

FAUNISTICS OF PIERID BUTTERFLIES (LEPIDOPTERA: PIERIDAE) WITH SOME NEW RECORDS FROM SWAT, PAKISTAN

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ABSTRACT

This study was conducted to explore the Pierid butterfly fauna of Swat over a one-year period from March 2021 to April 2022. A total of 100 specimens of butterflies were collected from different localities in Swat. Among the 100 specimens collected, 15 species spanning 10 genera categorized them into two subfamilies: Pierinae and Coliadinae. Within the identified species, nine belonged to the subfamily Pierinae, while the subfamily Coliadinae comprised six species. One species, *Eurema brigitta* (Stoll, 1780), is reported for the first time from Khyber Pakhtunkhwa, while five species—*Pieris rapae* (Linnaeus 1758), *Ixias pyrene* (Linnaeus 1764), *Euchloe daphalis* (Moore 1865), *Aporia nabellicahesba* (Boisduval, 1836), *Colias eratae* (Esper 1805) are reported for the first time from Swat.

1. INTRODUCTION

A healthy environment is essential for a healthy biological community. More than half of the world's species are insects, which also serve as pollinators, seed dispersers, biocontrol agents, and ecological indicators (Mengal *et al.*, 2019). Lepidoptera is regarded as the most varied group of insects. (Gay *et al.*, 1992). It includes butterflies and moths (Shields, 1989). Butterflies account for one-tenth of all known Lepidoptera-species (Carter, 1992). About 19,238 species of butterflies have been reported around the world (Heppner, 1998). Butterflies are the most well-known insect to humans, due to their enormous size and dazzling vibrant colours (Bibi *et al.*, 2021). As they fly from one colour and sun-loving lifestyle. We are amused by their plant to another, butterflies aid in pollination. The majority of butterfly species are seasonal and prefer a specific environment. (Kunte, 1997).

They are also the best indications of undesired activity and disruptions in the surroundings. (Kocher & Williams, 2000). The family Pieridae consists of medium-to-small sized butterflies, mostly white and yellow in colours. They are characterized by the absence of cleaning spur on fore tuba and bifid claws, hindwings are without pre-costal veins (Roberts, 2001). They are also generally known to be species of open areas. Members of the family Pieridae are distributed throughout the globe, except Polar regions (Khan *et al.*, 2004). They act as pollinator, but some are serious pests of many crops and fruits in their larval stages. Larva of *Pieris brassicae*, *Pontia daplidice* and *Anaphaeis aurota* are the pest of many plant families like Cruciferae, Leguminosae and Rhamnaceae. A large number of cabbage crop yield losses are due to the pests of *Pieris rapae* (Shah & Rafi, 2016). Pieridae is second largest family of butterflies with about 76 genera containing approximately 1100 species (Evans, 1903).

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The Pieridae are generally divided in four subfamilies: Dismorphiinae, Pierinae, Coliadinae, Pseudopontiinae (Braby, 2005). Only two subfamilies Pierinae and Coliadene represent their taxa in Pakistan (Shah & Rafi, 2016).

Many researchers worked on the Pieridae butterfly's fauna of Pakistan. Malik (1970) reported 21 species while Iqbal (1978) reported 12 species of Pieridae from Islamabad. Hasan (1994) documented 13 species of Pieridae from Murree and Islamabad. Shah & Rafi (2016) reported 10 pierid species from district Kohat. A total of 320 species of butterflies have been reported from Pakistan, including 56 species of Pieridae butterflies (Roberts, 2001). Naz et al. (2001) recorded 10 species of Pierid from district Buner. During a taxonomic study five species of pierid were recorded by Abbas et al. (2002) from Sakardu region. Similarly, in Azad Kashmir seven pierid species were documented by Khan et al. (2007). Perveen & Ahmad (2012) reported 11 species of pierid butterfly from Kohat while from District Mansehra five species of Pierid butterfly were recorded by Perveen & Fazal (2013).

The butterfly fauna from Poonch Azad Kashmir was recorded by Khan et al. (2014), yielding 13 species of Pierid butterfly. From District Chitral, five species of Pierid butterfly have been reported (Afshan et al., 2015). In District Dir Lower, of the total 24 species of butterflies only five belonged to the family Pieridae (Khan, 2016). Recently, Mengal et al. (2017) conducted a study on butterfly fauna of Quetta and found seven species of pierid butterflies. From District Battagram of the total eight species, 50 % were from family Pieridae (Bibi et al., 2021). Most recently, out of the total 23 species of butterflies from district Haripur seven belonged to the family Pieridae (Khalid et al., 2022) while Taj et al. (2022) reported eight species of Pierid butterfly from District Abbottabad. Tshikolovets & Pagès (2016) reported six families of butterflies comprising of approximate 436 species of butterflies in Pakistan. Present study is an approach to record diversity and distribution of Pierid butterflies in various habitats of District Swat prepare a Checklist for future study.

2. MATERIALS AND METHODS

Study Area

Swat is a popular tourist destination in Khyber Pakhtunkhwa. Swat district covers a total size of 5,337 square kilometers (2,061 square miles). Swat is bounded administratively by Chitral, Upper Dir, and Lower Dir to the west, Gilgit-Baltistan to the north, and Kohistan, Buner, and Shangla to the east and southeast, respectively. The district is divided into seven administrative Tehsils: Babozai, Kabal, Barikot, Matta, Charbagh, and

Khwazakhela, as well as Bahrain. Swat has an average elevation of 980 meters (3,220 feet) (Mohiuddin, 2007)

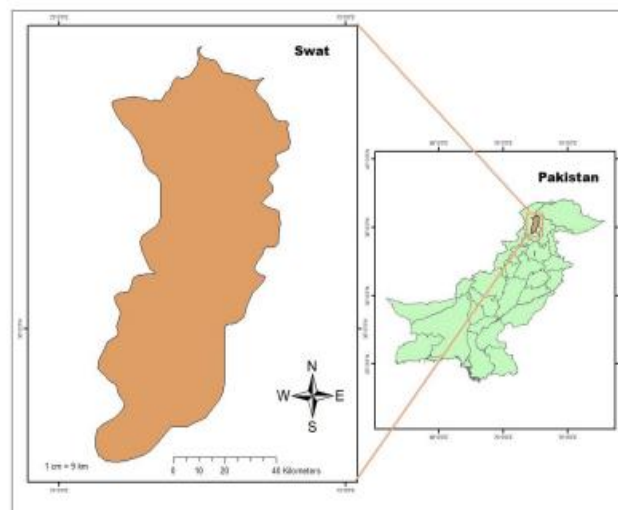


Fig 1 Map of study area

Collection

Butterflies were collected from the seven Tehsils of district Swat: Babozai, Barikot, Kabal, Bahrain, Khwazakhela, Charbagh, and Matta, throughout a one-year period from March 2021 to April 2022. Butterfly nets were used to collect butterflies, and photographs were shot in the field. The specimens were killed by pushing on the thorax. However, sensitive species were stored in the refrigerator overnight. On a thermophile setting board, dead specimens were stretched for Pinning. Butterflies were then labelled with the following information: common name, scientific name, date of collection, location of collection, and collector. After labelling, the butterflies were moved to rectangular wooden and plastic boxes with naphthalene balls in one side to prevent pests from entering.

Photography:

All photographs were taken using a digital camera model "Nikon D7200" equipped with a 70-300mm AFP or lens wide zoom optical moveable lens, and close-up images were made with an Oppo A16.

Identification:

The identification of butterflies in this study was done with the help of available literatures (Inyatullah et al., 2002; Khan et al., 2004; Khan et al., 2014; Mengal et al., 2017; Roberts, 2001; Sabir et al., 2000; Tshikolovets & Pagès, 2016; Yu-Feng et al., 2020).

3. RESULTS AND DISCUSSION

In the current survey 100 specimen of Family Pieridae were collected from the seven Tehsil of District Swat; Babozai, Barikot, Bahrain, Kabal, Matta, Khwazakhela and Charbagh for one-year period from March 2021 to April 2022. Collected specimens were identified into two sub-families, 10 genera and 15 species (Table 1).

Sub-family Pierinae comprised of nine species *Pieris canidia* (Linnaeus 1768), *Pieris rapae* (Linnaeus 1758), *Pieris brassicae* (Linnaeus 1758), *Belenois aurota* (Linnaeus 1758), *Pontia daplidice* (Linnaeus 1758), *Ixias pyrene* (Linnaeus 1764), *Euchloe daphalis* (Moore 1865), *Aporia nabellicahesba* (Boisduval, 1836) while subfamily Coliadinae composed of six species *Colias fieldii* (Menetries 1855), *Colias eratae* (Esper 1805), *Eurema hecabe* (Linnaeus 1758), *Eurema brigitta* (Stoll, 178), *Gonepteryx nepalensis* (Doubleday, 1847), *Catopsilia pomona* (Fabricius, 1775), *Catopsilia pyranthe*. One species *Eurema brigitta* (Stoll, 178) is first time reported from Khyber Pakhtunkhwa while 5 species *Pieris rapae* (Linnaeus 1758), *Ixias pyrene* (Linnaeus 1764), *Euchloe daphalis* (Moore 1865), *Aporia nabellicahesba* (Boisduval, 1836), *Colias eratae* (Esper 1805) are reported first time from Swat. *Pieris canidia* is the most abundant and *Aporia nabellicahesba* is comparatively rare. Highest number of collections was made in Tehsil Babozai.

Phylum Arthropoda

Class Insecta

Order Lepidoptera

Family Pieridae

Sub-family Pierinae

1. *Pieris canidia* (Linnaeus 1768)

Indian Cabbage White

Material examined: Pakistan: Khyber Pakhtunkhwa: Swat, Mingora, 24.ix.2021, 0.vii.2021; leg. Abdur Rehman. ; leg. Usama 12.vii.2021; leg. Usama, Matta, Balasoor, 9. x.2021; leg .A. Rehman

Distribution in Pakistan: Gilgit Baltistan , Gilgit by (Hasan, 1997); Azad Kashmir, Poonch (Khan *et al.*, 2014); Punjab from Lahore (Ahsan & Iqbal, 1975; Puri, 1931) , Attock (Rahman *et al.*, 2011), Murree Rawalpindi & Islamabad (Hasan, 1994; Iqbal, 1978) , Potohwar (Rafi, 2016); Khyber Pakhtunkhwa, Abbottabad (Taj *et al.*, 2022), Peshawar by Malik (1970), Buner (Naz *et al.*, 2001), Chitral (Afshan *et al.*, 2015), Shabqadar (Ullah *et al.*, 2017), Tangi (Yu-Feng *et al.*, 2020), Koaz Behram (Haroon *et al.*, 2014), Swat (Tshikolovets & Pagès, 2016).

al., 2017), Tangi (Yu-Feng *et al.*, 2020), Koaz Behram (Haroon *et al.*, 2014), Swat (Tshikolovets & Pagès, 2016).

2. *Pieris rapae* (Linnaeus 1758)

Small Cabbage White

Material Examined: Pakistan: Khyber Pakhtunkhwa; Swat, Babozai, Mingora, 22.ix.2021, 0.vii.2021; leg. Usama. Jahanabad 23.vii.2021, Matta, Balasoor, 10. x.2021, Khwazakhela, Chamtalai, 4.III.2022; leg.A. Rehman

Distribution in Pakistan: Azad Kashmir, Dhirkot (Abbasi *et al.*, 2019) ; Gilgit Baltistan Skardu (Abbas *et al.*, 2002) ; Punjab, Muree (Malik 1970) ,Potohwar (Shah & Rafi, 2016); Khyber Pakhtunkhwa Kohat (Perveen & Ahmad, 2012),Karak (Usman *et al.*, 2017);Haripur (Khalid *et al.*, 2022) ; Sindh (Mal *et al.*, 2014) ; Baluchistan, Takhti Suliman (Roberts, 2001) ,Quetta (Malik 1970; (Mengal *et al.*, 2017), Ziarat (Tshikolovets & Pagès, 2016).

Remarks; New record for Swat

3. *Pieris brassicae* (Linnaeus 1758)

Large Cabbage White

Material Examined: Pakistan: Khyber Pakhtunkhwa; Swat, Babozai, Mingora, Ingaradherai, 5.v.2021, 10.vii.2021; leg. Atif. Manglawar, 10.vi.2021, Kabal, Hazara, 14.ix.2021, Khwazakhela, Topsin, 25.ii.2022; leg. A. Rehman

Distribution in Pakistan ; Azad Kashmir from district Muzaffarabad & Azad Kashmir by (M. Khan *et al.*, 2004) similary (Khan *et al.*, 2014) from Poonch Malik (1970) from Rawalpindi Gilgit Baltistan Skardu (Abbas *et al.*, 2002) Punjab , Lahore (Ahsan & Iqbal 1975), Potohwar (Rafi, 2016); Khyber Pakhtunkhwa, Abbottabad (Taj *et al.*, 2022), Buner (Naz *et al.*, 2001), Malakand & lower Swat (Inyatullah *et al.*, 2002; Roberts, 2001) , Dir Lower (M. I. Khan, 2016), Dir Upper (Attaullah *et al.*, 2018), Karak (Usman *et al.*, 2017) , Haripur (Khalid *et al.*, 2022) ; Sindh (Mal *et al.*, 2014), Swat (Malamjabba, Kalam & Miandam) (Tshikolovets & Pagès, 2016); Baluchistan , Quetta (Mengal *et al.*, 2017).

4. *Belenois aurota* (Fabricius 1758)

Pioneer White

Material Examined: Pakistan: Khyber Pakhtunkhwa; Swat, Babozai, Mingora, Marghozar, 20.iii.2021, 25.vii.2021, Barikot, Amlookdara, 21. viii.2021, Charbagh;leg.Usama. Badar, 9.ix.2021, Matta, Beha, 13.x.2021, Kabal, Hazara, 17.ix.2021; leg.A.Rehman

Distribution in Pakistan: Azad Kashmir Poonch (Khan et al., 2014) ; Gilgit Baltistan ; Khyber Pakhtunkhwa ,Swat (Roberts, 2001) ,Kohat (Perveen & Ahmad, 2012) , Dir lower (Khan, 2016), Tangi Charsadda (Yu-Feng et al., 2020) ; Baluchistan , Quetta (Mengal et al., 2017; Roberts, 2001).

5. *Pontia daplidice* (Linnaeus 1758)
Bath White

Material Examined: Pakistan: Khyber Pakhtunkhwa; Swat, Babozai, Mingora, 28.iv.2021, Marghozar 10.vii.2021, Barikot, Amlookdara, 21.viii.2021; leg. Azan Charbagh ,Badar, 9.ix.2021, Matta Beha, 13.x.2021, Bahrain, Utrur, 8.viii.2022, Kabal, Hazara, 28.VII.2021, Khwazakhela, Behar, 17.vi.2021; leg. A. Rehman

Distribution in Pakistan : Hassan (1997) reported it from Rawalpindi Islamabad and Murree hills ;Azad Kashmir , Poonch (Khan et al., 2007) , Dhirkot (Abbasi et al., 2019) ; Gilgit Baltistan ,In Gilgit by Hasan (1997), Skardu (Abbas et al., 2002) ; Khyber Pakhtunkhwa, Buner (Naz et al., 2001) Chitral, Swat (Roberts, 2001) , Shabqadar (Ullah et al., 2017), Dir Upper Doag Dara (Attaullah et al., 2018), Manshera (Perveen & Fazal, 2013), Battagram (Bibi et al., 2021); Punjab , Potohwar (Shah & Rafi, 2016).

6. *Ixias pyrene* (Linnaeus 1764)
Yellow Orange Tip

Material Examined: Pakistan: Khyber Pakhtunkhwa; Swat, Babozai, Mingora, Saidu Sharif, 10.ix.2021, Marghozar, 10.vii.2021; leg. Usama. Barikot, Amlookdara, 21.viii.2021, Charbagh Badar; 9.v.2021; leg. Yaseen. Kabal, Hazara, 17.iii.2021; leg. A. Rehman.

Distribution in Pakistan; Azad Kashmir; Gilgit Baltistan; Punjab, Lahore Ahsan & Iqbal (1975) Taxila (Roberts, 2001); Khyber Pakhtunkhwa, Buner (Naz et al., 2001), Abbottabad, Hevellian (Roberts, 2001); Sindh (Mal et al., 2014)

Remarks: New record to Swat

7. *Euchloe daphalis* (Moore 1865),
Pearl White

Material Examined: Pakistan: Khyber Pakhtunkhwa; Swat, Babozai, Marghozar, 3.iii.2021, Charbagh ,Badar, 19.ii.2022; leg. A. Rehman

Distribution in Pakistan; It has been reported in Chiltan, karakoram Baluchistan, Torghar, Saiful Maluk, Chitral (Roberts, 2001), Gilgit, Chitral, Astore (Tshikolovets & Pagès, 2016).

Remarks: New record to Swat

8. *Aporia nabellicahesba* (Boisduval, 1836)
The Dusky Blackvein

Material Examined: Pakistan: Khyber Pakhtunkhwa; Swat, Kalam, 25.vii.2021. leg. A. Rehman

Distribution in Pakistan: Kaghan Valley, Shograh, Chitral (Roberts, 2001; Tshikolovets & Pagès, 2016).

Remarks: New record to Swat

Subfamily Coliadinae
9. *Colias fieldii* (Menetries 1855),
Dark Clouded Yellow

Material Examined: Pakistan: Khyber Pakhtunkhwa; Swat, Babozai, Mingora, 22.iii.2021, 29.vii.2021; leg. Taimur. Barikot, Amlookdara, 21.v.2021, Charbagh, Badar, 9.ix.2021, Matta, Beha, 13.v.2021, Bahrain, Mankiyal, 15.iii.2022, Kabal, Hazara, 17.ix.2021; leg. A. Rehman

Distribution in Pakistan: Azad Kashmir, kotli, Mirpur & Bhimber (Khan et al., 2007), Poonch (Khan et al., 2014) ; Gilgit Baltistan Skardu (Abbas et al., 2002) ; Punjab ,Lahore (Ahsan & Iqbal, 1975), Murree (Roberts, 2001) ; Khyber Pakhtunkhwa ,Buner (Naz et al., 2001) ,Hazara (Roberts, 2001) Koaz Behram (Haroon et al., 2014), Dir Lower (Khan, 2016), Swat (Tshikolovets & Pagès, 2016), Tangi Charsadda (Yu-Feng et al., 2020) ; Baluchistan, Suleiman range (Roberts, 2001).

10. *Colias erate* (Esper 1805),
Pale Clouded Yellow

Material Examined: Pakistan: Khyber Pakhtunkhwa; Swat, Babozai, Mingora, 17.vi.2021, Takhtab 10. v.2021; leg. Usama Badar, 9.ix.2021, Kabal, Kanju, 5.iii.2022, Khwazakhela, Behar, 13.x.2021. leg. A. Rehman

Distribution in Pakistan: Azad Kashmir (kotli, Mirpur and Bhimber) (Khan et al., 2007) ,Poonch (Khan et al., 2014) ; Gilgit Baltistan Skardu (Abbas et al., 2002) ; Punjab ; Khyber Pakhtunkhwa ;Buner (Naz et al., 2001), Takht-i-nasrat (Roberts, 2001) Tangi Charsadda (Yu-Feng et al., 2020) , Abbottabad (Taj et al., 2022), Malakand (Inyatullah et al., 2002) Dir Upper (Attaullah et al., 2018) ; Dir Lower, Chitral (Tshikolovets & Pagès, 2016); Sindh (Malik, 1970 ; Mal et al., 2014).

Remarks: New record to Swat

11. *Eurema hecabe* (Linnaeus 1758)
Common Grass Yellow

Material Examined: Pakistan: Khyber Pakhtunkhwa; Swat, Babozai, Mingora, 25.IV.2021, Marghozar, 10.vii.2021; leg. Usama. Badar, 9.viii.2021,

Matta, Beha, 13.x.2021, Bahrain, Mankiyal, 15.iii.2022, Kabal, Hazara, 17.ix.2021, Khwazakhela, Behar, 9.vi.2021. leg. A. Rehman

Distribution in Pakistan: Azad Kashmir Poonch (Khan *et al.*, 2014) Gilgit Baltistan Punjab Khyber Pakhtunkhwa, Buner (Naz *et al.*, 2001), Lower Swat, Charbagh (Inayatullah *et al.*, 2002), Kohat (Perveen & Ahmad, 2012), Manshera (Perveen & Fazal, 2013), Koaz Behram (Haroon *et al.*, 2014) Chitral (Afshan *et al.*, 2015), Dir Lower (M. I. Khan, 2016), Karak (Usman *et al.*, 2017) Tangi Charsadda (Yu-Feng *et al.*, 2020) Abbottabad (Taj *et al.*, 2022); Sindh (Mal *et al.*, 2014); Baluchistan, Quetta (Mengal *et al.*, 2017).

12. *Eurema brigitta* (Stoll, 178) Small Grass Yellow,

Material Examined: Pakistan: Khyber Pakhtunkhwa; Swat, Babozai, Mingora, 25.iii.2021; leg. Usama Badar, 9.iv.2021, Kabal, Hazara, 17.vii.2021. leg. Waqas

Distribution in Pakistan: Punjab, Lahore (Ahsan & Iqbal, 1975; Roberts, 2001); Islamabad, Margalla Hills, Poonch (Tshikolovets & Pagès, 2016).

Remarks: This species is documented for the first time from Khyber Pakhtunkhwa.

13. *Gonepteryx nepalensis* (Doubleday, 1847) Himalayan Brimstone

Material Examined: Pakistan: Khyber Pakhtunkhwa; Swat, Babozai, Marghozar, 5.iii.2021, Islampur, 10.vii.2021; leg. Usama. Malamjabba, 7.x.2021, Matta, Jarog o Valley, 19.ix.2021, Khwazakhela, Behar, 2.iv.2022. leg. Taimur

Distribution in Pakistan: Azad Kashmir, Dhirkot (Abbasi *et al.*, 2019). Gilgit Baltistan; Punjab; Khyber Pakhtunkhwa, Buner (Naz *et al.*, 2001), Marghuzar (Swat) (Inayatullah *et al.*, 2002); Sindh Baluchistan

14. *Catopsilia Pomona* (Fabricius, 1775) Common Emigrant

Material Examined: Pakistan: Khyber Pakhtunkhwa; Swat, Babozai, Mingora, 5.viii.2021, Odigram, 10.ix.2021, 21.viii.2021, Charbagh, Malamjabba, 28.vii.2021. Leg. A. Rehman

Distribution in Pakistan: Azad Kashmir; Gilgit Baltistan; Punjab, Lahore by Ahsan & Iqbal (1975), Taxila, Muree Hills & Bahawalpur (Tshikolovets & Pagès, 2016); Khyber Pakhtunkhwa, Swat, Lower Chitral (Roberts, 2001), Kohat (Perveen & Ahmad, 2012), Koaz Behram (Haroon *et al.*, 2014) Shabqadar (Ullah *et al.*, 2017), Karak

(Usman *et al.*, 2017), Tangi Charsadda (Yu-Feng *et al.*, 2020); Sindh, Karachi (Malik 1970; Mal *et al.*, 2014); Baluchistan, Quetta (Mengal *et al.*, 2017; Roberts, 2001)

15. *Catopselia pyranthe* Linnaeus Mottled Emigrant

Material Examined: Pakistan: Khyber Pakhtunkhwa; Swat, Babozai, Mingora, 10.iii.2021, Saidu sharif, 10.vi.2021; leg. Usama, Kabal, Hazara, 2.viii.2021. leg. A. Rehman.

Distribution in Pakistan: Azad Kashmir, Poonch (Khan *et al.*, 2014); Islamabad, Muree Hills (Hasan 1994) Gilgit Baltistan; Punjab, Multan, Bahawalpur, Taxila (Tshikolovets & Pagès, 2016); Khyber Pakhtunkhwa Kabal (Inayatullah *et al.*, 2002), Swat (Roberts, 2001) Koaz Behram (H. Khan & Perveen, 2015), Shabqadar (Ullah *et al.*, 2017), Tangi Charsadda (Yu-Feng *et al.*, 2020); Sindh (Mal *et al.*, 2014). Baluchistan (Roberts, 2001).

4. CONCLUSION

It is stated that the research area's high level of vegetation contributes to the diversity of the butterfly fauna. To fully understand the butterflies of the Swat Valley, more in-depth research is advised.

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6. CONFLICT OF INTEREST

All authors have declared that there is no conflict of interests regarding the publication of this article.

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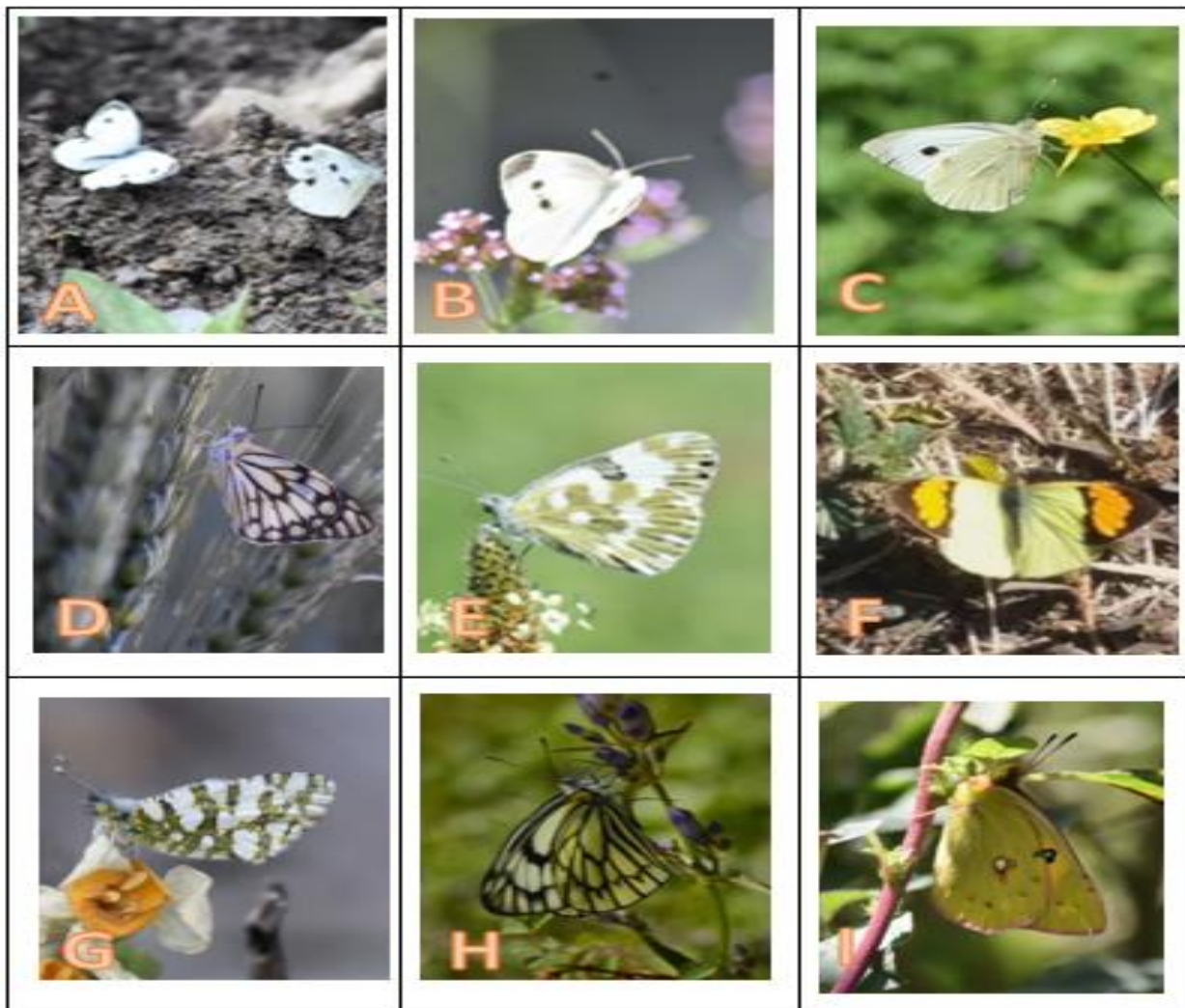


Figure 1 A, *Pieris canidia* (Linnaeus 1768); B, *Pieris rapae* (Linnaeus 1758) ; C, *Pieris brassicae* (Linnaeus 1758) ; D, *Belenois aurota* (Linnaeus 1758) ; E, *Pontia daplidice* (Linnaeus 1758) ;F, *Ixias pyrene* (Linnaeus 1764) ; G *Euchloe daphalis* (Moore 1865) ; H, *Aporia nabellicahesba* ; I, *Colias fieldi*

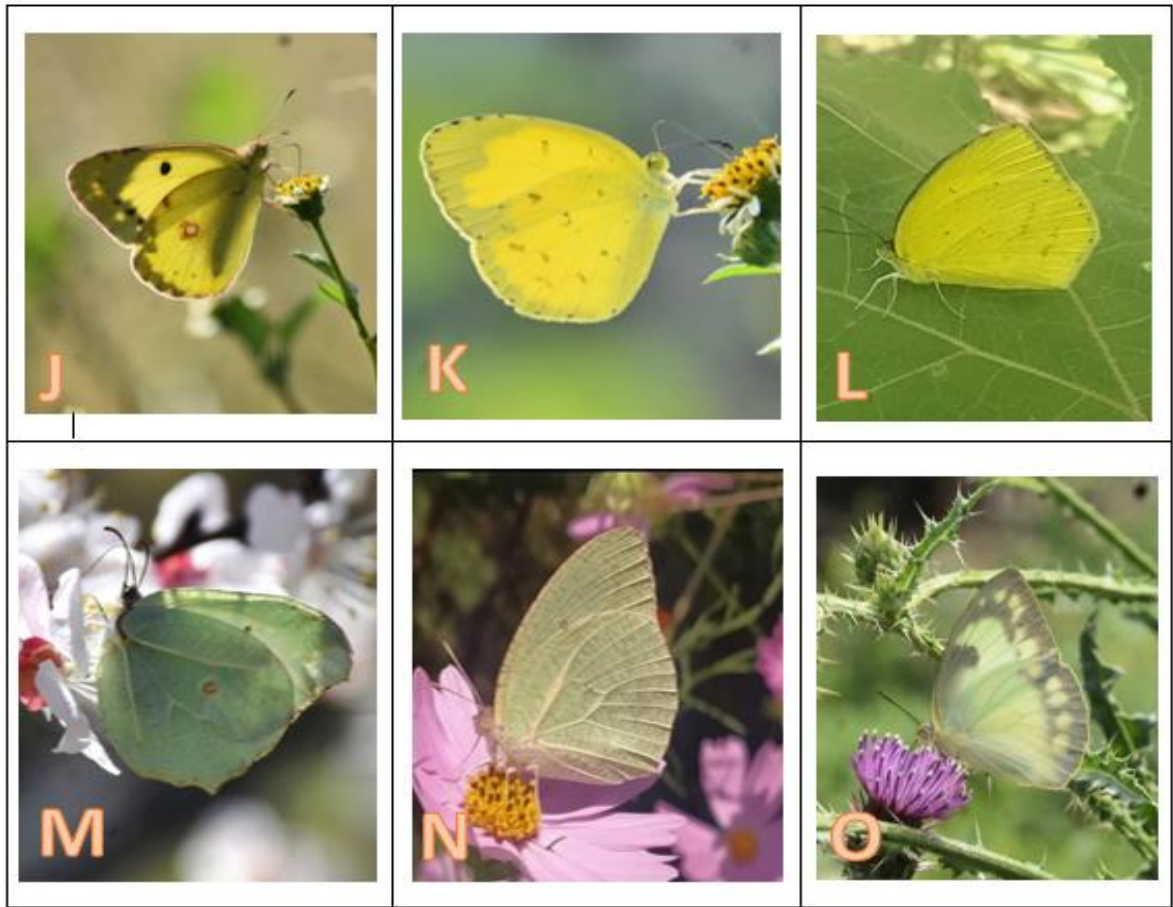


Figure 2, J, *Colias eratae* (Esper 1805); K *Eurema hecabe* (Linnaeus 1758); L, *Eurema brigitta* (Stoll ,1778) ; M, *Gonepteryx nepalensis* (Doubleday, 1847) ; N, *Catopsilia pyranthe* ; O, *Catopsilia pomona* (Fabricius, 1775),