

Original Research Article

<https://doi.org/10.20546/ijcmas.2019.806.052>

Diversity of Mymarid Fauna (Mymaridae: Chalcidoidea: Hymenoptera) in Different Agroecosystems of Tamil Nadu, India

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ABSTRACT

An extensive survey for the diversity of mymarid fauna, internal solitary egg parasitoid was conducted in different agroecosystems of Tamil Nadu, during August 2018 – April, 2019. A total number of 1901 mymarid specimens were collected by using yellow pan traps in different cropping ecosystems viz., mango, sapota, grapes, brinjal, red gram, cotton, coffee, medicinal plants, and marigold. The mymarids were identified upto generic level. Out of 38 genera (Manickavasagam and Athithya, 2018) reported in India so far, 20 genera have been described from this faunistic study *Acmopolynema* Oglobin, *Anagrus* Haliday, *Anaphes* Haliday, *Arescon* Walker, *Alaptus* Westwood, *Allanagrus* Noyes & Valentine, *Camptoptera* Forster, *Dicopomorpha* Oglobin, *Dicopus* Enoch, *Eofoersteria* Mathot, *Erythmelus* Enoch, *Gonatocerus* Nees, *Lymaenon* Walker, *Mymar* Curtis, *Narayanella* Subba Rao, *Omyomymar* Schauff, *Palaeoneura* Water house, *Polynema* Haliday, *Stephanocampta* Mathot and *Stethynium* Enoch. Among the mymarids, the most predominant genera was *Anagrus* Haliday and the least was *Stephanocampta* Mathot in this diversity study.

Keywords

Biodiversity,
Agroecosystems,
Mymaridae,
Egg parasitoid

Article Info

Accepted:

07 May 2019

Available Online:

10 June 2019

Introduction

The present study mainly focused on the diversity of mymarids in different agro ecological condition of Tamil Nadu. The mymarids are commonly known as fairy flies because of their small size, delicate and fringed wings. The body size generally range from 0.5 to 1.0mm. *Anaphes nitens* (Girault) (*Patasson nitens* Girault) recorded an effective egg parasitoid of the *Eucalyptus*

snout-beetle, *Gonipterus scutellatus* Gyllenhal, which is a serious pest of *Eucalyptus* in South Europe, South Africa, New Zealand and South America (Tooke, 1955). Apart from this, another species, *Anagrus armatus* (Ashmead) was also exploited to control the leafhopper, *Typhlocyba froggatti* Baker incidence which is a pest on apple (Dumbleton, 1934). *Anagrus optabilis* used for the control of sugarcane leaf hopper, *Perkinsiella*

saccharicida (Perkins, 1905). *Anagrus* is the most promising, because it can parasitize a wide range of hosts and extremely important in paddy fields, where they parasitize eggs of rice leaf hoppers and plant hoppers. In recent years mymarids have drawn attention as biological control agents, due to their ability to parasitize wide range of hosts. Therefore before exploitation of these agents for biocontrol, there is a need to generate information on their biodiversity. Hence this work was aimed to investigate the biodiversity of mymarid fauna in major districts of Tamil Nadu. The main objective of this research is to collect, identify and estimate diversity, generic richness and evenness of major agroclimatic zones of Tamil Nadu.

Materials and Methods

The collection of parasitoids was accomplished by setting up yellow pan traps (Noyes, 1982). The traps were set up randomly for effective collection of mymarid wasps. The yellow pan trap consisted a depth of about 60-75 mm and 30 cm square and painted with bright yellow colour inside. The trap was sunk into the ground, or simply laid on the surface and arranged in batches of an 80 numbers in a variety of suitable habitats/ecosystems such as grassland, agricultural land and horticulture ecosystem, a forest clearing, and wastelands or even on forest leaf litter. The traps were filled with saturated sodium chloride solution and to break the surface tension a few drops of detergent were added, so that the trapped insects immerse completely. These traps were emptied for every 36-48 hrs by filtering through double layered coffee strainer or the content of trap is washed through a piece of fine muslin cloth of about 10-15 cm diameter kitchen sieve. Then the collected specimens were washed in running tap water for removing the traces of detergents. The

samples were separated carefully recovered for examination/ detailed observation under binocular stereo zoom microscope for taxonomic details.

Identification

The mymarid parasitoids thus collected were identified up to generic level by the use of available literatures and keys provided by Annecke and Doutt (1961) for World genera, Subba Rao and Hayat (1983) for Oriental genera, Noyes and Valentine (1989) for New Zealand genera and Lin *et al.*, (2007) for Australian genera.

Measurement of diversity

Alpha diversity is used which is the diversity of genera within a community or habitat.

Shannon- wiener diversity index (1949)

Diversity index, $H = - \sum P_i \ln P_i$

Where $P_i = S/ N$

S = number of individuals of one family

N = total number of all individuals in the sample

ln = logarithm to base e

Measurement of generic richness

Margalef's index was used as a simple measure of generic richness (Margalef, 1958)

Margalef's index = $(S - 1) / \ln N$

S = total number of genera

N = total number of individuals in the sample

ln = Natural logarithm

Measurement of evenness

For calculating the evenness of genera, the Pielou's evenness index(e) was used (Pielou, 1966).

$$e = H / \ln S$$

where,

H = Shannon – weiner diversity index
 S = total number of genera in the sample

Results and Discussion

During this study, a total of 1901 mymarids belonging to 20 genera were collected by using yellow pan traps in major agroclimatic zones of Tamil Nadu (Table 1) which indicates the diversity indices of fairy flies of various locations of Tamil Nadu. Dindigul

(Coffee ecosystem) had the highest diversity index of 2.4080 while Ramnad (Field ecosystem) shows the lowest value of 1.8529.

The biodiversity (Shannon Weiner diversity index, Generic richness, Generic evenness) of fairy flies is rich in Dindigul followed by Salem, Theni, Madurai, Virudhunagar, Thirunelveli, Trichy, Pudukottai, Ramnad and Sivagangai is mainly due to the rich vegetation in that ecosystem. Vegetation plays an important role for the availability of mymarid fauna (Egg parasitoid) in a community as it plays a vital role in providing main source of food etc., for insects.

Table.1 Biodiversity indices of Mymaridae

Locations Surveyed	Shannon wiener index	Generic richness	Generic Evenness
Dindigul	2.40808	2.29004	0.17201
Madurai	2.15424	2.12981	0.17952
Pudukottai	1.91901	1.72581	0.1919
Ramnad	1.85299	1.24895	0.26471
Salem	2.28817	2.32986	0.16344
Sivagangai	1.81496	1.34942	0.22687
Theni	2.31797	2.07224	0.19316
Thirunelveli	2.05344	1.72974	0.22816
Trichy	1.97749	2.23437	0.15211
Virudhunagar	2.07988	2.15435	0.17332

Fig.1 Number of individuals of each genera of family Mymaridae caught by yellow pan trap in Tamil Nadu

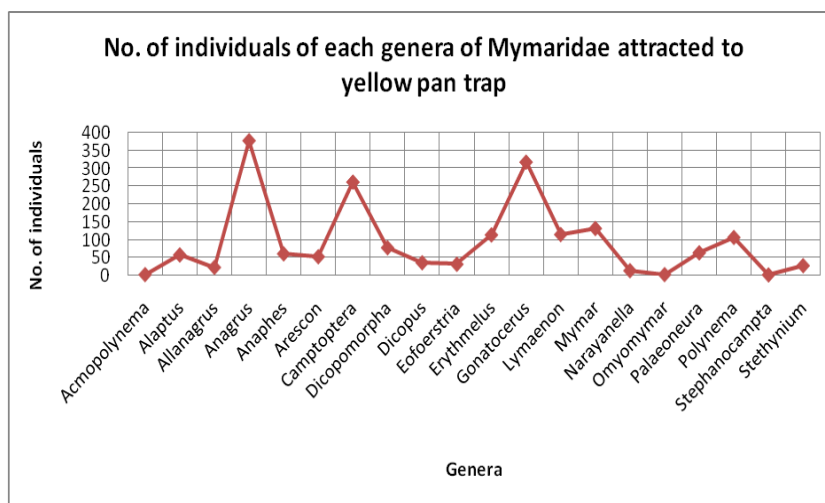


Fig.2 Shannon - Weiner diversity index of family Mymaridae

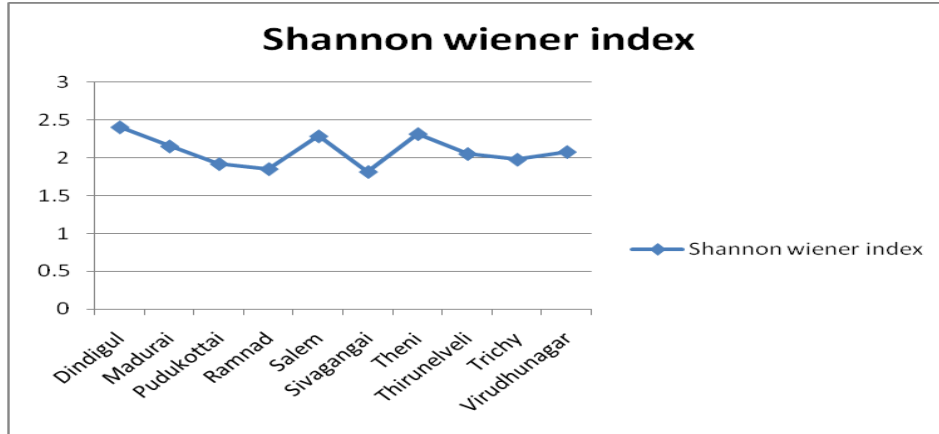


Fig.3 Generic evenness of the family Mymaridae

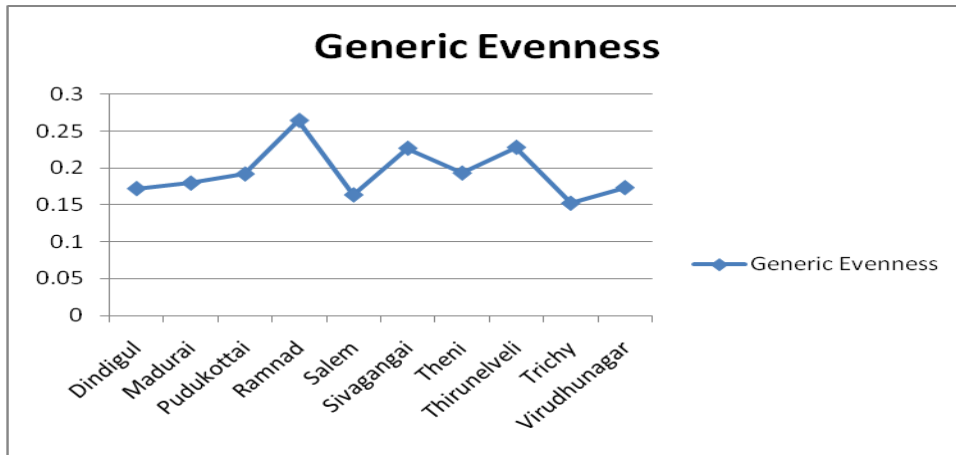
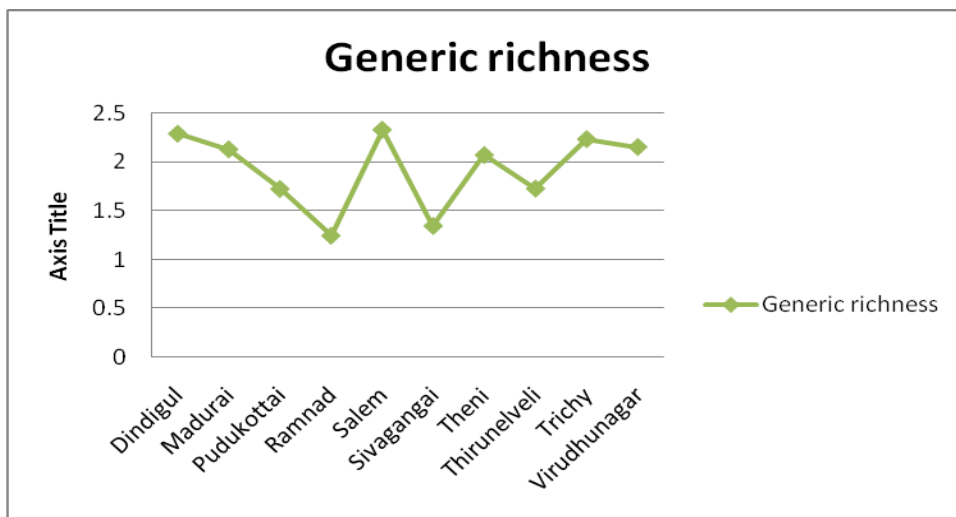


Fig.4 Generic richness of the family Mymaridae



For existence of many parasitoids of hymenopterans, conservation of natural habitats is very much essential. Figure 1 shows the number of individuals of each genus collected from various locations of Tamil Nadu. The total number of mymarid fauna attracted to yellow pan trap is an indication of biomass. In India, 38 genera are reported so far (Manickavasagam and Athithya, 2018). Out of 38 genera, 20 genera have been described from this faunistic study. The genus *Anagrus* Haliday were more than the *Gonatocerus* Nees followed by *Camptoptera* Forster, *Mymar* Curtis, *Lymaenon* Walker, *Erythmelus* Enoch, *Polynema* Haliday, *Dicopomorpha* Oglobin, *Palaeoneura* Waterhouse, *Anaphes* Haliday, *Alaptus* Westwood, *Arescon* Walker, *Dicopus* Enoch, *Eofoersteria* Mathot, *Stethynium* Enoch, *Allanagrus* Noyes & Valentine, *Narayanella* Subba Rao, *Acmopolynema* Oglobin, *Omyomymar* Schauff and *Stephanocampta* Mathot. *Anagrus* species are egg parasitoids of mainly Cercopidae, Cicadellidae and Delphacidae, though some parasitize eggs of odonata (Bakkendorf, 1926). Figure 3 indicates the generic evenness of the family mymaridae, Ramnad district recorded the highest index of 0.26471 and the lowest was recorded at Sivagangai (1.34942). Figure 4 showed the generic richness of mymaridae in different districts of Tamil Nadu, Salem recorded the highest generic richness (2.32986) and the lowest in Ramnad (1.24895). The Shannon weiner diversity index and generic richness was more in Dindigul and Salem region.

It is concluded that this work was an attempt to describe some aspects of biodiversity of mymarid fauna of major districts of Tamil Nadu. Further research is needed in this regard and further collections are essential for getting a detailed periodic estimate of the faunal diversity of fairy flies in these areas. Ultimately it is hoped that such work may

lead to the development of standard monitoring procedures which could be of value in assessing the environmental stability of areas under different ecosystems.

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How to cite this article:

Eniya, A., C. Chinniah, S. Manickavasagam, K. Premalatha and Eraivan Arutkani Aiyathan, K. 2019. Diversity of Mymarid Fauna (Mymaridae:Chalcidoidea: Hymenoptera) in Different Agroecosystems of Tamil Nadu, India. *Int.J.Curr.Microbiol.App.Sci.* 8(06): 462-467. doi: <https://doi.org/10.20546/ijcmas.2019.806.052>