

5.0 Conclusion

Monitoring and observing changes in population levels of a wide range of species in biodiversity and conservation studies requires some practical, easy to use and efficient assessment (Simaika & Samways, 2011). Dragonflies are identified as a valuable tool for assessing aquatic systems (Schindler *et al.*, 2003) and known as indicators of ecological integrity, ecological health, and environment change by many authors such as Carle (1979), Clark & Samways (1996), Moore (1997), Von Ellenrieder (2000), Simaika & Samways (2008), Ott (2009) and others.

Thus, the results of diversity and distribution of odonates reported in this study are useful for various agencies in their monitoring services and conservation efforts. This is because the possible disappearance of certain species in the area may implicate habitat destruction, of which some of the causal factors as listed in the Malaysian Wetland Directory (1987) have been discussed previously. The understanding of ecology, habitat use and diversity of odonate communities in different land use types is very important in developing a bio monitoring technique.

The state of Selangor provides rich odonate fauna. Most of the species found in these habitats tend to adapt to the clean environment. The presence of Calopterygidae, Platycnemididae and Protoneuridae reflects such condition. The baseline inventory should be gathered together with the regular monitoring of changes in the odonate species richness and abundance to assess the ecological health of the area (Chelmick *et al.*, 1980; Clark & Samways, 1994). A focus on threatened odonate habitats and forest

streams is essential for long term conservation. They are very conspicuous insects and are important biological indicators for monitoring freshwater and wetland habitats.

Global changes and principally climate warming are likely to have various impacts on Odonata and this may lead to many of the species extending their geographical range. Thus, the presence or absence of certain species would mirror human activities surrounding the water habitats either as positive or negative impacts (Rith-Najarian, 1998; Sahlén, 1999).

“ A clear resolution of odonates higher relationships is needed to achieve a classification which reflects the phylogeny of the order, and to facilitate progress in evolutionary, ecological and biological studies, which rely on phylogenetic estimates for purposes such as modeling past relationships, making a distinction between the ecological correlation and co-inheritance of traits, and determining whether instances of apparent co-variation are statistically independent or historically linked”

(Trueman, 1996).

This is the reason of this study which realizes that a clear understanding of the relationships among the dragonflies and damselflies can have implications in the odonate biology. Dragonflies and damselflies have regularly been used in both fundamental and applied research. In many areas, reliable identification literature of dragonflies is available, so the species of dragonflies can be determined fairly easily by the layman.

In 1935, an author Tillyard stated that the Odonata *“stand as one of the best understood of all Orders of Insects”* (Tillyard, 1935). However, the wing venation may

not be an infallible and dependable character for delineating natural groups of Odonata although it has long been used by the odonate taxonomists. It is conceivable that the wing venation may be subjected to parallelism, variation or reversal, just like any other morphological character (Artiss *et al.*, 2001).

Thus, this must be supported by the molecular characters which here in this study were used mitochondrial gene-partial regions of *NADH dehydrogenase 1 (ND1)* and 16S rDNA as well as full sequence of intervening tRNA^{Leu} region to produce more comprehensive phylogeny of odonates. It is a powerful application of modern technology to the biodiversity study which also includes the aspects of ecological, morphological variation and differential speciation rates of odonates in Selangor.

It is suggested that in future studies, *ND1* DNA sequences can serve as a reference for DNA-based identification purposes, especially for the larvae identification. The finding of the DNA-based species characterization is a great and authoritative application of modern technology to biodiversity studies towards the identification of formerly defined groups of organisms at any taxonomic level.

Therefore, with all the reasons that make dragonflies as bio indicators, the diversity and distributions of odonates, as well as the solutions of odonates identification; it can also propose an effective and capable method for precise species with the great benefit companionable with traditional taxonomy in a broader context. However, to ensure the validity and confirmation of identification being extrapolated, a large sample size of Odonata of different species which cover wider geographical and ecological ranges is recommended.