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NEW HOST ASSOCIATIONS AND DISTRIBUTION RECORDS OF NATURAL ENEMIES OF BANANA PESTS

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ABSTRACT

New distribution records and host associations of natural enemies of banana insect and mite pests are reported. These include eight parasitoids (two trichogrammatids, two mymarids, two encyrtids, one pteromalid, one scelionid) and twelve predators (one thrips, two staphylinids and nine coccinellids). Two egg parasitoids, *Prosoligosita perplexa* Hayat & Husain and *Epoligosita duliniae* Livingstone and Yacoob are reported for the first time from banana tingid, *Stephanitis typica* (Distant). *Prosoligosita perplexa* is also recorded for the first time from South India and this is the first host record for this genus. Details of host associations are provided for the other bioagents recorded.

Key words: Banana, insect pests, mites, natural enemies, parasitoids, predators, scales, tingid, new record, distribution, India, Tamil Nadu.

Horticultural ecosystems provide ideal habitats for biological control in view of their perennial nature and the long duration of the crops. Biological control, naturally occurring or augmentative, is highly successful in perennial crops because of the undisturbed ecosystems that encourage the establishment and sustenance of natural enemies. Banana is a long duration fruit and vegetable crop and provides ideal conditions for the survival of a plethora of insect parasitoids, predators and also spiders. Among the pests of banana, only two weevil borers, *Cosmopolites sordidus* (Germar) and *Odoiporus longicollis* (Olivier), banana aphid, *Pentalonia nigronervosa* Coquerel, and the fruit scarring beetle, *Basilepta subcostata* (Jacoby), are considered as major pests in India, of which the last is confined to the northeastern and northern states. Unfortunately, very little work has been done in India in documenting the natural enemies of various banana pests and hardly any information is available in the literature. This paper documents the results of long-term observations on the parasitoids and predators of banana pests mainly from Tamil Nadu and some other parts of India.

MATERIALS AND METHODS

The specimens were collected during the surveys conducted for insect and mite pests of banana and their natural enemies during 2016–20 in Tamil Nadu and Uttar Pradesh. Field collected insect and mite pest stages were brought to the laboratory and the natural enemies reared from various life stages were collected, preserved and identified by using the available keys. Photographs of the natural enemies were taken with a Nikon D750 DSLR camera and Leica DMC 4500 digital camera attached to a Leica M205A stereozoom microscope. The specimens are preserved in the reference collections maintained at the National Research Centre for Banana, Trichy.

RESULTS AND DISCUSSION

In the surveys, totally eight parasitoids (two trichogrammatids, two mymarids, two encyrtids, one pteromalid, one scelionid) and twelve predators (one thrips, two staphylinids and nine coccinellids) were identified in association with various insect and mite pests. The host associations of these natural enemies are given below.

A. Parasitoids

Hymenoptera

a. Trichogrammatidae

***Prosoligosita perplexa* Hayat & Husain** (Fig. 1a, c): *Prosoligosita perplexa* was recorded as an egg parasitoid of the banana tingid, *Stephanitis typica* (Distant) from Tamil Nadu. It was originally described based on female specimens and it is known to be distributed in Madhya Pradesh, Odisha, and Uttar Pradesh (Hayat and Husain, 1981; Noyes, 2019). Until now, its host associations were not known. The host

association with *S. typica* and the locality (Tamil Nadu) are new records for this genus and species.

Epoligosita duliniae **Livingstone and Yacoob (1986)**(Fig. 1b, d): It was recorded as an egg parasitoid of the banana tingid from Tamil Nadu. This parasitoid is known to be distributed in Kerala and Tamil Nadu and parasitizes the morinda tingid, *Dulinius conchatus* Distant (Livingstone and Yacoob, 1983; Noyes, 2019). Its association with *S. typica* constitutes a new host record. Both *Epoligosita duliniae* and *P. perplexa* were found to coexist on banana tingid colonies and difficult to differentiate in view of their similar coloration and very small size (Length: 0.5-0.6 mm). The forewing venation is a useful character to separate *E. duliniae* (Fig. 1c) and *P. perplexa* (Fig. 1d).

b. Mymaridae

Erythmelus **sp.** (Fig. 1e): Another egg parasitoid belonging to *Erythmelus* was collected in association with banana tingid from Tamil Nadu and it could not be matched with any of the known species. *Erythmelus panis* Enock, distributed in different parts of Europe, Africa and India, is known to be a parasitoid of the pear tingid, *Stephanitis pyri* (Fabricius) (Noyes, 2019).

Lymaenon **sp.** (Fig. 1f): *Lymaenon* sp. was collected from banana tingid colonies from Tamil Nadu and it is likely to be a parasitoid of tingid eggs.

c. Encyrtidae

Aenasius advena **Compere** (Fig. 1g): It is a commonly collected parasitoid of the tailed mealybug, *Ferrisia virgata,* a pest of banana foliage and fruits, in Tamil Nadu. It is new to the banana ecosystem as per the Universal Chalcidoidea Database (Noyes, 2019).

Blepyrus insularis **(Cameron)** (Fig. 1h): It is an endoparasitoid of *F. virgata,* a pest of banana foliage and fruits, in Tamil Nadu but never collected in large numbers. There is no previous record of its association with *F. virgata* infesting banana (Noyes, 2019).

d. Pteromalidae

Cephaleta brunniventris **Motschulsky** (Fig. 1i): This species is a commonly collected parasitoid of soft scales (Hemiptera: Coccidae) (Sureshan et al., 2011). It was reared from *Saissetia* sp. infesting banana in and around Trichy, Tamil Nadu. There is no record of its occurrence in banana ecosystem as per Noyes (2019).

e. Scelionidae

Telenomus **sp.** (Fig. 1j): *Telenomus* sp. was recorded as an egg parasitoid of *Amata passalis* (F.)*,* a minor pest of banana foliage in Tamil Nadu.

B. Predators

a. Thysanoptera: Thripidae

Scolothrips **sp.** (Fig. 2a): *Scolothrips* sp., close to *S. rhagebianus* Priesner, was recorded in association with all the major mite pests of banana, particularly *Oligonychus* spp., *Eutetranychus orientalis* (Klein) and *Raoiella indica* (Hirst)*,* almost throughout the year in Tamil Nadu. *Scolothrips* spp. are well known predators of phytophagous mites (Mound, 2011).

b. Coleoptera: Staphylinidae

Oligota **sp.** (Fig. 2b): Larvae of *Oligota* sp. were found to be commonly associated with tetranychid mites infesting banana, particularly *Eutetranychus orientalis,* in Tamil Nadu. The species could not be identified because the larvae were not reared to adults.

Paederus fuscipes **Curtis:** It is a major polyphagous predator of many agricultural pests in India and was found in association with banana fruit scarring beetle in and around Lucknow, Uttar Pradesh.

c. Coleoptera: Coccinellidae

Parastethorus indira **(Kapur)** (Fig. 2c): It was a specific predator of *Eutetranychus orientalis* and commonly found during summer in Tamil Nadu.

Stethorus **spp.:** Four species of *Stethorus* were recorded as predators of banana mites in many parts of Tamil Nadu and found to be highly host-specific. *Stethorus pauperculus* Weise (Fig. 2d), *S. forficatus* Poorani (on *Oligonychus* spp. and *Tetranychus* spp.), *S. keralicus* Kapur (on *Raoiella indica*) (Fig. 2e), and one undescribed species of *Stethorus* (on tetranychids) were commonly collected from the field germplasm bank of ICAR-NRCB, Trichy. Of these, *S. pauperculus* was found to be the most abundant predator in the banana ecosystem and collected round the year whereas the other species were found in comparatively fewer numbers and their activity coincided with the summer months (April-August) when mite population levels were at their peak.

Chilocorus nigrita **(F.)** (Fig. 2f): This is the most common and effective predator of banana scale, *Aspidiotus destructor* Signoret (Hemiptera: Diaspididae) in South India and found almost round the year except winter (November-February).

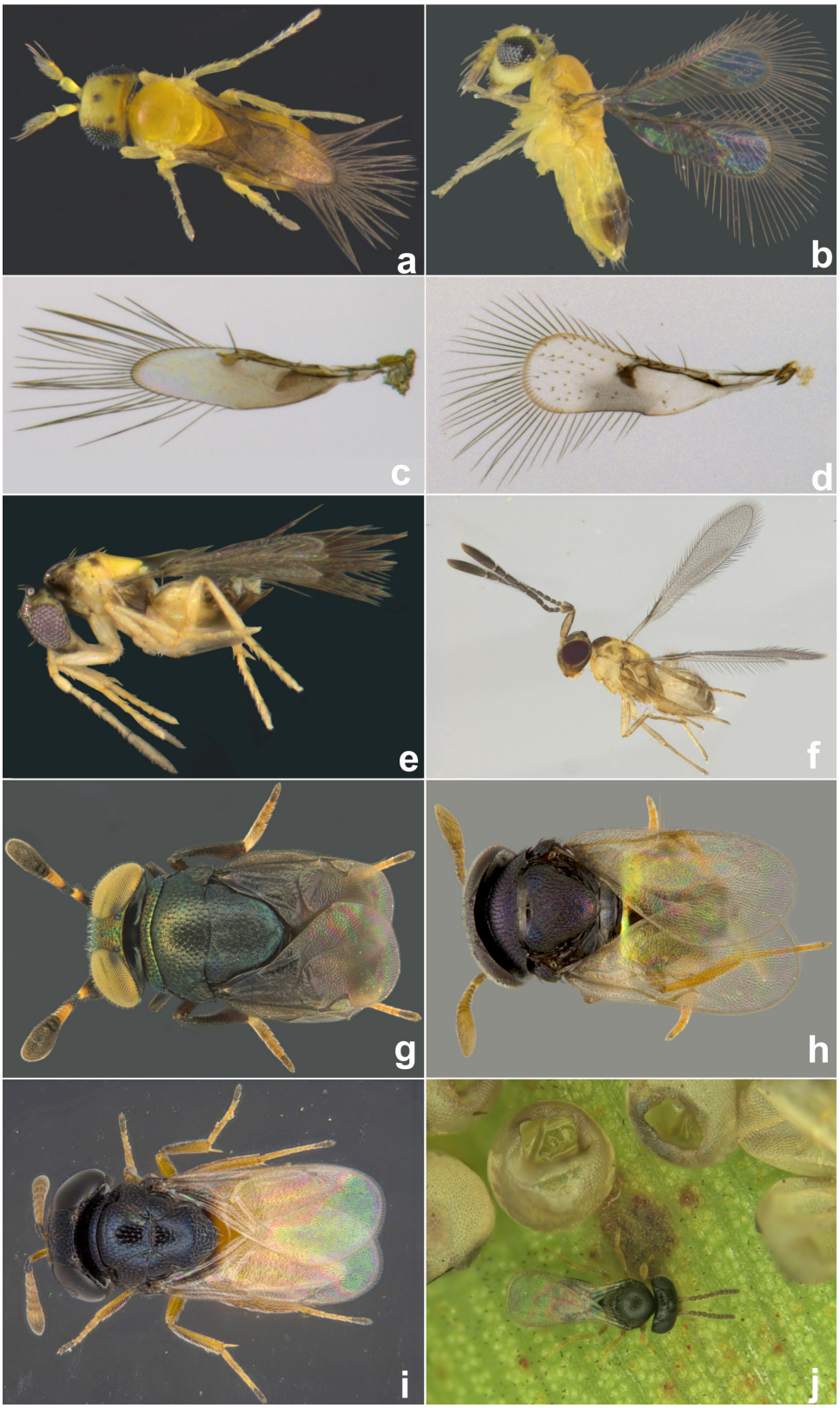

Fig. 1. Parasites of insect and mite pests of banana a. *Epoligosita duliniae*; b. *Prosoligosita perplexa*; c. Forewing, *Epoligosita duliniae*; d. Forewing, *Prosoligosita perplexa*; e. *Erythmelus* sp.; f. *Lymaenon* sp.; g. *Aenasius advena*; h. *Blepyrus insularis*; i. *Cephaleta brunniventris*; j. *Telenomus* sp.

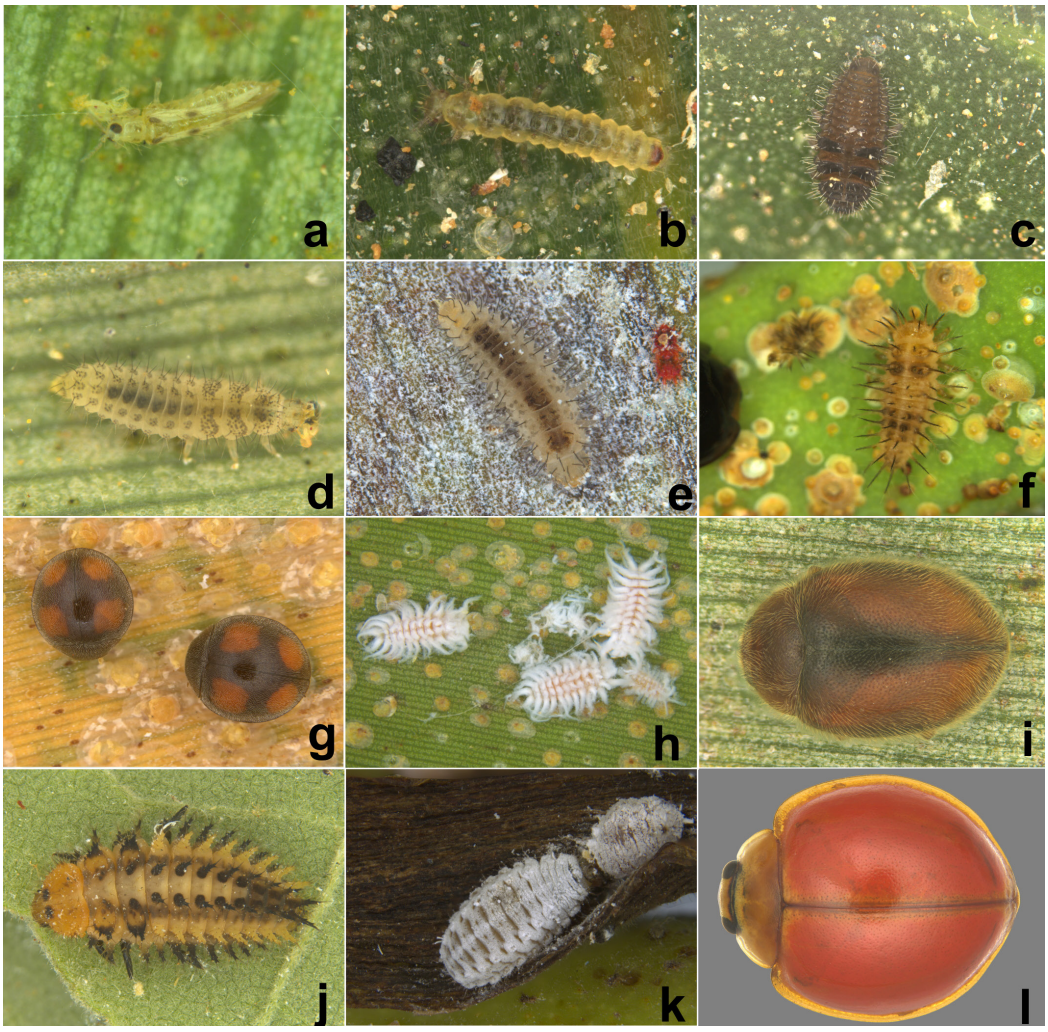

Fig. 2. Predators of insect and mite pests of banana: a. *Scolothrips* sp.; b. *Oligota* sp.; c. *Parastethorus indira*; d. *Stethorus pauperculus*; e. *Stethorus keralicus*; f. *Chilocorus nigrita*; g. *Pharoscymnus horni*; h. *Sasajiscymnus dwipakalpa*; i. *Scymnus fuscatus*; j. *Brumoides suturalis*; k. *Hyperaspis maindroni*; l. *Micraspis yasumatsui*

***Pharoscymnus horni* (Weise)** (Fig. 2g): Larvae and adults of *P. horni* were found to feed on *A. destructor* and other diaspine scales on banana during summer (April-May) in and around Trichy, Tamil Nadu, and were not commonly collected.

***Sasajiscymnus dwipakalpa* (Ghorpade)** (Fig. 2h): Larvae and adults of *S. dwipakalpa* were found to feed on *A. destructor* mainly during the summer (April-August) in Tamil Nadu. It is an effective and highly specific predator of *A. destructor* (Ghorpade, 1977) and widely distributed in South India.

Scymnus* (*Neopullus*) *fuscatus (Fig. 2i): It coexists with *S. nubilus* in the banana ecosystem in association with *A. destructor* and other scales in Tamil Nadu. It closely resembles *S. nubilus*, which is an effective predator of banana aphid (Poorani et al., 2022), and can be differentiated by its distinctly denser and longer dorsal pubescence.

***Brumoides suturalis* (F.)** (Fig. 2j): Larvae of *B. suturalis* were found to feed on *Phenacoccus solenopsis* Tinsley, an occasional pest of banana in and around Trichy, Tamil Nadu.

***Hyperaspis maindroni* Sicard** (Fig. 2k): Larvae and adults of *H. maindroni* were found to feed on *Dysmicoccus brevipes* (Cockerell) and solenopsis mealybug infesting banana bunches and foliage in Tamil Nadu.

***Micraspis yasumatsui* Sasaji** (Fig. 2l): Several specimens of *Micraspis yasumatsui* were collected from the leaf whorl and sheath of banana near rice fields in and around Lucknow, Uttar Pradesh, during October

2018. *Micraspis* spp. are abundant in rice ecosystem and it is most likely that banana is used as a shelter/ refugium by this species because the banana plants were free of pests.

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CONFLICT OF INTEREST

No conflict of interest.

AUTHOR CONTRIBUTION STATEMENT

All authors equally contributed.

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