

## Study on morphological structures of eggs belongs to super family: Papilionoidea, at department of life sciences, M.K. Bhavnagar University, Bhavnagar, and Gujarat, India

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### Abstract

The present study was conducted at Department of Life Sciences, Saradar Patel Campus, Maharaja Krishnakumarsinhji Bhavnagar University, Bhavnagar, Gujarat. Study contribute to understand comparative morphological structure of eggs of different families of order Lepidoptera. Lepidoptera, an order of class insecta stands for moths and butterflies with 2, 55,000-2,65,000 worldwide reported species or more and likely similar number of unreported species. Among which 12,000 species of moths and 1800 species of butterflies have been represented by India. It is first comparative study of morphological structure of eggs of order Lepidoptera in Bhavnagar. Selected site was surveyed from December 2021 – December 2022. 4 eggs of different families of butterfly were yield as a result of present study. Across this study we found 4 eggs of different species of butterfly; they are unique and different in their own shape, size, colour, texture and live bases but represent common super family Papilionoidea. This study will helpful to know about adaptation performed by different species of butterfly for their survival in ecosystem and also play valuable role in aspect of conservation.

**Keywords:** Morphological structure of eggs, adaptation, survival, lepidoptera

### Introduction

Lepidoptera, an order of class insecta stands for moths and butterflies with 2, 55,000-2,65,000 worldwide reported species or more <sup>[1]</sup> and likely similar number of unreported species <sup>[2]</sup>. Among which 12,000 species of moths <sup>[3]</sup> and 1800 species of butterflies <sup>[1]</sup> have been represented by India. In Gujarat no previous study is visible on comparative morphological structure of eggs of order Lepidoptera. Moths and butterflies are environmental indicators as they are well dispersing in different habitat, closely linked with the diverse vegetation <sup>[4]</sup> and are responsive to environmental changes <sup>[5]</sup>. Most of the vegetation are rely on different species of Lepidoptera for pollination <sup>[8]</sup>. Butterflies, moths and their larvae are required as food for many other species, such as amphibians, bats, small mammals, and also bird species <sup>[6]</sup> and indicators of ecological fitness <sup>[7]</sup>. The morphologies of insect eggs are extraordinarily diverse <sup>[14]</sup>. Eggs must also resist to the physiological challenges of being laid in diverse microenvironments, including in water, air, or internal to

plants <sup>[15]</sup>. The present study was contribute to understand how eggs of different species of Lepidoptera differs in their biophysics. This knowledge will helpful in conservation and also in aspect of study about adaptation for survival in dynamic environment.

### Material and methods

#### 1. Study area

At Department of Life Sciences, Saradar Patel Campus, Maharaja Krishnakumarsinhji, Bhavnagar University; lies between 21.756002N & 72.129193E <sup>[8]</sup>. The Campus scenery is overspread with diverse vegetation and remaining part is open land with rocky topography. The campus also possesses a seasonal lake that remains filled for around 6 months throughout the time of monsoon. The campus of Department of Life Sciences is rich in their vegetation. We observed many host plants of butterflies and moths which fulfil their needs of habitat and provide food supply especially for their larval stages.



Fig 1: Map of study area <sup>[18]</sup>

## 2. Study

Study were conducted from December 2021 to December 2022 at selected site, at Department of Life Sciences, Maharaja Krishnakumarsinhji Bhavnagar University, Bhavnagar, Gujarat, India, to study the morphological structure and base of eggs belonging to order Lepidoptera. We done day field within campus and clicked photographs with a Smartphone camera. We used stereo microscope (stemi 305 Trino) for better study of morphological structure of eggs and clicked 60x zoom pictures. (figure 2).

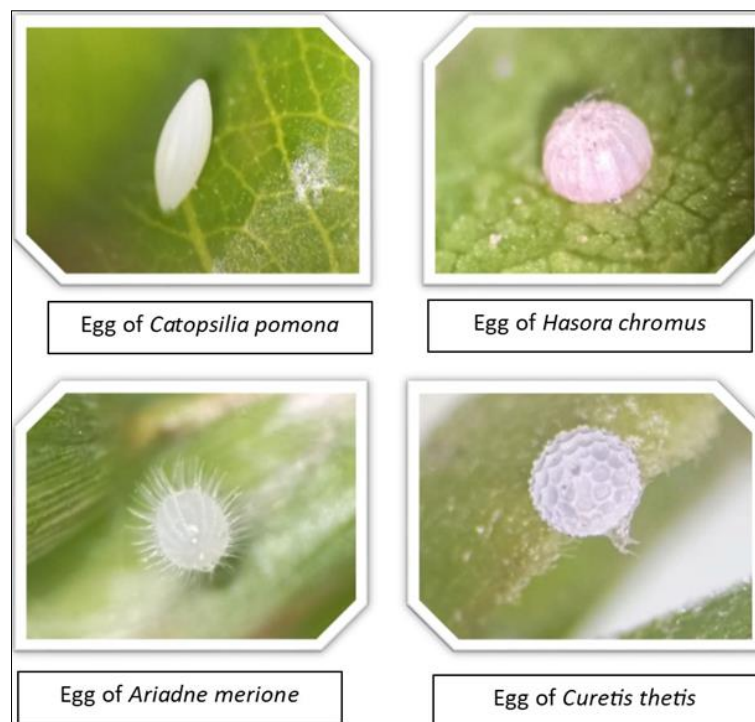
## 3. Identification

We compared photographs of eggs with available different scientific publication <sup>[9, 10]</sup> for identification and other citizen science platform well known iNaturalist (<https://www.inaturalist.org>). We match photographs of plant with one of the E- science platform known as E- flora of Gandhinagar, Gujarat, India (<https://www.efloraofgandhinagar.in/>) for identification of host plants.

## Result

We found 4 eggs from different families of butterfly, Lycaenidae, Hesperidae, Pieridae, Nymphalidae; all belonging to common super family Papilionoidea. We noted eggs of 4 different butterflies, *Curetis thetis*, *Hasora chromus*, *Catopsilia pomona*, *Ariadne merione* commonly known as Indian sunbeam, Common banded awl, Common emigrant, Common castor respectively and all eggs have their own different Biophysics. Egg of Indian sunbeam is

singly distributed on young shoot of its host plant *Millettia pinnata* commonly known as Karanj in winter during month of December. The egg is Bun shaped with coarse hexagonal reticulations with flattened base. Eggs are small less than 2mm is size and colour variation seen pale greenish to white during maturation period. We also found egg of Common banded awl which is isolated distributed on young shoot and staple of the leaves or upper surface of young leaves of its host plant *Millettia pinnata* commonly known as Karanj in December month during winter season. The egg is Bun shaped with striations and flat base. Eggs are small less than 2mm is size and colour variation seen pinkish to white during incubation period. We found the egg of Common emigrant also known as Lemon emigrant which is singly distributed on upper leaf surface on its host plant *Senna fistula* commonly known as Golden shower in month of July during pre-monsoon. The egg is Bottle shaped and ribbed vertically and less than 3mm in size. Colour variation seen creamy white to yellowish during maturation period. We found egg of common castor which is singly distributed on young shoot tip or buds on *Festulaca* species of grass in month of September during monsoon season. Generally common castor butterfly prefer to lay their eggs on its host plant a *Ricinus communis* commonly known as castor plant but Castor plant is not available in the campus of Department of Life Sciences so it get adapted to *Festulaca* species of grass which is available in the campus of Department of Life Sciences. The eggs are Dome shaped and covered with whitish hairs and sculptured. Eggs are small less than 1mm in size and off white in colour.



**Fig 2:** Morphological structure of eggs

## Discussion

According to encyclopaedia of entomology, eggs are the first free-living stage of most insects, within an outer covering of shell <sup>[11]</sup>. Egg shell is an extracellular matrix that is secreted by the follicular epithelium whereon it accumulate and make a structure that protect the embryo

and mediate the flux of water and gas exchange between the components of egg and its environment <sup>[12]</sup>. Egg size is afflicted by latitude, peculiarly by mean temperature <sup>[11]</sup>. One time honoured hypothesis is that the energy expenditure in producing an egg co-varies positively with its size, which turn out in a generalized trade-off between egg

size and fecundity<sup>[13]</sup>. Eggs are a common means of passing through unfavourable periods like winter or dry season when food sources are less or easily unavailable. Defense mechanism can be grouped into three general types: deceptive devices, chemical protection, and mechanical protection. Most species prefer to conceal their eggs<sup>[11]</sup>. Here, we can see that majority of eggs are attached to its base with viscous matter and minimal colour variation seen during incubation period. Eggs of *Ariadne merione* have spines for their protection and eggs are deposited apically on plant so it create illusion of seed of plant and protect itself from predators.

### Conclusion

The present comparative study of morphological structure of eggs of 4 different species with common super family Papilionoidea of order Lepidoptera is interesting and informative work. Eggs varies in their shape, size, colour, texture and live bases which lead to resistant power of egg in front of environmental forces. Usually *Ariadne merione* has common host plant *Ricinus communis* but as this castor plant is not available, *Ariadne merione* adapted to another plant *Festulaca* species for the survival. We can also deduce that *Millettia pinnata* (Karanj) is top choice host plant by different species of lepidopteran belonging to super family Papilionoidea. We also make assumption that one of the reason why majority of species try to adapt to Karanj is its presence in higher number in the study area.

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