Chapter 6

Significant Findings & Conclusion

- This research work was on species diversity, abundance, seasonal variation, nectar plant preference and the co-evolutionary relationship between butterflies and plants in Champaner-Pavagadh Archaeological Park, a UNESCO recognized world heritage site.
- Champaner-Pavagadh Archaeological Park is a healthy ecosystem having varied habitats such as Forest area, Agricultural fields, Garden area and concrete structures and thus provides a healthy environment for the growth and development of different stages of butterflies.
- The occurrence status of butterfly species is associated with the availability of host plants and their flowering season (Table 5 and Table11).
- Flora of Pavagadh has been studied by the Department of Botany, The M.S.University of Baroda and flora of Pavagadh has also been extensively listed by in the Working plan of the Forest Department Godhra (2008) (Annexures I&II) and a separate list of host plants of butterflies have also been identified by us in this work (Table 12).
- A gradual increase in the number of species was observed in monsoon season June, July and August to post-monsoon i.e., September, October and November.
- There were some butterfly species present throughout the year (Table 6) because the preferred nectar plants by them used to bear flowers throughout the year for example *Lantana camara* (Lantana) and *Tridax procumbens*.
- During the study period, a total of 63 butterfly species were identified belonging to 48 genera and 5 families (Table 6).
- Amongst 63 species, 06 species were Papilionids, 26 species were Nymphalids, 13 species were Pierids, 14 were Lycaenids and 4 were Hesperiids.
- Family Nymphalidae showed the highest number of butterfly species, followed by Lycaenidae and Pieridae while Family Hesperiidae showed least diversity of butterfly species.
- Depending on the availability of butterfly species they become common, uncommon or rare.

- *Lantana camara* was found to be the most preferred nectar plant by wide range of butterflies (Table 12&13). The diversity and abundance of butterflies were maximum in Forest area followed by Scrubland and Garden area.
- The foraging strategy of butterflies was positively correlated with their preferred nectar plants because the selection of flowers strongly favored shape of corolla (tubular), corolla length, texture, color of corolla and frequency of flower visits. For example, the frequency of flower visits was more on *Lantana camara* by *Danaus chrysippus* (Plain Tiger) that is 16 times per hour, but the same species was visited on *Wedelia trilobata* 6 times per hour. *Graphium agamemnon* (Tailed Jay) visited *Catharanthus roseus* 8 times per hour but visited *Ixora coccinea* only 2 times per hour (Table 13).
- The study reveal that the floral morphology and the structure of butterfly proboscis are correlated which lead to the existence of the co-evolutionary relationship with their pollinators. They often prefer bright colored flowers with tubular corolla. The visits were more on flowers of *Lantana camara* (red colour) *Sida acuta* (yellow colour) and *Tridax procumbens* (pink colour) Catharanthus *roseus* (white colour) flowers. If we plot a graph between the depth of flowers and the length of proboscis of butterflies, there was a positive correlation. The result of the correlational study shows that the length of corolla and length of proboscis are correlated. Butterflies with shorter proboscis restrict their visits to flowers with deep corolla.

Family	Preferred Nectar Plant	Scientific Name of Butterfly	Common Name of Butterfly
Papilionidae	*Lantana camara* (Lantana)	*Graphium doson* C. & R. Felder, 1864	Common Jay
		Graphium agamemnon Linnaeus, 1758	Tailed Jay
		Pachliopta aristolochiae Fabricius, 1775	Common Rose
		Papilio polytes Linnaeus, 1758	Common Mormon
		Papilio demoleus Linnaeus, 1758	Lime Swallowtail
	Ixora coccinea (Ixora)	*Graphium doson* C. & R. Felder, 1864	Common Jay
		Pachliopta aristolochiae Fabricius, 1775	Common Rose
		Papilio demoleus Linnaeus, 1758	Lime Swallowtail
	Catharanthus roseus (Periwinkle)	*Papilio demoleus* Linnaeus, 1758	Lime Swallowtail
Nymphalidae	*Lantana camara* (Lantana)	*Danaus chrysippus* Linnaeus, 1758	Plain Tiger
		Hypolimnas misippus Linnaeus, 1764	Danaid Eggfly
		Danaus genutia Cramer, 1779	Striped Tiger
		Tirumala limniace Cramer, 1775	Blue Tiger
		Junonia lemonias Linnaeus, 1758	Lemon Pansy

	Chromolaena odorata (Siam Weed)	*Danaus chrysippus* Linnaeus, 1758	Plain Tiger
		Hypolimnas misippus Linnaeus, 1764	Danaid Eggfly
	Lantana camara (Lantana)	*Catopsilia pomona* Fabricius, 1775	Common Emigrant
		Catopsilia pyranthe Linnaeus,1758	Mottled Emigrant
		Delias eucharis Drury, 1773	Common Jezebel
	Chromolaena odorata (Siam Weed)	*Catopsilia pomona* Fabricius, 1775	Common Emigrant
		Catopsilia pyranthe Linnaeus,1758	Mottled Emigrant
	Tridax procumbens (Coat Buttons)	*Eurema hecabe* Linnaeus, 1758	Common Grass Yellow
		Eurema brigitta Stoll, 1780	Small Grass Yellow
Lycaenidae (Monsoon and Post monsoon)	*Tephrosia purpurea* (Wild Indigo) *Sida acuta* (Common Wireweed) *Emilia sonchifolia* (Purple Sow Thistle) *Sida rhombifolia* (Cuban Jute)	*Chilades lajus* Stoll, 1780	Lime Blue
		Zizina otis Fabricius, 1787	Lesser Grass Blue
		Zizula hylax Fabricius, 1775	Tiny Grass Blue
		Freyeria trochylus Freyer, 1845	Grass Jewel
		Zizeeria karsandra Moore, 1865	Dark Grass Blue

Table14: Butterflies and their Preferred Nectar Plants from Pavagadh (some examples)

CONCLUSION

The butterfly fauna depends mainly on the floristic elements, humidity, rainfall, and temperature. Type of vegetation determines the survival of the organisms. Butterflies are highly sensitive to changes in the environment. Plantation of the right flora in any habitat invites a large number of butterflies throughout the year. It is highly recommended that the public garden on the foothill of Pavagadh can be uplifted to a Butterfly Park by planting more nectar host plants as well as other larval host plants which promote the survival of different developmental stages of butterflies.