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## Population structure of pierid butterflies in Savar at North West part of Dhaka, Bangladesh

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#### Abstract

The present study incorporates detailed field observations of family Pieridae in different areas of Savar during January to December, 2014. During the course of field study, 2665 specimens of Pierid butterflies belonging to 24 species under 11 genera were recorded and assessed their species status, flying period, species abundance and their annual fluctuation pattern. The *Eurema* and *Leptosia* were most dominating genus with recorded highest number of individuals and they occupied 42.10% and 25.40% of total genera respectively, respectively. Nine species occur throughout the year and rest of the species showed very short seasonal peaks and they are either absent or rare in other seasons. Study revealed that the Pierid butterfly populations and species showed bimodal annual fluctuations peaked in December and May in study sites and also showed the first peak formed in December was much higher as compared to the second peak occurred in May. Monthly occurrence of pierid butterfly population was lower from June to September. *Leptosia nina nina* and *Eurema hecabe hecabe* were recorded highest abundant species in study sites.

**Keywords:** Population, structure, status, abundance, butterfly, pieridae

#### 1. Introduction

The butterfly family Pieridae is a relatively small family of Lepidoptera comprising about 1000 species and 85 genera [1]. This group of butterflies is distributed worldwide, most species are found in the tropics. Adults of Pierid butterflies are pollinators, but caterpillars are serious pest of many crops and fruits. These are small to medium sized butterflies fall into two major subfamilies i.e. Pierinae (Whites): white butterflies have white wings with black dots or bars. A few species, such as the Marbles and Orange tips, have greenish yellow or bright orange patterns on their wings. Their larvae feed almost exclusively on members of the Mustard family. Coliadinae (Sulfurs): The Sulfur butterflies have yellow or orange-yellow wings, with black bars or dots. Their larvae feed on various legumes (Bean family). Some Entomologists have subsequently worked on the species composition, richness, diversity and distribution of butterflies in different parts of the world [2-7]. Butterfly fauna and their diversity, distribution, abundance, seasonal fluctuation, seasonal polymorphism has been explored from Bangladesh [8, 9]. Recently documented the check list of Nymphalid butterflies and their species diversity as well as species abundance in deciduous forest of Bangladesh [10]. The present study was conducted to document the butterflies of family Pieridae for the first time in Savar region at north-west part of Dhaka city. The objectives of this study were to prepare a check list of the family Pieridae and to study the population diversity, distribution, abundance, species status as well as annual fluctuation of butterfly species of Pieridae family in Savar region, Dhaka, Bangladesh.

#### 2. Materials and Methods

Study areas at Savar are situated of the north-west suburbs of Dhaka city that vary in its vegetation characteristics. The climate of this area is pleasant. The average temperature was about 30 °C in wet season (March to October) and about 20 °C in dry season (November to February). The maximum 37 °C and minimum 14 °C temperature were recorded in May and January, respectively. Annual rainfall reached 182 mm. The specimens of Pierid butterflies were collected on a sunny day of every month with the help of insect net and hand picking from four localities of Savar. The collected specimens were killed by pinching their thorax by taking proper care, stretched on stretching board, dried overnight into the oven at 50 °C then

transfer to the insect boxes and were identified using the keys of Pinratana, 1983 [11].

### 3. Results and Discussion

During the course of field study, 2665 individuals of Pierid butterflies belonging to 24 species under 11 genera were recorded and their species status as well as their flying period was tabulated in Table 1. Among the 24 species about 8.33% (2 species) were occurring very rare (*Saletara liberia distanti* and *Artogeia canidia indica*), 29.17% (7 species) were rare (*Delias descombesi descombesi*, *Appias paulina distanti*, *Appias albina darada*, *Hebomoia glaucippe glaucippe*, *Catopsilia pomona pomona f. jugurtha*, *Catopsilia pomona pomona f. catilla* and *Ixias pyrene verna*, 25% (6 species) were less common (*Appias paulina andamsoni*, *Catopsilia pomona pomona f. pomona*, *Catopsilia pomon pomona f. alcmeone*, *Eurema andersoni andersoni* *Eurema ada iona* and *Eurema blanda sihetana*), 12.5% (3 species) were common (*Cepora nerissa dapha*, *Pareronia anais anais* and *Catopsilia pomona pomona f. hilaria*) and 25% (6 species) were very common (*Delias hyparete indica*, *Appias libythea olferna*, *Catopsilia pyranthe pyranthe*, *Leptosia nina nina*, *Eurema hecabe hecabe* and *Eurema simulatrix inouei*).



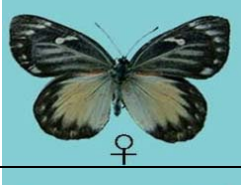
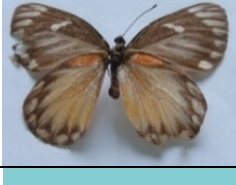


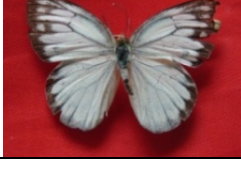
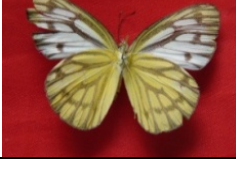
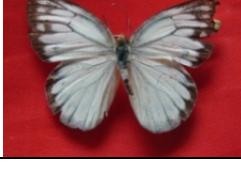
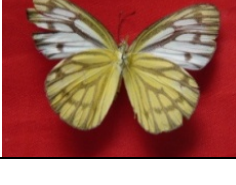
The identified species distributed under 11 genera of Pierid butterfly were shown in Figure 1. The genus *Eurema* were recorded highest number 42.10% (1122 individuals) including five species followed by *Leptosia* 25.40% (677 individuals) including one species, *Catopsilia* 11.48% (306 individuals) including six species, *Appias* 10.47% (279 individuals) including four species, *Delias* 4.77% (127 individuals) including two species, *Pareronia* 2.74% (73 individuals) including one species, *Cepora* 2.66% (71 individuals) including one species, *Hebomoia* 0.19% (5









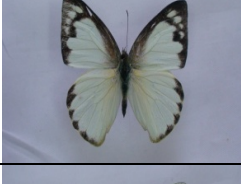

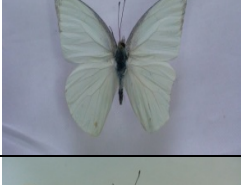

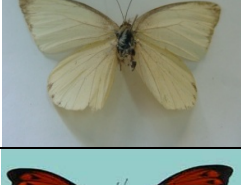

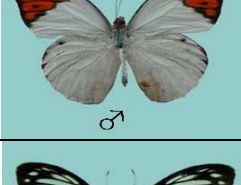
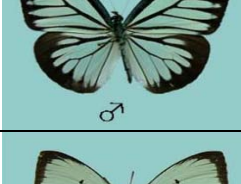

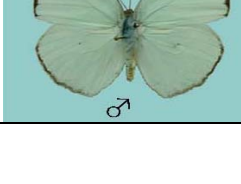

individuals) including one species, *Ixias* 0.11% (3) including one species and genus *Artogeia* and *Saletara* 0.04% (1 individuals) including one species respectively in the selected study areas at Savar.

Figure 2 showed monthly distribution of pierid butterfly populations in this study area. Number of populations was started to increase from October (>300) and showed peak in December (>400) thereafter population decreased and kept decline up to February. From March population was increase (>200) again and formed second peak in May (>250). Thereafter population began to decline (<155) again and remained in that condition up to September (<120). Results indicated that the Pierid butterfly populations showed bimodal annual fluctuations peaked in December and May in study sites and also showed the first peak formed in December was much higher as compared to the second peak occurred in May. That means the optimum season for pierid butterfly was winter and summer in this study sites. Two peaks of butterfly species richness was recorded, one in summer and other in early winter which was very much similar to our observation [12]. Islam *et al.*, (2013) Noticed differences in observations on abundant of Pierid butterfly population [13]. According to them there is one peak of Pierid population that was May which is consistent with that of [14] and may be due to forest area under study. In the present study monthly occurrence of pierid butterfly population was lower from June to September. The cause of lower population might be non-availability of nectar and larval host plants, heavy rainfall and high humidity in this study area at that time.





















The figure 3 and 4 showed monthly patterns of species richness (abundance) and fluctuation of very common and common species of pierid butterfly respectively.









**Table 1:** Species status and flying period of Pierid butterflies

| ♂♀ | Common Name      | Scientific Name Status                               | Flying Period (Status)            | Sex | Dorsal and ventral view of adult butterflies   |   |
|----|------------------|--|-----------------------------------|-----|--|---|
|    |                  |  |                                   |     | Dorsal view  | Ventral view  |
| 1  | Red-spot Jezebel | <i>Delias dscombesi descombesi</i> (Boisduval, 1836) | Feb - March (Rare)                | ♂   |  |  |
|    |                  |  |                                   | ♀   |  |  |
| 2  | Painted Jezebel  | <i>Delias hyparete indica</i> (Wallace, 1867)        | Oct - May, and July (Very Common) | ♂   |  |  |
| 3  | Common Gull      | <i>Cepora nerissa dapha</i> (Moore, [1879])          | Throughout the year (Common)      | ♂   |  |  |
|    |                  |  |                                   | ♀   |  |  |

|    |                      |   |  |   |  |   |
|----|----------------------|---|--|---|--|---|
|    |                      |   |  |   |     |     |
| 4  | Striped Albatross    | <i>Appias libythea olferna</i><br>(Swinhoe, 1890)       | Throughout the year<br>(Very Common)   | ♂ |    |    |
|    |                      |   |  | ♀ |    |    |
| 5  | Common Albatross     | <i>Appias paulina adamsoni</i><br>Moore, 1902           | Oct-Jan and April-Aug<br>(Less Common) | ♀ |    |    |
| 6  | The Lesser Albatross | <i>Appias paulina distanti</i><br>Moore, (1905)         | April, Nov, and Dec<br>(Rare)          | ♂ |   |   |
| 7  | Common Albatross     | <i>Appias albina darada</i><br>(C. & R. Felder, [1865]) | Nov-Jan<br>(Rare)                      | ♂ |  |  |
| 8  | Malaysian Albatross  | <i>Saletara liberia distanti</i><br>Pinratana, 1983     | July<br>(Very Rare)                    | ♂ |  |  |
| 9  | The Great Orange Tip | <i>Hebomoia glaucippe glaucippe</i><br>(Linnaeus, 1758) | Nov-Jan<br>(Rare)                      | ♂ |  |  |
| 10 | Common Wanderer      | <i>Pareronia anais anais</i><br>(Linnaeus, 1837)        | Throughout the year<br>(Common)        | ♂ |  |  |
| 11 | Mottled Emigrant     | <i>Catopsilia pyranthe pyranthe</i><br>(Linnaeus, 1758) | Throughout the year<br>(Very Common)   | ♂ |  |  |



|    |                         |   |  |   |  |   |
|----|-------------------------|---|--|---|--|---|
| 12 | Lemon Emigrant          | <i>Catopsilia pomona pomona f. pomona</i><br>Pinratana,1983   | Jan, Feb, May. June and Aug-Dec<br>(Less Common) | ♀ |    |    |
| 13 | Lemon Emigrant          | <i>Catopsilia pomona pomona f. jugurtha</i><br>Pinratana,1983 | May and June<br>(Rare)                           | ♀ |    |    |
| 14 | Lemon Emigrant          | <i>Catopsilia pomona pomona f. hilaria</i><br>Pinratana,1983  | Throughout the year<br>(Common)                  | ♂ |    |    |
| 15 | Lemon Emigrant          | <i>Catopsilia pomona pomona f. catilla</i><br>Pinratana,1983  | Aug-Oct<br>(Rare)                                | ♀ |    |    |
| 16 | Lemon Emigrant          | <i>Catopsilia pomona pomona alcmeone</i><br>Pinratana,1983    | Throughout the year<br>(Less Common)             | ♂ |   |   |
| 17 | Psyche                  | <i>Leptosia nina nina</i><br>(Fabricius, 1793)                | Jan-Dec<br>(Very Common)                         | ♂ |  |  |
| 18 | Yellow Orange Tip       | <i>Ixias pyrene verna</i><br>Druce, 1874                      | Nov-Jan<br>(Rare)                                | ♂ |  |  |
|    |                         |   |  | ♀ |  |  |
| 19 | The Common Grass Yellow | <i>Eurema hecabe hecabe</i><br>(Linnaeus, 1758)               | Throughout the year<br>(Very Common)             | ♂ |  |  |
| 20 | Changeable Grass Yellow | <i>Eurema simulatrix inouei</i><br>Shirōzu & Yata, 1973       | Throughout the year<br>(Very Common)             | ♂ |  |  |

|    |                             |  |  |   |  |   |
|----|-----------------------------|--|--|---|--|---|
| 21 | The Anderson's Grass Yellow | <i>Eurema andersoni anersoni</i><br>Shirôzu & Yata, 1982 | Mar, April, Aug and Oct-Dec<br>(Less Common) | ♀ |   |   |
| 22 |                             | <i>Eurema ada iona</i><br>Talbot, 1939                   | Sep-Jan<br>(Less Common)                     | ♀ |  |  |
| 23 | Three Spot Grass Yellow     | <i>Eurema blanda sihetana</i><br>(Wallace, 1867)         | Sep-Jan, and April<br>(Less Common)          | ♂ |  |  |
| 24 | Indian Cabbage White        | <i>Artogeia canidia indica</i><br>(Sparman, 1768)        | April<br>(Very Rare)                         | ♀ |  |  |

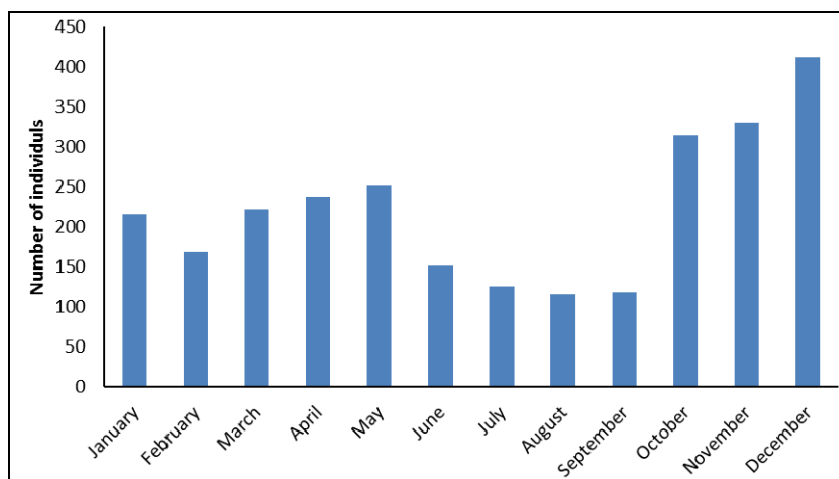


Fig 1: Monthly abundance of Pierid butterfly population during study period (January- December, 2014)

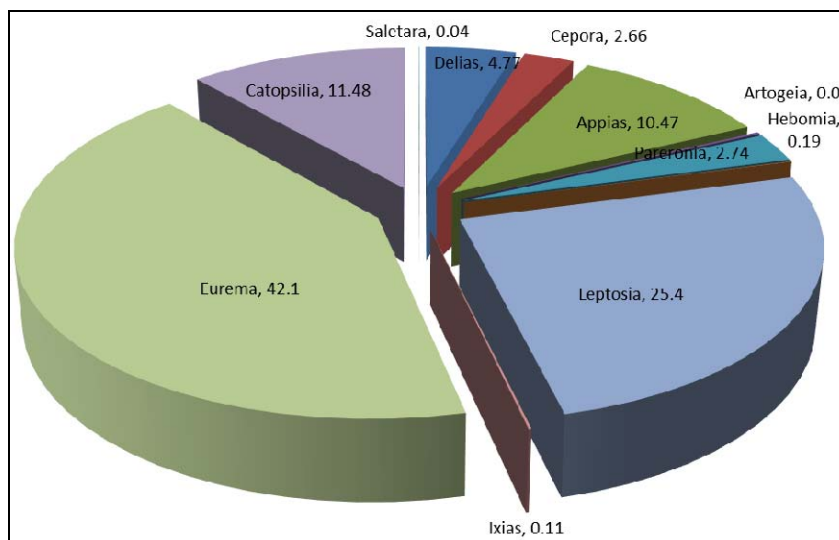


Fig 2: Genera wise distribution of Pierid butterflies during study period (January- December, 2014)

**3.1 Painted Jezebel (*Delias hyparete indica*)**

This species was very less abundant (average 10.0 individuals/month) and it was not present throughout the year it was absent in June, August and September in the study sites. Abundance was found higher in December (>40 individuals) than January, March, April and May (<20 individuals). December was optimum period for this species (Figure 3).

**3.2 Stripped Albatross (*Appias libythea olferna*)**

It was very less abundant (average 19.58 individuals/month) but found all the year round. Peak season of this species was March to May (24 to 57 individuals) thereafter population decline and remained in that condition until October. The population rise again from November and showed small peak in January (20 individuals). April and May was optimum period for this species (Figure 3).

**3.3 Mottled Emigrant (*Catopsilia pyranthe pyranthe*)**

It was also very less abundant (average 9.33 individuals/month). Highest population was found in March and sparsely distributed all over the year with minute fluctuation (Figure 3).

**3.4 Psyche (*Leptosia nina nina*)**

This species was moderately abundant (average 56.42 individuals/month) and found all over the year with very high population. Their abundance became higher in October and high population remained until May thereafter population decline and remained in that condition up to September. October to December was optimum period for this species (Figure 3).

**3.5 Common Grass Yellow (*Eurema hecabe hecabe*)**

It was also moderately abundant (average 59.08 individuals/month). Peak season of this species was October and November (>100 individuals) and distributed all over the year with high fluctuation. October to December was optimum period for this species (Figure 3).

**3.6 Changeable Grass Yellow (*Eurema simulatrix inouei*)**

This species was less abundant (average 27.08 individuals/month) but found all the year round. Population increased from October and highest population was found in December and January (>50 individuals). After winter the number of population was decreased and remained in that condition up to May except April. Very little (1-3 individuals) was found in June to September. December, January and April were optimum period for this species (Figure 3).

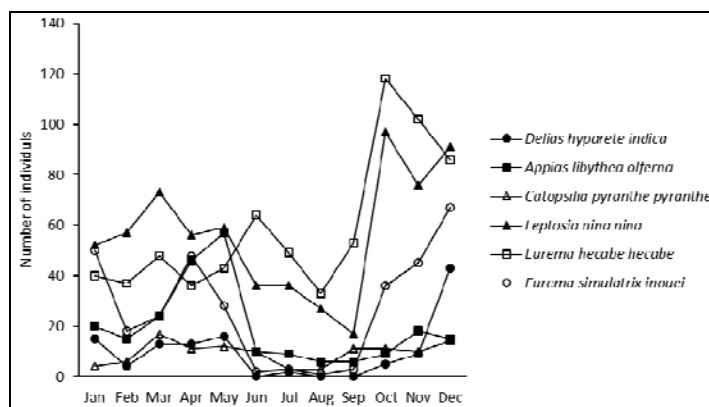


Fig 3: Monthly abundance and fluctuation of very common species of Pierid butterflies

**3.7 Common Gull (*Cepora nerissa dapha*)**

Abundance of this species was very less (average 5.92 individuals/month) during the study period but it was visible all over the year. Highest population (>10 individuals) was found in April and May and remained months was sparsely distributed with very minute fluctuation (Figure 4).

**3.8 Common Wanderer (*Pareronia anais anais*)**

It was very less abundant (average 6.08 individuals/month) but it was distributed all over the year. Only 10 to 11 individuals were found in the months of February, September and December. Little populations (1-9 individuals) were found in other nine months (Figure 4).

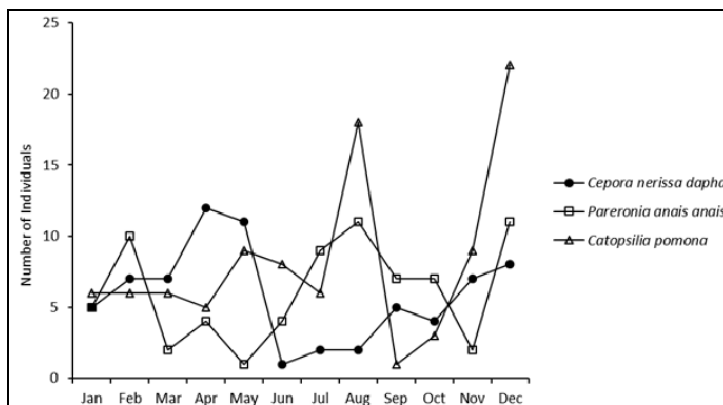


Fig 4: Monthly abundance and fluctuation of common species of Pierid butterflies

### 3.9 Lemon Emigrant (*Catopsilia pomona pomona f. hiliaria*)

This species was also very less abundant (average 8.25 individuals/month) and found all over the year. Highest population was found in August (18 individuals) and December (22 individuals) and rest of the months observed 1 to 9 individuals (Figure 3).

Rest of the 15 species was found very few during study period in the selected areas. Those species abundant was average 2.17-3.92 individuals/month for 6 less common species, 0.67-0.25 individuals/month for 7 rare species and average 0.08 individuals/month was for 2 very rare species.

Among those 24 species, the 2 species (*Leptosia nina nina* and *Eurema hecabe hecabe*) were moderate abundant, 1 species (*Eurema simulatrix inouei*) was less abundant and 6 species (*Delias hyparete indica*, *Cepora nerissa dapha*, *Appias libythea olferna*, *Pareronia anais anais*, *Catopsilia pyranthe pyranthe* and *Catopsilia pomona pomona f. hiliaria*) was very less abundant and the rest 15 species were very few in study sites. The huge number recorded in case of *Leptosia nina nina* and *Eurema hecabe hecabe* may be the host plant availability and weather suited to composition its life cycle.

Out of 24 species, 9 species were found throughout the year as follows: *Appias libythea olferna*, *Catopsilia pyranthe pyranthe*, *Catopsilia pomona pomona f. hiliaria*, *Catopsilia pomona pomona f. alcmeone*, *Leptosia nina nina*, *Eurema hecabe hecabe*, *Eurema simulatrix inouei*, *Cepora nerissa dapha* and *Pareronia anais anais* and the rest of species were seasonal i.e. they were found in specific season. Host plant is a vital factor for the survivability of butterfly larvae in all season. If host plants exist in the habitat throughout the year then they will be able to complete multiple generation, which is essential to subsist all over the year round. Thus it seems that, species foraging all the year round may have their host plant in all season and seasonal species may have host plant in specific season. Cause of increasing abundance in October to December (early winter) and in March to May (early summer) may be the availability of nectar plant for adult butterfly in early winter and host plant for butterfly larvae in early summer. In early summer affluent number of tender leaves appeared in trees, herbs and shrubs, which are essential for butterfly larvae (caterpillars). Consequently, their reproductive and survivability rate was increased. In early winter, flowering occurs in man-made flower garden and wild flowering plants, which is the prime source of nectar for adult butterfly. Response to seasonality is an important aspect of life history characteristics of insects<sup>[15]</sup>. Almost all butterflies have very short seasonal peaks and they are either absent or rare in other seasons<sup>[4]</sup>. Some species occur throughout the year with a short population peak in a specific season and some species occur only for a few months<sup>[16]</sup>. So, the present findings are supported by the findings of the above authors. The present study was the first attempt to explore of Pierid butterflies from Savar, Dhaka Bangladesh that could be provides a gross distributional estimate of the Pierid butterfly individuals and species along with its habitat type.

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