in medically important species are therefore essential for developing and implementing effective vector control strategies.

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