Impact Of High Rise Bridges And Metrorail On Life Of Lepidopterans And Conservation Strategies in, Nagpur (M.S.), India: A Preliminary Report

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ABSTRACT

The present paper has attempted to report biodiversity in specific areas of Nagpur which are heavily inhabited by humans as well as polluted (air, water, soil & sound).The butterflies and moths have adapted to this altered environment, but due to regular decline in plant species which serve as food and dwelling place to survive and propagate the numbers of species and their populations are reducing at an alarming rate. Butterflies includes families like Nymphalidae**10**, Pieridae**5;** one species each of Lycanidae**,** Hesperiidae, Papilionidae respectively;while moths includes families likeErebidae**3**,Sphingidae**2,** one family each ofCrambidae, Noctuidae, Limacodidae**,**Geometridaerespectively. .The authors have proposed importance of growing potted ornamental and other plant species and maintenance of individual and community gardens compulsorily as the ultimate habitats as "Corridors" in residential flats, ownership houses, schools, offices, etc., in all cities and metropolitans. This strategy may in the long run either partly or wholly aid in conserving biodiversity of all butterfly and moth species and prevent their extinction due to various natural and anthropogenic cataclysm. Construction of bridges and fragmentation of their habitats has created obstacles for these creatures and will convert many as "Ecotone or Edge effect species" as is the case with spiders and other insect species and several vertebrates like amphibian, reptiles, some mammals and more aves. The circadian and circannual behavior of all these creatures are under the control of programmed gene and gene pools that had gradually evolved and spontaneously by mutation and is presently also evolving. Butterflies and Moths are indicators of quality and climate change of habitats.

Keywords: - Butterfly, Moth, Conservation, Metropolitan, Ecotone, Nagpur.

INTRODUCTION:

Butterflies and moths are ecological indicators of the natural and altered environment. In the present study specific areas of Nagpur metropolis were surveyed to know their biodiversity and impact of development and urbanization. Among insects butterfly and some moths are pollinator and indicator of plant health.

MATERIALS AND METHODS:

Field survey in Manewada-Besa and Piplafata area respectively was done in Oct 18 –19, 19-20 using binoculars to sight and digital camera Sony W830 14 MP, optical zoom 8X and

mobile Redmi note 5:14 MP were employed to take photographs of butterfly and moth. Identification key and reference books were used to for taxonomy.

OBSERVATIONS:

Refer table 1 for names of butterflies and table 2 for names of moths recorded at Manewada-Besa and Pipla-Fata for both Lepidopterans.

Sr. No.	Name	Family	Common Name
1.	Melanitisleda	Nymphalidae	Evening Brown
2.	Moduza Procris	Nymphalidae	Commander
3.	Phalantaphalanta	Nymphalidae	Common Leopard
4.	Junoniaorithya	Nymphalidae	Blue Pansy
5.	Colitis danae	Pieridae	Crimson Tip
6.	Euthalia aconthea	Nymphalidae	Baron
7.	Hypolimnasbolina	Nymphalidae	Great Egg Fly
8.	Euremahecabe	Pieridae	Common Grass Yellow
9.	Tarucusnara	Lycaenidae	Pea Blue
10.	Melanitisphedima	Nymphalidae	Evening Brown
11.	Catopsillapomona	Pieridae	Lemon emigrant
12.	Papilliocrino	Papilionidae	Crimson rose
13.	Junoniaatlites	Nymphalidae	Grey Pansy
14.	Gonopteryxrhamni	Pieridae	Common Brimstone
15.	Suastusgremius	Hesperiidae	Indian Palm Bob
16.	Delias eucharis	Pieridae	Common Jezebel
17.	Danaus chrysippus	Nymphalidae	Plain Tiger
18.	Hypolimnasmisippus	Nymphalidae	Danoid Egg Fly

Table 1: Butterflies of Manewada-Besa and Pipla-Fata area,Nagpur (M.S.)

Sr.No.	Genus and species	Family	Common Name
1.	Amata phagea	Erebidae	9- spotted moth
2.	Spolodaerecurvalis	Crambidae	Beet web worm
3.	Daphnis nerii	Sphingidae	Oleander hawk moth
4.	Spodoptera litura	Noctuidae	Tobacco cutworm
5.	Parasaindetermina	Limacodidae	Stinging rose
6.	Grammiaornata	Erebidae	Ornate tiger moth
7.	Asotacarica	Erebidae	Tropical tiger moth
8.	Acherontiastyx	Sphingidae	Lesser death head
9.	Aspitatesochrearia	Geometridae	Yellow belle

Table 2: Moths of Manewada-Besa and Pipla-Fata area, Nagpur (M.S.)

ShanonWeiner index for butterflies

Sr, No.	Genus	No. of species	Pi	In (Pi)	Pi X In (Pi)
1.	Catopsillapomona	46	0.09218	-2.38401	-0.21975
2.	Danaus chrysippus	42	0.08416	-2.4750	-0.20829
3.	Melanitisleda	21	0.04208	-3.16818	-0.13331
4.	Junoniaorithya	30	0.06012	-2.81141	-0.16902
5.	Junoniaatlites	38	0.07615	-2.57505	-0.19609
6.	Hypolimnasbolina	31	0.06212	-2.77868	-0.17261
7.	Gonopteryxrhamni	14	0.02805	-3.57376	-0.10024
8.	Euremahecabe	37	0.07414	-2.60180	-0.19289
9.	Hypolimnasmisippus	27	0.05410	-2.91692	-0.15780
10.	Tarucusnara	31	0.06212	-2.77868	-0.17261
11.	Suastusgremius	12	0.02404	-3.72803	-0.18962
12.	Delias eucharis	33	0.06613	-2.71613	-0.17961
13.	Papilliocrino	25	0.05010	-2.99373	-0.14998
14.	Melanitisphedima	28	0.05611	-2.88044	-0.16162
15.	Euthalia aconthea	26	0.05210	-2.95459	-0.15393
16.	Colitis danae	18	0.03607	-3.32229	-0.11983
17.	Phalantaphalanta	19	0.03807	-3.26832	-0.12442
18.	Moduzaprocris	21	0.04208	-3.16818	-0.13331
		499	0.99992		-3.64151
	Hvalue 3.64151				

Table. 3. Shanon Weiner diversity index for butterflies

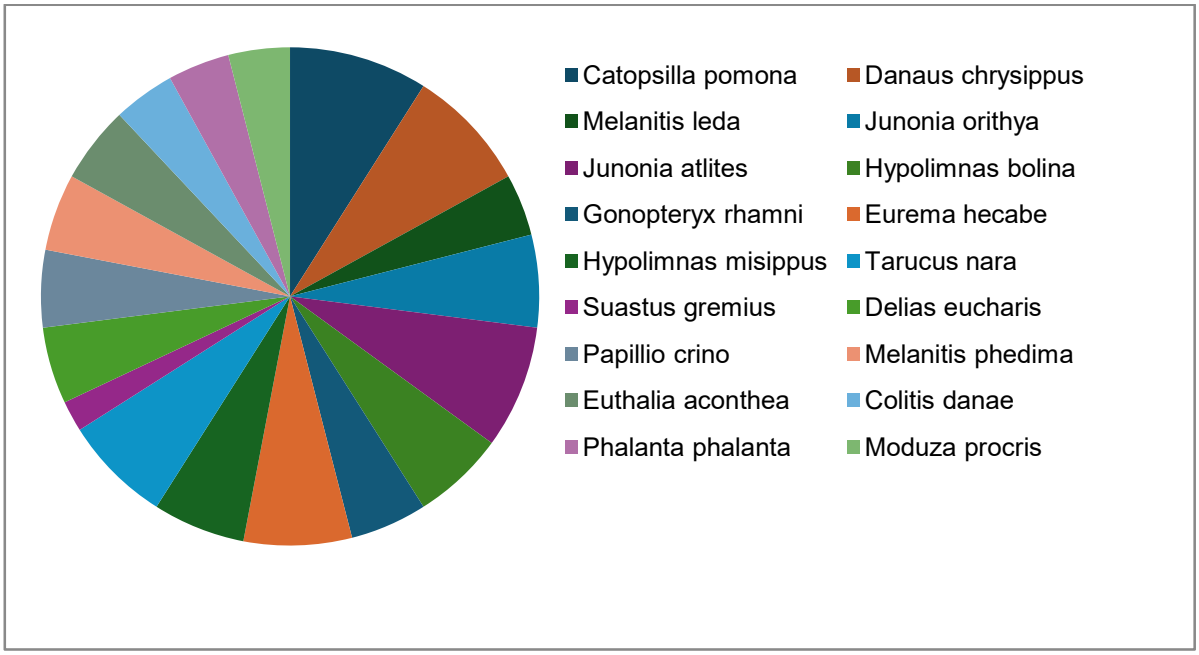

Fig. 1. Percentage of Genus wise distribution of butterflies

ShanonWeiner index for moths

Sr. No.	Families	No. of Genus	No. of species	Pi	In (Pi)	Pi X In (Pi)
1.	Nymphalidae	10	283	0.55555	-0.587796	-0.032246
2.	Pieridae	05	148	0.27777	-1.28096	-1.00319
3.	Lycaenidae	01	31	0.05555	-2.89047	-2.83492
4.	Papilionidae	01	25	0.05555	-2.89047	-2.83492
5.	Hesperiidae	01	12	0.05555	-2.89047	-2.83492
			499	0.99997		-9.540196
	Hvalue 9.540196					

Table. 4. Shanon Weiner diversity index for moths

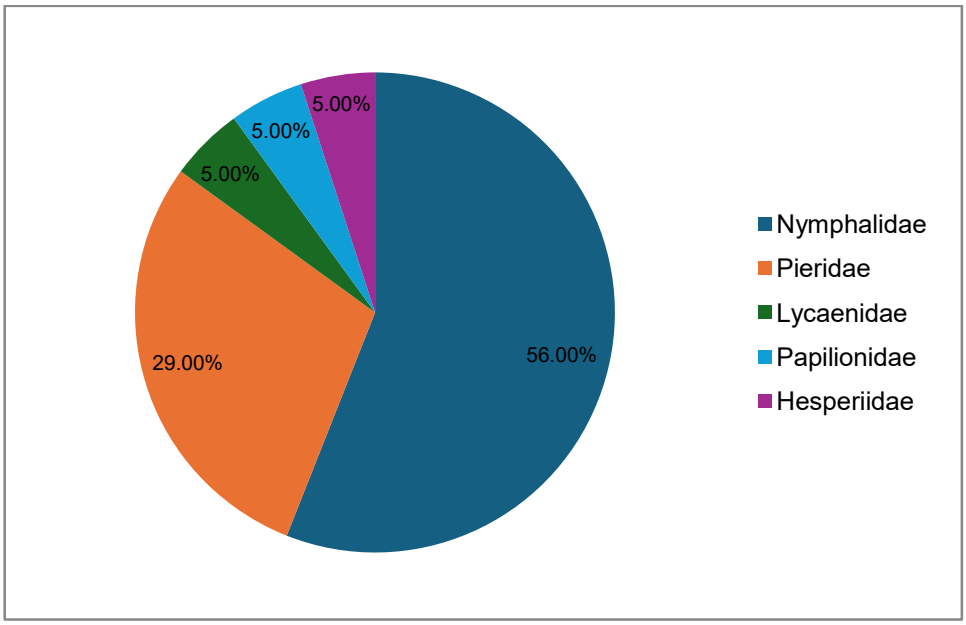

Fig. 2. Percentage of family wise distribution of moths

RESULTS AND DISCUSSION:

Patil et al., in 2013 recorded butterfly families in the decreasing order like: Nymphalidae with 25 species belonging to 17 genera and averaging 49% species richness of total species, followed by Lycaenidae (10 species,9 genera and 21.6%), Pieridae (9 species,7 genera and 17.6%), Papilionidae (5 species,3 genera and 9.8%) and Hesperiidae (2 species, 2 genera,4%), the reduction of species richness and general abundance of butterflies in impacted areas of the

Toranmal Plateau, Nandurbar, Northern (M.S.) has been attributed to habitat destruction in 41 Sq.Km. area where 51 species of butterfly of 38 genera were reported. According to Kunte (1999) and (Andrewartha and Birch,1973) seasonality of butterfly abundance is regulated by resource, mates, predators, pathogen and aggressors and weather. The environmental factors like temperature, rainfall and humidity serve to limit the existence of insects in their habitat or the place in which they live.

In the present investigation at Manewada-Besa and Pipla-Fata area in Nagpur 18 species of butterflies and 09 species of moths were recorded(for names refer table 1 and 2 respectively). In another earlier study carried out, D.R. Saxena has observed parallel evolution that can be regarded as "Molecular Evolution" in host plants containing alkaloids and preference of the same as food by many butterfly larvae and adults, because they have evolved enzyme systems to digest, modify and nullify toxic effects of plant alkaloids. Modified food probably aid in acting as medicine to maintain health and immunity and adapt butterfly to colonize and feed on wide range of vegetations in different habitats which otherwise would not have been possible. Some families or groups of butterflies aggregate (adaptive convergence) or disaggregate to diversify(adaptive radiation) mainly due to respective pheromones evolved and have a role in overcoming climatic adversities like cold, etc., but favour breeding to increase their population. This comes under the scope of "Genetic-Molecular toxicology and Ethology" and is regulated in time and space dimension by "Genetic-Molecular Clock Mechanism" either leading to extinction or extantation of the species concerned. Preference to feed on mono or multispecies of plant depends upon the circadian and circannual "Energy Budget" of animals and has a direct bearing on their population. Phytochemicals probably act as antihormones that alter normal secretion of hormones by their antagonism or may favour secretion of hormones by synergism in the life cycle of insects including Lepidopteran at reproduction and metamorphic stages respectively. In the present study at Nagpur 16 species of butterfly and 6 moth species were sighted in two areas. Y.A. Gadhikar et al., (2013) recorded 8 moth families from in and around Amravati city.

D.R.Saxena and G.J.Tiwary (2020), in their field survey work at Rawanwadi reservoir and forest area in Bhandara district (M.S.) identified 17 species of butterflies belongingto:Nymphallidae (07), Pieridae (05), Lycaenidae (02), Hesperiidae (02) and Papilionoidea (02) respectively.About 12 moth species were recorded belonging to families: Crambidae (05), Geometridae (04), Uraniidae (01), Saturniidae (01), Noctuidae (01) and Sphingidae (01) respectively. They suggested both insitu and exsitu conservation as these creatures enhance the bioaesthetic value and are sources of recreation, and pollinators of plants to mankind. These creatures enhance bioaesthetic value and are a source of recreation for humans, and food for vertebrates. Pyralidae and Erebidae, Geometride, etc; due to urbanization now occur together or dispersed in undisturbed and disturbed habitats.

Lepidopterans (butterfly and moth) are minor-pollinators of Angiosperm plants in forest, agrobios-systems, mangroves, etc. and are important as they provide services to humans. Conservation of honey bees, butterflies, moths and Class insecta is an urgent issue, otherwise

there will be severe decline in food production and lead to hardships like starvation, disruptions in life cycles of human and animals eating to collapse plant and animal kingdom. The authors suggest to promote cross between compatible species of butterflies and moths to obtain hybrid " Buttermoths " to conserve the mixed gene pools (ex-situ restoration to prevent the extinction and cease the rate of extinction of endangered and threatened species of Lepidopterans and insects at the global scale). Incentives must be given to citizens in taxes for maintaining the local, regional and national biota under the “Special Social Biodiversity Conservation Extension Program For Sustenance Of Corridor Concept For Reduction Of Global Poverty".

Shanon Weiner index measures diversity trend in natural animal populations from sample survey data. It provides a picture regarding species richness that reflects the health of environment , currently global warming, climate change deforestation, extinction of vegetation, disturbed rainfall pattern, alterations in temperature (due to solar flares spontaneous heat waves, winter, etc.),rapid decline or absence of ground water levels in specific pockets globally, anthropogenic activities development of metropolitan in urban and semi-urban areas (decline in number and species of migratory birds and endemic birds both , personal communication , D.R. Saxena 2008), change in cropping pattern, are major concerns in the above context. In this investigation at Manewada-Besa and Pipla-Fata areas for the recorded butterflies and moths the statistical calculations indicate (refer tables 3 and 4, pie charts fig. 1and 2): for butterflies values obtained include H = 3.64151, Hmax = 2.89, E = 1.259; for moths H =9.540196, Hmax = 1.60, E =5.9626. This result can be interpreted in connection with above mentioned factors. SWI must be carefully applied for biodiversity queries to seek answers. The relative population density of each moth species being greater than butterfly in the same study area suggests moths robustness regarding adaptation to climate change/ shifts, availability of abundant food, normal breeding cycles eventually favouring increase in number of moths regionally. More scientific model based researches may throw light whether the preferred plant species for above purposes are available to both butterflies and moths if not may be causing decline in butterfly species. Moths cause economic losses to teak as well as non-teak plants. Undernutrition and emergence of diseases (specifically viral) may decline the butterfly species (minor pollinators).Transmission of such disease to moths from butterfly and insects may decline moth species in future. Competition for preferred vegetation by honey bees, lac insect, other insects; predation by spiders, lizard, birds, etc., introduction of invasive animals may be the cause of decline of species richness in case of butterflies; the same may happen in future for moths and all economically significant insects (hypothesis proposed by D.R. Saxena). The authors propose to create awareness for conservation of total global biodiversity by one and all as well as to stabilize exchange of matter and energy in the various ecosystems to combat to revert the climate shift.

CONCLUSIONS:

Authors suggest in-situ conservation of Lepidopterans in gardens, allow citizenslicensed permission to breed them, awareness to conserve flowering plants and incentives of tax discounts

to citizens for this and also award 10 marks to school and collegiate students for the above activities in their exams under the Special Social Extension Program (SSEG).

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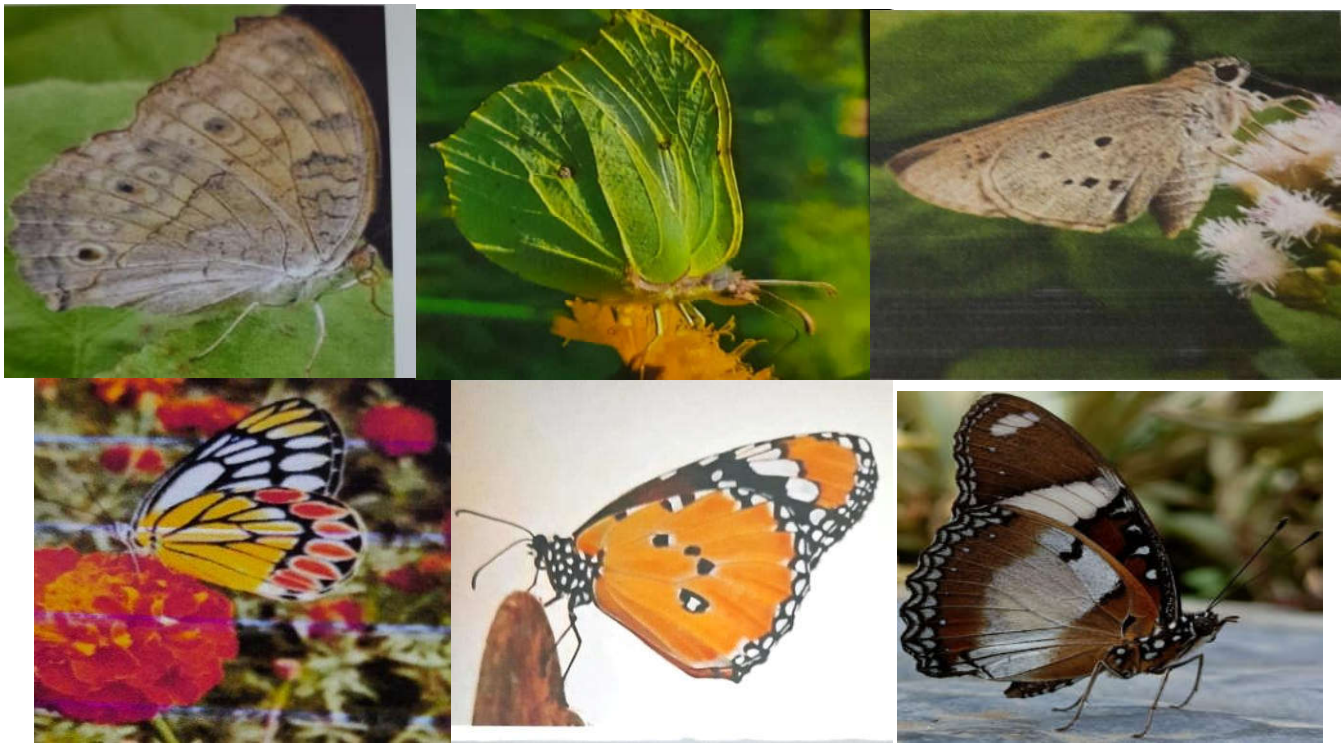

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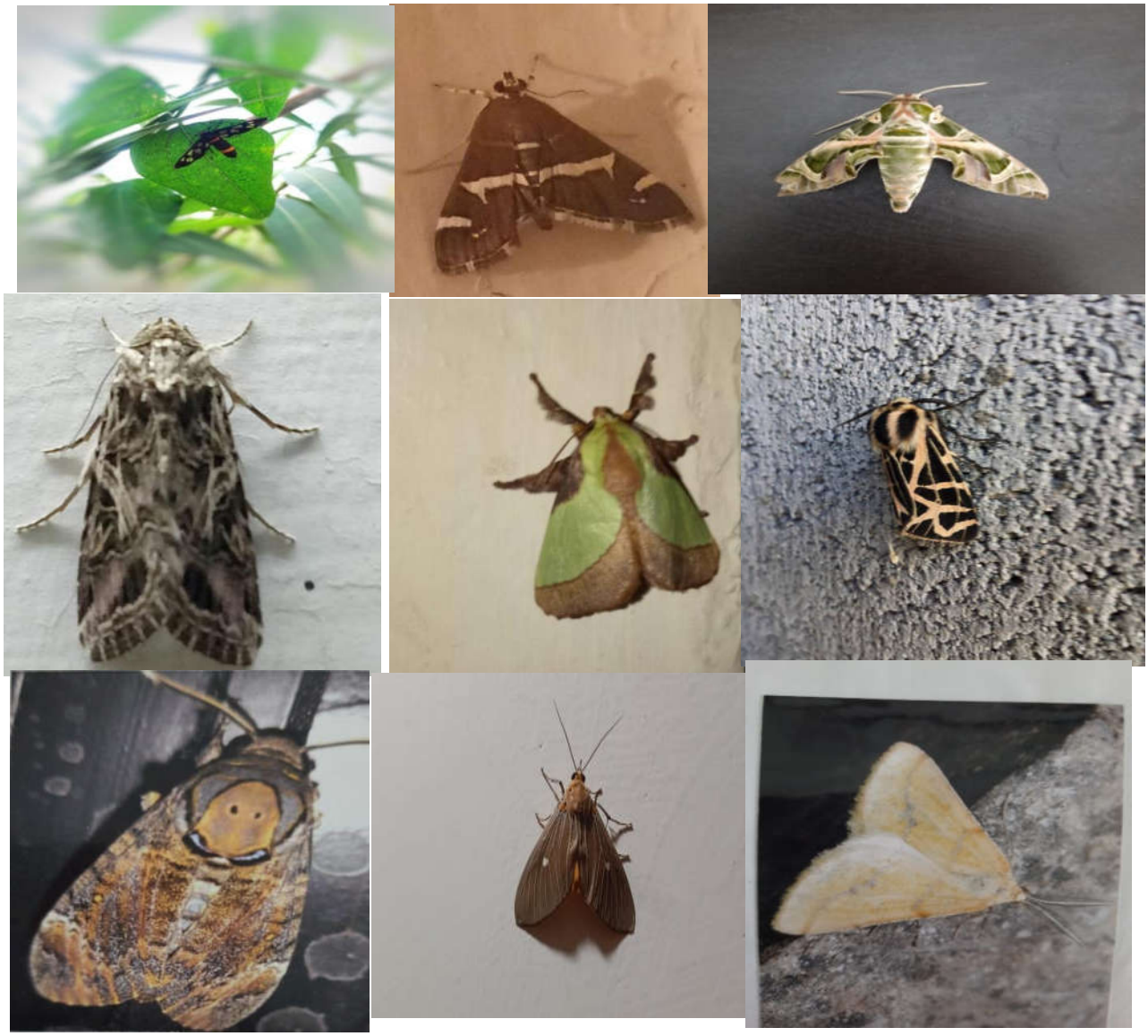

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4. Spodoptera litura 5. Parasaindetermina 6. Grammiaornata
7.Acherontia styx8. Asotacarica 9. Aspitatesochrearia