6. Summary

6.1. Altogether, 115 butterfly species which belong to 76 genera and five families viz., Hesperiidae, Lycaenidae, Nymphalidae, Papilionidae and Pieridae were recorded. Of all, Nymphalidae family members were more compared to others.

6.2. Around 66.1% butterfly species were abundantly distributed at different parts of Chamarajanagar District. Only 22.6% butterfly species were common in their occurrence. However, 11.3% butterfly species were rarely occurred in this part of the State.

6.3. During rainy season butterflies were more (101 species) it was followed by winter (99 species) and little less (63 species) during summer season at different taluks. However, there was a considerable variation existed between members of butterfly species which belong to different families.

6.4. Around 16 species such as Anthene lycaenina, Appias albina, Borbo cinnara, Castalius rosimon, Euchrysops cnejus, Euthalia aconthea, Euploea core, Euthalia aconthea, Eurema andersoni, Hypolimnas misippus, Lampides boeticu, Melanitis zitenius, Pachilopta hector, Pareronia valeria, Rathinda amor and Tajuria cippus were protected species as per Indian Wildlife (Protection) Act, 1972.

6.5 Mycakesis visala, Triodes minos and Delias eucharis species are endemic to peninsular India and Western Ghats, which were recorded at different agricultural ecosystems in this part of the State.

6.6. Negative correlation existed between temperature and butterfly species richness. But, the relative humidity and annual rainfall have shown positive correlation during rainy season.

6.7. The Shannon Diversity Index indicated the rich diversity of butterflies at different agricultural ecosystems, but different butterfly families were evenly distributed at various taluks.
6.8. H\textsuperscript{1} index was highest during winter season and ranges between 4.18- 4.30. It was followed by 4.08 to 4.20 during rainy season, and 3.72 to 3.84 during summer season.

6.9. Further, Shannon Evenness index ('J\textsuperscript{1}') was ranged between 0.94 to 0.98 and 0.91 to 0.93 in rainy season, and it was 0.93 to 0.95 during summer season. The Sorensen's index was 0.46 between Chamarajanagar- Yellandur, Yellandur-Kollegala and Gundlupet- Chamarajanagar taluks where, it was 0.43 similarity existed between Kollegala - Gundlupet taluks.

6.10. The *Euploea core*, *E. sylvestor*, *Tirumala limnace* and *T. septentrionis* were exhibited migratory activity. These species showed bi-directional migration and travelled towards north-east to south-west during March-April and September, October and November during 2013 and 2014.

6.11. The life cycle of *Papilio polytes* was completed in between 32 to 43 days. The egg stage completed in three to four days, larval stage in 14-19 days, pupal stage in 14 to 18 days. *Graphium agamemnon* has completed its life cycle within 30-28 days. The duration of different stages as follows: The egg stage in 3-4 days, larval stage in 14-19 days and 13-15 days in pupal stage. The *Ariadne merione* has completed its life cycle within 22-28 days. It has taken to complete egg stage in 2-3 days, 13-18 days in larval stages and 5-7 days in pupal stage. The *Junonia hierta* completed its life cycle within 19-28 days, with 3 days in egg stage, 12-19 days in larval stages and 4-6 days in pupal stage.

6.12. Fourteen plant species were recorded as larval host plants. Among the studied butterfly species *Papilio polytes* preferred *Aegle marmelos*, *Citrus aurantifolia*, *C. grandis*, *C. limon*, *Murraya koenigii* and *Zanthoxylum rhetsa* during its larval period. The *Graphium agamemnon* preferred *Annona reticulate*, *A. squamosa*, *Polyalthia longifolia* and *Michelia champaca* plant species during its larval stage. The *Junonia hierta* preferred *B. prionitis*, *B. involucrata* and *B. prionitis* during its larval period. The *Ariadne merione* preferred only *Ricinus communis* plant species during its larval period.
6.13. Altogether, 86 flowering plants which belong to 27 plant families with different flower colour were preferred as nectar source, of which weed plants with yellow coloured inflorescences were preferred more and it was followed by white and pink coloured flowers. Flower preference by butterfly species didn’t show any significant variation during different seasons.

6.14. Shrubs and herbs grown amidst non-cultivated land were more preferred by these butterfly species for oviposition. Thus, non-cultivable lands have provided suitable breeding ground for certain butterfly species.

6.15. Floral calendar was prepared for butterfly species. The nectar source availability during different seasons was normal at agricultural ecosystems.

6.16. Correlation studies between environmental conditions viz., temperature (Maximum, Minimum and Average), relative humidity (Maximum, Minimum and Average) and annual rainfall with number of eggs laid by each butterfly species during different seasons showed positive correlation with relative humidity and annual rainfall but, negatively correlated with temperature.

6.17. Butterflies died due to pesticide poisoning were recorded at different crop fields and indicated the adult butterfly’s death. However, few butterfly species belong to Hesperiidae, Lycaenidae and Nymphalidae family were completely absent amidst agriculture fields after the spray of pesticides. This clearly indicated that these species are facing highest problem due to pesticide poisoning of their food plants in agriculture ecosystems.

6.18. The Hesperiidae family members (e.g. Spialia galba, Suastus gremius, Telicota ancilla) Lycaenidae (e.g. Edales pandava, Prosotas nora, Zizeeria otis and Zizula gaika) and Nymphalidae (e.g. Melanitis leda, Ypthima asterope) and Pieridae (e.g. Eurema blanda, Eurema brigitta and Leptosia nina) are very sensitive to pesticides which were used against pests in agricultural ecosystems.

6.19. Altogether, 41 butterfly species which belong to Lycaenidae, Nymphalidae, Papilionidae and Pieridae families were recorded in road mortality at NHs and
SHs due to Car, Scooter, Bus and Lorry vehicular traffic. However, there was no significant variation existed between death of butterflies and different vehicles at NHs and SHs.

6.20. *Tirumala septentrionis* (Dark Blue Tiger) and *Euploea* species (*Euploea core* and *Euploea sylvester*) showed migratory activity. During their migration they are facing difficulty while flying enroute on their migratory path due to NHs and SHs passing amidst agriculture ecosystems.

6.21. Comparatively, male butterflies died more than females and showed a significant variation at different road ways in Chamarajanagar District.

6.22. The pupa of *Catopsilia pyranthe, Graphium agamemnon, G. doson, Danaus chrysippus, Pachilopta aristolochiae, Papilio polytes* and *Euploea core* were infected with different pupal parasites. The *G. doson* and *Euploea core* were infested by an endo-parasite, *Brachymeria jambolana*. The *Telenomus* species infested the *P. polymnestor* eggs.