



FORTUITOUS INTRODUCTION OF *LANTANOPHAGA PUSILLIDACTYLUS* (WALKER) INTO NEPAL

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ABSTRACT

The neotropical plant, *Lantana camara* L., introduced as an ornamental plant to several countries, has become an invasive weed. It was first reported from Nepal in 1848. About 50 countries have introduced natural enemies for suppression of the weed. India, Nepal's neighboring country, initiated biological control of this weed in 1916 and reported the occurrence of *Lantanophaga pusillidactylus* Walker. In a recent survey, the Feed the Future Nepal Integrated Pest Management project found larvae of this insect feeding on flower heads of *L. camara* in Nepal. This communication reports the first discovery of *L. pusillidactylus* in Nepal on March 13, 2023.

Key words: *Lantana camara*, *Lantanophaga pusillidactylus*, fortuitous introduction, biological control of a weed, Invasive species management

The alien invasive weed, *Lantana camara* L. (Verbanaceae) is neotropical in origin and pantropical in distribution. It invades pastures, orchards, plantations, forests, vacant lands, and roadsides and it has established in about 70 countries worldwide (Day et al., 2003). It was introduced into the Royal Botanic Garden in Calcutta (now known as the Acharya Jagadish Chandra Bose Botanic Garden, Kolkata), India in 1809 as an ornamental plant, and subsequently introduced in other places. Since then, it has escaped cultivation and become a serious weed (Rao et al., 1971). It was first reported from Nepal in 1848, and, currently, is distributed in the elevations from 70 to 1715 (masl) (Shrestha, 2016). *Lantana camara* is a composite species. While it is thought to have evolved from two or more species, over 650 varieties are known to exist (Day et al., 2003). It grows as individual clumps or dense thickets, displacing desirable species (Day and Zalucki, 2009). It is highly allelopathic, reduces productivity of orchards, and pastures and interferes with the movement of wildlife in forests. Options available to manage this weed include use of chemical herbicides, mechanical removal, use of fire, adoption of cultural methods, and release of biological agents. Of these, biological control is the most preferred long-time option considering its establishment in forests, orchards, pastures, fences, vacant lots, slopes and remote areas.

Hawaii was first to import and introduce natural enemies of *L. camara* from Mexico in 1902. Since then, 41 agents have been released in 50 countries resulting

only in partial suppression and inadequate control (Julien and Griffiths, 1998; Day et al., 2003). From November 15, 1916 to March 31, 1919, Ramachandra Rao conducted a survey of arthropods recruited by *L. camara* in India and Burma (now Myanmar). He recorded 148 insects, two pathogenic fungi and one parasitic plant associated with *L. camara* (Ramachandra Rao, 1920). Of these, occurrence of one, a flower feeder *Lantanophaga (Platyptilia) pusillidactylus* (Walker) (Lepidoptera: Pterophoridae), and a native of Mexico and the Caribbean region, was recorded in the survey. Most likely it was fortuitously introduced to India with the imported *L. camara* plant material. In fact, *L. pusillidactylus* was one of the insects imported by the Hawaii Department of Agriculture from Mexico for control of *L. camara* in 1902 (Perkins and Swezey, 1924). From Hawaii, it was introduced to Pohnpei in 1948 and from there to Palau in 1960. Since then, it has fortuitously established in several Micronesian Islands (Denton et al., 1991; Muniappan, 1988; 1989; Muniappan and Reddy, 2003). Currently *L. pusillidactylus* has established in Australia, Federated States of Micronesia, Guam, Hawaii, New Zealand, Northern Mariana Islands, Palau, Papua New Guinea, and Solomon Islands in Oceania; Bhutan, China, Hongkong, India, Indonesia, Israel, Myanmar, Philippines, Sri Lanka, Taiwan, Thailand, and Vietnam in Asia; Canary Islands, Cape Verde, Democratic Republic of Congo, Republic of Congo, Egypt, Eswatini, Ivory Coast, Madagascar, Madeira, Malawi,

Mauritius, Morocco, Namibia, Nigeria, Reunion, Saint Helena, Seychelles, South Africa, Tanzania, Zambia, and Zimbabwe in Africa; and Cyprus, Italy, Malta, and Portugal in Europe; and Argentina, Barbados, Bermuda, Brazil, Cuba, Dominican Republic, Ecuador, Galapagos, Grenada, Guiana, Jamaica, Mexico, Paraguay, Peru, Puerto Rico, Surinam, Virgin Islands, and U.S.A. in the Americas (Agius, 2017; Day et al., 2003; Day and Zalucki, 2009; De Prins and de Prins, 2017); Ramachandra Rao, 1920). This moth is one of the few lantana agents that can tolerate wide climatic conditions (Day et al., 2003).

On March 13, 2023, the Feed the Future Nepal Integrated Pest Management (FTFNIPM) project found *L. pusillidactylus* on *L. camara* at Mehelkuna, Gurbhakot municipality, Surkhet district, Karnali province, Nepal (28.43675227422874, 81.84756356309164) (Fig. 1). It lays individual eggs on flower buds and the eggs hatch in four days. Larvae bore in to the flower buds and each larva can destroy at least 15 to 20 flowers in a flower head as a result the flower head carries only 3 or 4 berries instead of a large bunch. Pupation takes place in a silken cocoon in the flower head. In Guam, Muniappan (1988) reported it to infest 32% to 83% flower heads in different parts of the island. In his study from 1916 to 1919, Ramachandra Rao (1920) reported

L. pusillidactylus as one of the most efficient of the insects on lantana in India. He also noted that one egg parasitoid, some larval parasitoids and a predator of the pupa *Icaria* sp. (Hymenoptera: Vespidae) affect the efficacy of this insect.

This is a first report of a fortuitous introduction of *L. pusillidactylus* on *L. camara* in Nepal. Earlier reports of such fortuitous introductions include natural enemies of the weeds *Parthenium hysterophorus* L. (Asteraceae) and *Ageratina adenophora* (Spreng.) R.M. King & H. Robinson (Asteraceae). The leaf feeding beetle *Zygogramma bicolorata* Pallister (Coleoptera: Chrysomelidae) and winter rust *Puccinia abrupta* Diet. & Holw. var. *parthenicola* (Jackson) (Pucciniales: Pucciniaceae) of *P. hysterophorus* and the stem galling fly *Procecidochares utilis* Stone (Diptera: Tephritidae) and the leaf spot fungus *Passalora ageratinae* Crous and A.R. Wood (Capnoidales: Mycosphaerellaceae) of *A. adenophora* were introduced (Shrestha, 2016).

Even though *L. camara* has been recognized as an exotic invasive weed in forests and shrublands in Nepal (Shrestha, 2016), no control method has been adopted except manual digging out the clumps in a few cases. *Lantanoaphaga pusillidactylus* is the first natural enemy of *L. camara* to be reported from Nepal. A systematic

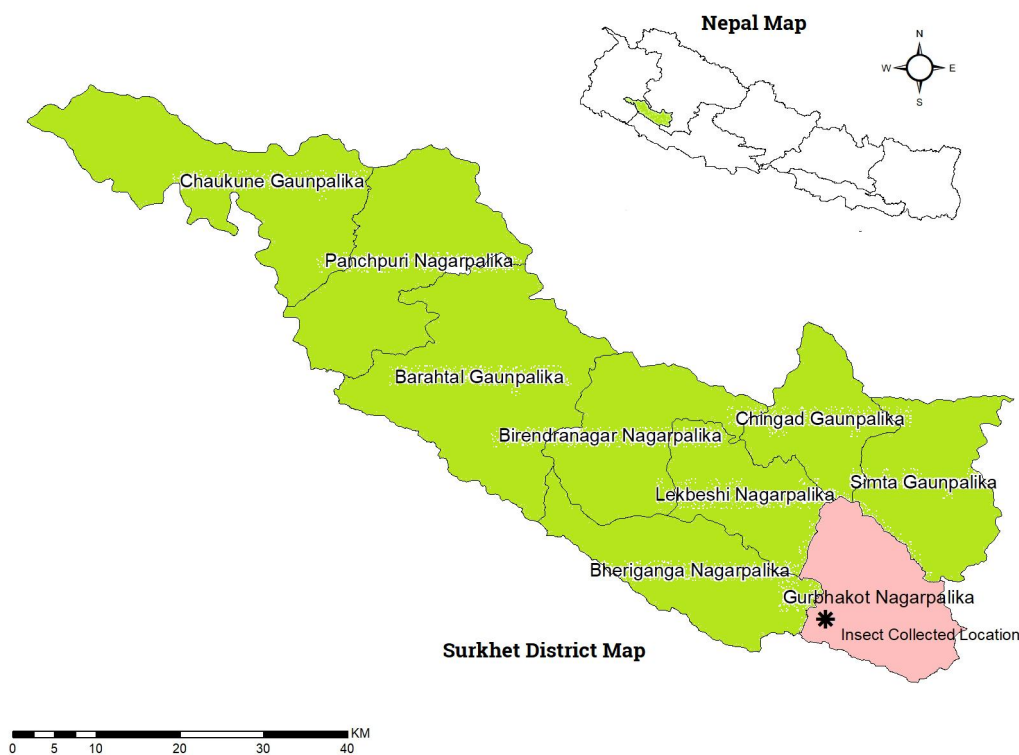


Fig. 1. Location of first finding of *L. pusillidactylus* in Nepal

survey of natural enemies recruited by *L. camara* in Nepal would form a baseline study for any future biocontrol activities to be taken up.

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AUTHORS CONTRIBUTION STATEMENT

R M conceived and R M and L S conducted field surveys. R M wrote the manuscript. All authors read and approved the manuscript.

CONFLICT OF INTEREST

No conflict of interest.

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