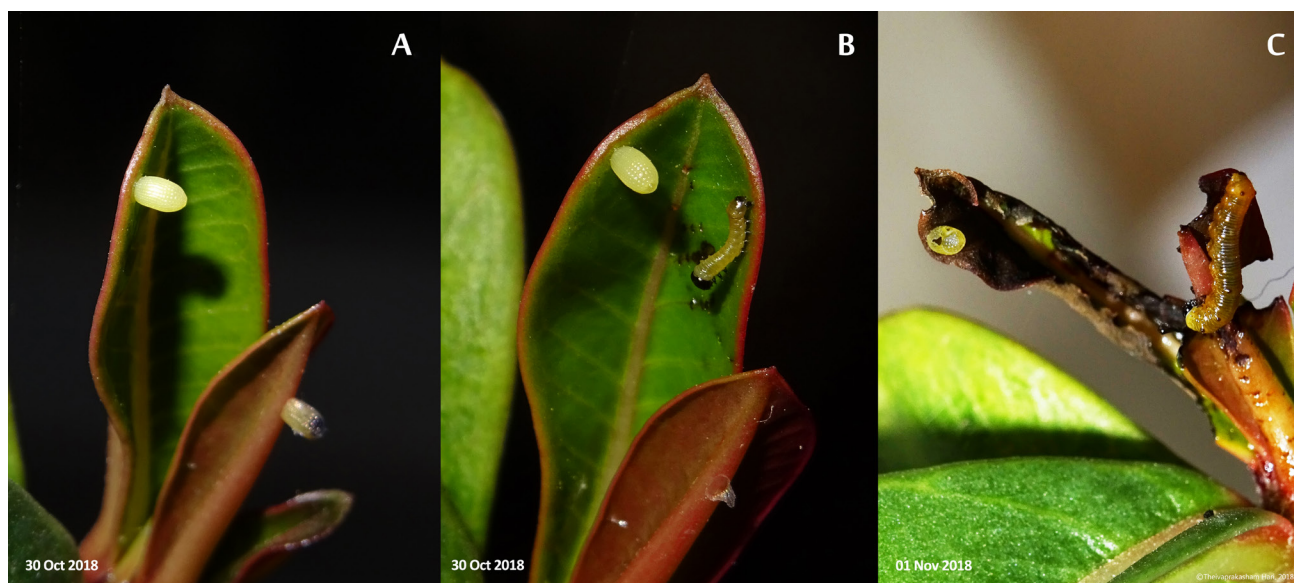




Cannibalistic behaviour in an early instar larva of Common Crow butterfly



A—Eggs of *Euploea core* butterfly | B—Eclosed larva of *Euploea core* | C—Cannibalized egg (left) and the second instar larvae (right) of *Euploea core* butterfly. ©Theivaprakasham Hari.

Most of the butterflies are phytophagous. On rare occasions, the larva will turn cannibalistic for a period of time either regularly or in the absence of sufficient food supply (Nakahara et al. 2020). Many of the butterflies under the family Papilionidae were reported to be cannibalistic (Dethier 1937); especially, the butterflies that feed on Aristolochiaceae family of plants, namely, *Pachliopta hector* Linnaeus, 1758, *Troides minos* Cramer, 1779, *Pachliopta aristolochiae* Evans, 1932, *Battus philenor* Linnaeus, 1771 (Nishida & Fukami 1989). The propensity for cannibalism is also found among the family

Pieridae. The butterflies belonging to the genus *Appias*, namely, *libythea* Fabricius, 1775 and *lyncida* Moore, 1881, eat freshly-formed pupae of their own species, larvae in the process of under moulting and also the larvae and pupae *Leptosia nina* Fabricius, 1793 and *Pontia sisymbryii* Boisduval, 1852 (James 2017). The butterfly larvae from the family Lycaenidae, namely, *Acytolepis*, *Tarucus* (Theivaprakasham pers. obs. 2016), *Tajuria*, *Rapala*, *Arhopala*, *Zesius*, and *Amblypodia* are cannibalistic (De Niceville 1900). Bell (1919) observed that *Zesius chrysomallus* Hübner, 1819 were the greatest

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Close up view of the cannibalized egg by the first and second instar larva of *Euploea core* butterfly. ©Theivaprakasham Hari.

cannibals with respect to larvae of certain Lycaenidae. Under the butterfly family Nymphalidae, *Elymnias hypermnestra* Linnaeus, 1763 (James 2017) and butterflies belonging to subfamily Danainae family, namely, *Danaus chrysippus* Linnaeus, 1758, *Danaus plexippus* Linnaeus, 1758, *Danaus gilippus berenice* Cramer, 1779, and *Euploea core* Cramer, 1780, were reported to cannibalize the eggs (Dixon et al. 1978). Some other butterflies from the family Nymphalidae feeding on family Passifloraceae

plants, namely, *Acraea terpsicore* Linnaeus, 1758 (Haribal 1992) and *Heliconius* undergo larval cannibalism (Merrill et al. 2013). The cannibalistic behavior of newly hatched larva that occurs under crowded conditions in the absence of sufficient food has been reported in some butterfly species namely *Danaus chrysippus* Linnaeus, 1758 (Dixon et al. 1978), *Danaus plexippus* Linnaeus, 1758, *Danaus gilippus berenice* Cramer, 1779 (Brower 1961), *Pieris rapae* Linnaeus, 1758 (Watanabe & Yamaguchi

1997), *Colias alexandra columbiensis* Ferris, 1973 in laboratory conditions (Hayes 1982) and *Anthocharis cardamines* Linnaeus, 1758 (Feltwell 1982).

In the present study, we provide evidence that under natural conditions, the larva of the *Euploea core* undergoes egg cannibalism.

The observations were made from the author's garden (11.030N, 76.902E) located at Coimbatore, Tamil Nadu, India. Two female adult butterflies were seen ovipositing an egg each on the tender leaves of *Adenium obesum* (family Apocynaceae) on 28 and 29 October 2018. The plant having eggs was isolated for further observations. On 30 October 2018 evening, a larva emerged out of the first egg (laid on 28 October 2018). The enclosed larva was observed feeding its own hatched egg shell completely. The larva was wandering on the leaf surface

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thereafter. Before feeding on the leaf, the larva was observed to make marks on the leaves through lesions after which they feed on the leaves. On 31 October 2018, the larva was found to feed on the tender leaves followed by partial nibbling of the unhatched second egg. The close-up image of a partially nibbled egg of *Euploea core* is given in Image 2. The next day afternoon (01 November 2018), the larva moulted to the second instar stage. The second instar larva also continued to feed the unhatched egg completely.

The observation described in this paper has shown that the first and second instar of Common Crow *Euploea core* (Cramer, [1780]) exhibit the behaviour of egg cannibalism under natural conditions for a considerable period of time after hatching. Egg cannibalism was commonly observed in some early-stage larva of Danainae when reared in Petri dishes. But, a similar occurrence was rare in natural field conditions (Dixon et al. 1978) as the eggs are laid singly on the leaf of the host plant and very rarely more than one egg on the same leaf (Wynter-Blyth 2009; Zalucki & Kitching 1982). Feltwell (1982) and Hayes (1982) have pointed out that the intra-competition for the food resources due to crowding of larvae as the main reason for egg cannibalism. Brower (1961) observed that in the Monarch and Queen butterfly, the percentage of eggs

cannibalized by hatching larvae increases as the initial egg density is increased and this mortality factor is density-dependent.

But in the present observation, the oviposition of two eggs each on different leaves of the same leafy plant invalidates crowding density as a reason for egg cannibalism. The larva had plenty of leaves on the plant as the food resources for survival which negates starvation (Dethier 1937; Cottrell 1984) as a significant ground for egg cannibalism. The significant observation to note in this study is that both the eggs were laid on the tender leaves. Most of the early instar butterfly larvae prefer to feed on young tender leaves (Wynter-Blyth 2009). Coley et al. (2006) observed that the butterfly larva showed doubled growth rates when fed on young leaves than those on mature leaves. In addition, the hardness of the old leaves can also impair the young larva mastication since their mandibular apparatus is very delicate (Bittencourt-Rodrigues & Zucoloto 2009). Hence, the competition for the tender leaf as a food source to the earlier instar would have induced egg cannibalism. Also, the observation of larva to feed on leaf and cannibalize the egg alternatively is unreported elsewhere. Brower (1961) notes that the locomotor activity of larva devouring the shell would cease after the feeding of eggshell due to the chemotactic stimulus from the shell. It would enable the larva to

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initiate the instinctive behavior of feeding on the leaves. Hence the intuitive feeding on the nearby egg is avoided and egg cannibalism is rarely observed in butterflies.

The population stabilization of butterflies in the environment continues through complex food chains combined with other climatic factors and environmental factors like food plant availability and predation (Booton et al. 2019). The larva of the *Euploea core* obtains toxic cardiac glycosides from their food plants. Usually, the larva of the *Euploea core* is less predated by predators because of its unpalatableness (Dixon et al. 1978). Due to lower predation chances of *Euploea core*, the cannibalistic behavior of eggs in the *Euploea core* indicates to be an important strategy for stabilizing their population. However, cannibalism can strongly affect population density when resources are limited and show a density-dependent effect on population dynamics (Brower 1961).

This study presents the new observation of egg cannibalism by the larva of *Euploea core* (Cramer 1780). The findings of this study may open the way for further understanding the role of larval egg cannibalism in intra-species dynamics and population stability. The availability of cannibalistic studies about the butterflies of Indian subcontinent is less. Further observations and laboratory studies of mass breeding in natural and laboratory

conditions will help to understand the causes of egg cannibalism and the butterfly larva's survival strategies.

References

- Bell, T.R. (1919).** The common butterflies of the plains of India (including those met with the hill stations of the Bombay Presidency). *Journal of the Bombay Natural History Society* 26: 941–954.
- Bittencourt-Rodrigues, R.S. & F.S. Zucoloto (2009).** How feeding on young and old leaves affects the performance of *Ascia monuste orseis* (Godart) (Lepidoptera, Pieridae). *Revista Brasileira de Entomologia* 53: 102–106.
- Booton, R., R. Yamaguchi & Y. Iwasa (2019).** A population model for diapausing multivoltine insects under asymmetric cannibalism. *Population Ecology* 61(1): 35–44. <https://doi.org/10.1002/1438-390X.1012>
- Brower, L.P. (1961).** Experimental analyses of egg Cannibalism in the Monarch and Queen Butterflies, *Danaus plexippus* and *D. gilippus berenice*. *Physiological Zoology* 34(4): 287–296. <https://doi.org/10.1086/physzool.34.4.30161207>
- Coley, P.D., M.L. Bateman & T.A. Kursar (2006).** The effects of plant quality on caterpillar growth and defense against natural enemies. *Oikos* 115(2): 219–228.
- Cottrell, C.B. (1984).** Aphytophagy in butterflies: its relationship to myrmecophily. *Zoological Journal of the Linnean Society* 80(1): 1–57. <https://doi.org/10.1111/j.1096-3642.1984.tb02318.x>
- De Niceville, L. (1900).** The food-plants of the butterflies of the Kanara District of the Bombay presidency with a revision of the species of butterflies there occurring. *Asiatic Society of Bengal* 69(2): 187–278.
- Dethier, V.G. (1937).** Cannibalism Among Lepidopterous Larvae. *Psyche* 44(4): 110–115. <https://doi.org/10.1155/1937/19727>
- Dixon, C.A., J.M. Erickson, D.N. Kellett & M. Rothschild (1978).** Some adaptations between *Danaus plexippus* and its food plant, with notes on *Danaus chrysippus* and *Euploea core* (Insecta: Lepidoptera). *Journal of Zoology* 185(4): 437–467. <https://doi.org/10.1111/j.1469-7998.1978.tb03344.x>

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Feltwell, J. (1982). *Large White Butterfly: The Biology, Biochemistry, and Physiology of Pieris Brassicae* (Linnaeus). Springer Netherlands.

Haribal, M. (1992). *The Butterflies of Sikkim Himalaya and Their Natural History*. Gangtok, Sikkim: Sikkim Nature conservation Foundation.

Hayes, J.L. (1982). Diapause and diapause dynamics of *Colias alexandra* (Lepidoptera: Pieridae). *Oecologia* 53(3): 317–322. <https://doi.org/10.1007/BF00389007>

James, D.G. (2017). *The Book of Caterpillars: A Life-Size Guide to Six Hundred Species from around the World*. The University of Chicago Press Books.

Merrill, R.M., R.E. Naisbit, J. Mallet & C.D. Jiggins (2013). Ecological and genetic factors influencing the transition between host-use strategies in sympatric *Heliconius* butterflies. *Journal of Evolutionary Biology* 26(9): 1959–1967. <https://doi.org/10.1111/jeb.12194>

Nakahara, T., J. Horita, R.D. Booton & R. Yamaguchi (2020). Extra molting, cannibalism and pupal diapause under unfavorable growth conditions in *Atrophaneura alcinous* (Lepidoptera: Papilionidae). *Entomological Science* 23(1): 57–65. <https://doi.org/10.1111/ens.12399>

Watanabe, M. & H. Yamaguchi (1997). Egg cannibalism by newly hatched larvae of the small white butterfly, *Pieris rapae crucivora* (Pieridae), on an artificial diet. *Journal of the Lepidopterists' Society* 51(4): 304–315.

Wynter-Blyth, M.A. (2009). *Butterflies of the Indian Region*. Today & Tomorrow's Printers and Publishers. Retrieved from <https://books.google.co.in/books?id=kdLDv-jw4P0C>

Zalucki, M.P. & R.L. Kitching (1982). Temporal and spatial variation of mortality in field populations of *Danaus plexippus* L. and *D. chrysippus* L. Larvae (Lepidoptera: Nymphalidae). *Oecologia* 53(2): 201–207. <https://doi.org/10.1007/BF00545664>

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