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Life antiquity of the Indian sunbeam *Curetis thetis* (Lepidoptera: Rhopalocera: Lycaenidae) commencing Southern Andhra Pradesh-India

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Abstract:

The Indian sunbeam Curetis thetis belonged to Lycaenidae or blue butterfly found in Asia. It is on the wing from May to November and breeds almost with high-frequency (June -August) during the periods of monsoon and posts monsoon seasons. Studies were conducted during May 2016 to December 2016 at different study sites in Eastern Ghats of Southern Andhra Pradesh. The development from egg to adult was 17 - 21 days. There was no dormancy stage in the life history. Successful development of adults, larvae, and pupae was 72% – 94% during the study period. Short life cycle and high success development of life stages suggest the production of 3-4 broods in the season.

Key words: *Curetis thetis*, Life history, Instars, univalent, Population index. The Eastern Ghats, Southern Andhra Pradesh

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INTRODUCTION:

Butterflies show a distinct pattern of habitat utilization. The nature of vegetation is a significant factor which regulates the dependence and survival of a species in a particular habitat. Being extremely sensitive to environmental changes, they are easily affected by even relatively minor disturbances in the habitat so much that they have been considered as indicators of ecological quality and are also treated as indicators of the health of an ecosystem. The presence of butterflies emphasizes the availability of larval food plants in great abundance. Plant-feeding insects are estimated to constitute approximately a quarter of the total number of species on Earth (Strong et al., 1984). Since an additional quarter is represented by their host plants on which they feed and lay eggs on, roughly 50% of the diversity of life can be explained by insect-plant interactions (Bernays & Chapman, 1994, Harinath P et al, 2012, Harinath et al., 2014).

Butterflies are one of the most studies invertebrate groups (Boggs et al., 2003). They represent a special case since adults almost exclusively feed on nectar from flowering plants, limiting the acquirements of nitrogen and other important resources to the larval stage. Since life history consequences may vary extensively among hosts, female oviposition choice to a great extent determines offspring future fitness.

Sadly enough, as an effect of landscape fragmentation and mono-deculturization, several butterfly species have become endangered or even extinct while unwanted agricultural pests prosper. Increased knowledge on how host plants affect life-history is necessary to preserve species as well as for protecting crops from caterpillars that may destroy whole harvests without extensive pesticide use. Due to their tremendous success and variability, lepidopterans make excellent model organisms for the study of aposematism,

polymorphism, mimicry, speciation, and the central topic of this thesis - insect-plant interactions. Around the world, butterflies symbol happiness and fragile beauty. Denoted for their extraordinary transformation from larva to imago, this 'ugly duckling' of invertebrates has a tendency to fascinate even people that generally dislike bugs. However, the life of butterflies is (literally) not a bed of roses. Each life stage is associated with challenges. Adults need to feed, find mates, find and appreciate host plants for the offspring, avoid predators etc.

Larvae may be exposed to predators, parasitoids, and competition from other larvae. During molting and pupation, the soft and relatively immobile larvae are even more vulnerable. Another risk larvae face is the possibility of being hatched upon a poor host. In temperate areas, the importance of matching developmental pathway to the season is yet another challenge. The environmental demands shape the life-history of individuals and therefore several traits (physiological as well as behavioral) can be described as responses to phenotypic plasticity. These environmental variables can be illustrated by differences in temperature and day-length as well as the variety of host plants. To study these consequences of host plants utilization and seasonal variation I in this thesis apply The Indian Sunbeam *Curetis thetis* (Figure 4) as my model organism. Now we describe here the life cycle and population index for the Indian Sunbeam butterfly *Curetis thetis* measurements of adults, eggs, larvae, and pupae given here are based on ten samples each.

Classification:

Family	Genus	Species	Sub species	Wing span	Larval host plant	Status
Lycaenidae	*Curetis*	*C. thetis*, 1819	*Lycaena thetis*	42-45 mm	*Pongamia glabra* (Leguminosae)	It is not considered rare

MATERIALS AND METHODS

Study areas were searched for the reproductive activity of the *Curetis thetis* and were found laying eggs on *Pongamia glabra* (Leguminosae) (Beccaloni, George, 2016). The leaf material along with eggs and different larval stages were brought to the laboratory and incubated and further development stages were recorded and the success rates of hatching, larval and pupal development was also recorded. Young leaves were supplied daily to the growing larvae. Searches were made every month for recording the different life stages – egg, larvae, and pupae on 150 plants of *Pongamia glabra* to work out the population index.

Distribution (Fig: 1):

This butterfly normally requires a tropical to the subtropical environment but sometimes ranges into sheltered, hot temperate areas. In Southern Andhra Pradesh the butterfly has at present been encountered at Sri Lankamaleswara reserve forest, of the Eastern Ghats. The host plant, *Pongamia glabra* has been widely recorded in the Sri Lankamaleswara reserve forest areas of Southern Andhra Pradesh, and so there was a good chance that butterfly will be further encountered in these regions (Bingham, C. T. 1907, Strong DR et al., 1984, Bernays EA et al., 1994). It occurs uncommonly in the tropical Southern Andhra Pradesh (Harinath *et al*., 2014), and in the hot, humid, open grassland areas of Eastern Ghats of Southern Andhra Pradesh. The early stages of known breeding populations of the butterfly in the Far North Region of Sri Lankamaleswara reserve forest are heavily parasitized by flies and wasps, and this would suggest that these populations are relatively sedentary (Harinath *et al*., 2012). However, the butterfly probably has some degree of nomadic dispersal ability with breeding stocks being replenished from interstate due to

the butterflies following the major creek-lines down into Eastern Ghats of Southern Andhra Pradesh during periods of good tropical rain.

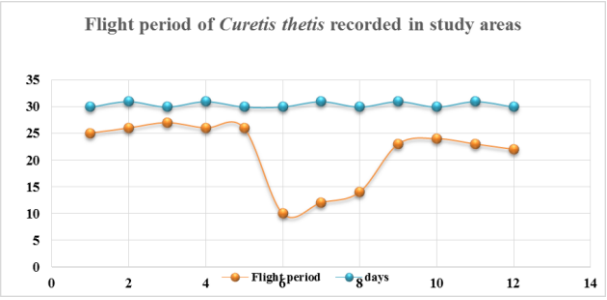

Fig-1 Flight period of *Curetis thetis* recorded in study areas.

Field observation of butterfly behavior:

The species was uncommon study area Sri Lankamaleswara reserve forest (14°45' - 14°72' N & 79°07' - 78°80' E) (Fig:2) there was a better chance of finding larval stages of this species on its host plant *Pongamia glabra* (Leguminosae).Then seeing the adults up close. The fast flying adults have been observed to visit flower for nectar. Both sexes fly mainly at dusk and dawn although they can be seen during the day time if conditions are overcast. They fly very rapidly, always keeping very close to the ground.

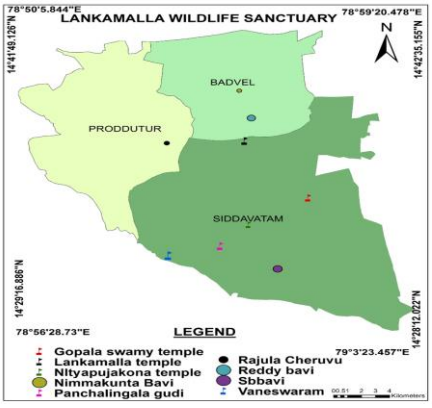

Fig: 2 Study areas Map.

RESULTS

OVIPOSITION HOST PLANTS (Fig: 3)

The Indian Sunbeam *Curetis thetis* largely located in the places where damp patches near streams and rivers and food plants are abundant (Wynter-Blyth et al.,1957, Kunte K (2000)). Adults are found laying eggs mostly after the rainy seasons. The larvae are found in large number on food plants. *Pongamia glabra* serves both as larval host plant and adult nectar host, other host plants *Pithecellobium* (Mimosaceae), *Murraya, Toddalia* (Rutaceae) and *Camellia* (Theaceae), according to locality and availability. It was also seen feeding on *Ricinus communis*. They feed mostly on *Pongamia glabra, Pongamia pinnata*.

Fig: 3 larval host plant *Pongamia glabra*

MORPHOLOGY:

Male:

Upper side:

Ground color similar but of a slightly paler shade in all the specimens. Fore wing: costal and terminal margins edged more broadly with black than in *thetis*, the inner margin of this color forms a regular strongly curved arch from the base of the wing to tornus, not angulate at all opposite apex of wing, the edging

of the coastal margin not jagged on the inner side. Hind wing: the coastal margin not pale but somewhat broadly dusky black; the terminal black edging broader than in *thetis*, not linear, produced for a very short distance up each vein. The irrigation of dusky scales at the bases of both fore and hind wings and along the dorsal area of the hind wing heavier and more broadly diffused, especially on the latter. Underside: as in the typical form. Antenna, head, thorax, and abdomen similar (Harinath et al.,2012).

Female:

Upper side:

Ground colour darker brownish black, deep opaque black on the costa, apex and terms of the fore wing; the medial oval white patch on the fore wing smaller, the upper discal white band on the hind wing narrower, the short, broad black streak from base terminates in a large round spot or patch inwardly merged in the ground colour which fills the whole area of the cell.

LIFE HISTORY STAGES: (FIG. 4)

EGGS:

The eggs are laid singly or in small groups of 2-3 on young shoots. They are white and bun shaped with a flatted base. Prominent ridges are present running from pole to base. The entire egg turns pinky red as it develops and then decolorizes as the caterpillar was ready to emerge. It takes 2- 3 days for hatching

Food plants:

The larva has been recorded as feeding on *Pongamia glabra*, *Derris scandens*, *Abrus precatorius* (Leguminosae), *Xylia dolabriformis* and *Heynia trijuga* (Meliaceae) (Venkata Ramana S.P et al.,2014, Kehimkar, I. 2008).

Larvae:

On emergence eats a hole through the top of the egg about equalling one-third of its surface and crawls out. The empty shell has a close superficial resemblance to an echinus shell. In color pale ochreous, furnished with long stout white hairs of which a sub dorsal series was on each side, with one long hair springing from the apex of each tubercle; there are, besides, other lateral series and numerous hairs projecting forwards in front of the head and backward over the anal segment. The full-grown larva was the most beautiful known to me among the Lycaenidae of the exact shade of green of the leaves on which it feeds (Pierce, Naomi E, 2002). The second segment was quite unmarked; the third to the thirteenth has a sub dorsal series of short oblique pale yellowish green lines between which the ground colour is paler than the rest of the body; There was a dark green dorsal line; on each side of the ninth segment there was a prominent pure dead white, somewhat diamond shaped mark. The larvae have tentacular organs as seen on myrmecophilous lycaenids, but they have not been observed to be tended by ants. (DeVries, P. J. 1984, Fiedler et al, 1992, Pierce et al., 2002)

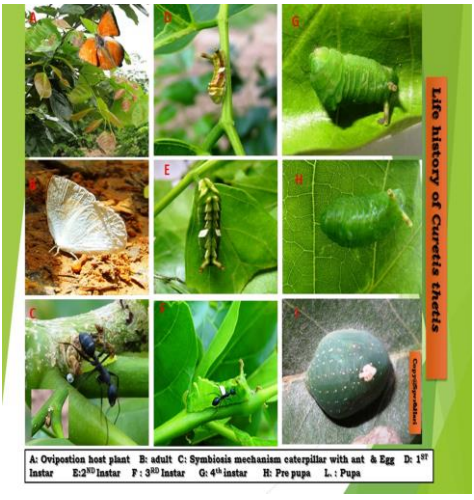

Fig. 4. Life cycle of the Indian sunbeam *Curetis thetis*

Instar I: This stage lasts for 2-3 days.
Instar II: This stage lasted 3-4 days, it measures around 0.91 (±0.05) mm.
Instar III: This stage lasted for 3 to 4 days. It reached a length of 1.23 mm and a width of 1.00 to 1.10mm.
Instar IV: This stage lasted for 3 to 4 days and grows to a length of 1.66 mm and 1.23 – 2.00 mm in width.
Pre-pupal stage: This stage lasted for 03-04days. At this stage, the larva stops feeding get shortened in length.
Pupa: This stage lasted for 03-04days. Light green; Wing cases bluish green. "There was a conspicuous heart shaped pale ochreous mark on the top of the thorax, the pits on it filled in with reddish pigment." (de Nicéville) The pupae are capable of producing sounds and the function of these are not fully understood (Downey, John C. 1966).

POPULATION INDEX: (FIG.5)

The numerical frequency of the natural occurrence of the life stages – eggs, larvae, and pupae, on the host plant, was given in figure- 1. All the stages could be spotted out during August to November which corresponds post monsoon in the study locality. However, there was a higher frequency of occurrence of the life stages during June to August which corresponds with the post monsoon season (Fig: 5).

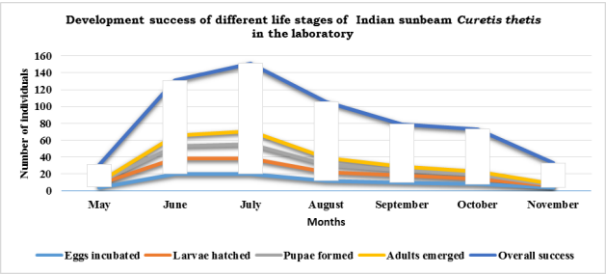

Fig. 5.Population index of eggs, larvae, pupae of *Curetis thetis* based on the searches of 150 *Pongamia glabra* plants.

CONCLUSION

The total period of development from egg to emergence of an adult was estimated to be 17 - 23 days. This was a relatively short period and may enable the butterfly to have more broods yearly (Gunathilagaraj *et al.1*998, Kunte, 2000, Harinath., *et al.* 2012). During this period laboratory study of hatching success rate ranged between 51 – 91% larval development success rate between 51 – 88%, pupal development success between 51 – 88%. With the three lifecycle stages, there was a higher success rate recorded between June to August (Fig: 5).

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REFERENCES:

1. Bingham, C.T. (1907). The Fauna of British India, Including Ceylon and Burma. II (1st ed.). London*:* Taylor and Francis, Ltd.
2. Beccaloni, George; Scoble, Malcolm; Kitching, Ian; Simonsen, Thomas; Robinson, Gaden; Pitkin, Brian; Hine, Adrian; Lyal, Chris. "The Global Lepidoptera Names Index (LepIndex)*"*. Natural History Museum, London. *Retrieved 2016-10-15*.
3. "Markku Savela's website on Lepidoptera".
4. Wynter-Blyth, Mark Alexander (1957). Butterflies of the Indian Region. *Bombay, India:* Bombay Natural History Society. ISBN 978-8170192329.

5. Pierce, Naomi E., Michael F. Braby, Alan Heath, David J. Lohman, John Mathew, Douglas B. Rand, and Mark A. Travassos 2002. "The Ecology and Evolution of Ant Association in the Lycaenidae (Lepidoptera)" Annual Review of Entomology 47: 733-771
6. Downey, John C. 1966. "Sound Production in Pupae of Lycaenidae". Journal of The Lepidopterists' Society 20(3).
7. DeVries, P. J. 1984. "Of crazy-ants and Curetinae: are Curetis butterflies tended by ants?" Zool. J. Linnean Soc. 79: 59-66.
8. Harinath. P, Prasanna Kumar. V, and Venkata Ramana S.P.. 2012 Eco-biology of the Common Banded Awl *Hasora chromus* (Cramer) (Lepidoptera: Rhopalocera: Satyridae) from southern Andhra Pradesh. Bulletin of Pure and Applied Sciences. Vol.31A (Zoology), Issue No.1,:P.23-28.
9. Venkata Ramana S.P., Harinath P. and Prasanna Kumar V. 2014 Life history of the dark grass blue *Zizeeria Karsandra* (Lepidoptera: Rhopalocera: Lycaenidae) from southern Andhra Pradesh – India. Cibtech Journal of Zoology. Vol. 3 (1) January-April, pp.1-6.
10. Kehimkar, I. 2008. The book of Indian Butterflies. Bombay natural history society, Oxford University Press, Oxford, New York. pp. 497.
11. Wynter-Blyth, Mark Alexander (1957). Butterflies of the Indian Region. Bombay, India: Bombay Natural History Society. p. 498.
12. Strong DR, Lawton JH & Southwood SR (1984) Insects on plants. Harvard University Press, Cambridge, Massachusetts.

13. Bernays EA & Chapman RF (1994) Host-plant selection by phytophagous insects. Chapman & Hall, Inc., New York.
14. Gunathilagaraj K, Perumal TNA, Jayaram K and Ganesh Kumar M (1998). Some South Indian butterflies. Nilgiri Wild life and Environment Association Nilgiris.
15. Kunte K (2000). Butterflies of Peninsular India (University Press, Hyderabad) 254.
16. Harinath P, Prasanna Kumar V and Venkata Ramana SP (2012). Eco-biology of the Common Banded Awl *Hasora chromus* (Cramer) (Lepidoptera: Rhopalocera: Satyridae) from southern Andhra Pradesh. Bulletin of Pure and Applied Sciences 31A (1) 23-28.
17. Harinath P, Prasanna kumar.V and Venkata Ramana S.P. Ecobiology of the Common Pierrot *Castalius rosimon* (Fabricius) (Lepidoptera: Rhopalocera: Lycaenidae). World Journal of Zoology 2012. 7 (3): 216-220.
18. Harinath. P, Suryanarayana.K, Prasanna Kumar.V and Venkata Ramana S.P. Biology and food efficiency of the dark blue tiger butterfly *Tirumala septentrionis* (Lepidoptera: Rhopalocera: Danaidae) in southern Andhra Pradesh. Research Journal of Biology, 2014. 2: 122 – 131