A CHECK LIST OF PARASITOIDS AND PREDATORS OF *OPISINA ARENOSELLA* WLK. ON COCONUT[1]

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ABSTRACT

Two species of parasitoids, *Antrocephalus* sp.? *maculipennis* CAM. and *Trichospilus diatraeae* CHERIAN & MARGABANDU and four species of predators, *Ankylopteryx octopunctata* FAB., *Geocoris* sp., *Physopleurella* sp. and *Cardiastethus* sp.? *pygmaeus pauliniae* CARAYON were recorded by the authors on the leaf eating caterpillar, *Opisina arenosella* WLK. on coconut, for the first time. Including these, the pest supports 40 species of parasitoids and 20 predators. Among the parasitoids, 34 belong to Hymenoptera, 5 to Diaptera and one to Acarina. The hymenopterans fall under 9 families. Fourteen species belong to Chalcididae, seven species to Ichneumonidae, four species to Braconidae, three to Eulophidae, two to Eurytomidae and one species each to Elasmidae, Bethylidae, Eupelmidae and Trichogrammatidae. Three species of tachinids and two phorids constitute the dipterans. Among 40 species of parasitoids, ten are larval, two larval-pupal, two prepupal and twenty five species pupal. *Bracon hebetor* SAY (*B. brevicornis* WESM.) *Bracon serinopae* (CHERIAN), *Goniozus nephantidis* (MUES.), *Elasmus nephantidis* ROHWER, *Trichospilus pupivorus* FERR., *T.diatraeae* and *Tetrastichus israeli* (M. & K.) are the seven gregarious parasitoids of *O. arenosella.* Twenty species of the predators fall under four orders:

I. Coleoptera (Carabidae-4, coccinellidae-4)
II. Heteroptera (Anthocoridae-7, Reduviidae-1, Lygaeidae-1)
III. Neuroptera (Chrysopidae-2)
IV. Psocoptera (Peripsocidae-1)

The dipteran, *Stomatomyia bezziana* BARANOFF which is a common parasitoid in some parts of the eastern and south-eastern tracks of Sri Lanka is not at all present in India. The Sri Lankan biotype of *Eriborus trochanteratus* (Morley) attacks *O. arenosella* caterpillars on coconut and this biotype is established at Coimbatore (Tamil Nadu) and Thottappally (Kerala) in India. *B. hebetor* becomes adapted to *Corcyra cephalonica* ST., when reared continuously on its larvae in the laboratory and such adults quite often do not exert any high degree of suppression of *O. arenosella* in the field. *Xanthopimpla punctata* F. and *x. nana nana* SCHULZ. appear in the field only in the latter half of the year. Both species select breeding sites close to the sea shore, back waters, streams and paddy fields and congregate in such sites without uniformly dispersing to all pest-infested regions *Brachymeria* sp. dominate the parasitoid complex of *O. arenosella* in Kerala and *Brachymeria nosatoi* HABU has several desirable attributes of an ideal parasitoid. Larval and pupal parasitism vary from locality to locality and region to region. A thorough survey for the natural enemies of *O. arenosella* in different tracts of the country would be rewarding.

INTRODUCTION

Opisina arenosella WLK (Lepidoptera : Oecophoridae), the leaf-eating caterpillar pest of the coconut palm, is mostly an Indo-Sri Lankan species of great economic importance. It was mostly confined to the coastal and back water tracts, but in recent years it has migrated to the interior tracts as well, particularly in Tamil Nadu, Karnataka and Andhra Pradesh and caused extensive damage to coconut plantations. After devastating an area, the moths migrate to distant places.

After DHARMARAJU (1962) prepared a check list of the insect parasitoids and predators of *O. arenosella,* several natural enemies of the pest had been reported, of which a few were listed by COCK & PERERA (1987). The most significant among them was the record of *Brachymeria nosatoi* HABU (Hymenoptera : Chalcididae) by JOY & JOSEPH (1972). Other notable natural enemies reported include *Meteoridea hutsoni* NIXON (SUDHEENDRA KUMAR *et al.,* 1979), *Xanthopimpla nana nana* SCHULZ. (PILLAI & NAIR, 1983), the coccinellids such as *Micraspis* sp., *Menochilus sexmaculatus* F. etc. (PILLAI & NAIR, 1986 b) and the chrysopid, *Ankylopteryx octopunctata candida* FAB. (SATHIAMMA *et al.,* 1985).

With the available knowledge on the natural enemies of *O. arenosella,* the following observations can be made:

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(i) So far no effective egg parasitoid has been recorded.

(ii) Even the effective and dominant species of parasitoids have some disadvantages/limitations, such as localised distribution (as in the case of *B. nosatoi, Stomatomyia bezziana* BARANOFF AND *M. hutsoni*) and certain ecological prerequisites are there for colonisation (as in the case of *Xanthopimpla punctata* F. and *X. nana nana*).

(iii) Levels of parasitism vary from locality to locality and region to region in most of the cases. The overall larval parasitism is quite low, although high parasitism by *Bracon hebetor* SAY / *Bracon brevicornis* WESM., *Goniozus nephantidis* (MUES.) etc. was recorded in some areas.

(iv) The pupal parasitoids are important when the extent of pest suppression is taken into account and the parasitoid community of *O. arenosella* is dominated by *Brachymeria* sp. In southern Kerala, when the pupal parasitism was 52.3%, the contribution of *Brachymeria* sp. was 49%. At the same time *Trichospilus pupivorus* FERR. parasitised only 2.6% pupae. (PILLAI & NAIR, 1982 c).

(v) Information regarding the role played by the predators in the natural suppression of the pest is scanty.

A. PARASITOIDS

(i) **Egg parasitoid:**

NARENDRAN (1985) listed *Trichogramma chilonis* ISHII (*T. australicum* GIRAULT) as an egg parasitoid of *O. arenosella.* However, the present authors are not aware of any authentic record of the egg parasitoid from India so far. This species was being released against *O. arenosella* in some parts of Andhra Pradesh (RAO & AZAM, 1985). But, it is not known whether *T. chilonis* has been recovered from the eggs of *O. arenosella* from the release sites.

(ii) **Larval parasitoids:**

Stomatomyia bezziana is not present in India and the Indian biotype of *Eriborus trochanteratus* (MORLEY) does not attack *O. arenosella.* Both the species were introduced into India. During 1963, 144 adults of *S. bezziana* were released at Neendakara, Kollam District, Kerala, but did not establish. *E. Trochanteratus* was established at Coimbatore, Tamil Nadu (SWAMIAPPAN & BALASUBRAMANIAN, 1987) and at Thottappally, Alappuzha District, Kerala (PILLAI & NAIR, 1986 a).

At present, *Bracon brevicornis* and *B. hebetor* are considered one and the same species, while the latter is the preferred name. It is highly polyphagous and distributed in many countries. Being gregarious and easy to rear in the laboratory on the fictitious host, *Corcyra cephalonica* ST, this species was reared in large numbers and released in the field for the suppression of *O. arenosella.* However, data on the extent of pest suppression obtained from the releases are not available. When reared continuously for a few generations on *C. cephalonica,* it becomes adapted to *Corcyra* and as such B. hebetor/B. brevicornis adults thus reared when released to the field do not suppress *O. arenosella* population efficiently. In high humid areas, appreciable extent of natural parasitism by the solitary braconid, *Apanteles taragamae* WILKINSON on early instar caterpillars can be observed during certain months. MANJUNATH (1985) observed 28% parasitism by *Goniozus nephantidis* (MUES.) in an outbreak of the pest at Guntur District (Andhra Pradesh), but the strain of *G. nephantidis* occurring in Kerala does not affect such high per cent parasitism. In general, the larval parasitoids of *O. arenosella* do not exert any significant level of pest suppression in most parts of Kerala State.

(iii) **Pupal parasitoids:**

The pupal parasitoids play a vital role in suppressing O. arenosella population and among them *Brachymeria nosatoi* HABU and *Brachymeria nephantidis* GAHAN are the most important ones. Other significant parasitoids include *Xanthopimpla punctata, X. nana nana* SCHULZ. (in southern Kerala), *Trichospilus pupivorus* FERR. and *Meteoridea hutsoni* (NIXON) (in Northern Kerala). *B. nosatoi* has limited distribution in Kerala and in Sri Lanka, while *B. nephantidis* is found all over India and Sri Lanka. In south Kerala, *B. nosatoi* parasitises 30.1% pupae and *B. nephantidis* 15.7%. At the same time *T. pupivorus* suppresses only 2.6% pupal population (PILLAI & NAIR, 1982 d). *B. nosatoi* has several outstanding desirable attributes of an effective biocontrol agent, such as good searching ability, long life span, capacity to tolerate prolonged drought, high summer temperature and low relative humidity, amenability to laboratory rearing, female biased sex-ratio (3 + : 1 o), capacity to dominate other pupal parasitoids (except *Xanthopimpla* sp.) and good dispersal capability. It sticks to *O. arenosella* population throughout the year and increases its own population, synchronising with the in-

LIST OF PARASITOIDS OF *OPISINA ARENOSELLA* WLK
(E=egg, L=larva, L-P= larval-pupal, P= pupal, PP=pre pupal,
NRA= new record by the authors

		Stage attacked	References
Hymenoptera Chalcididae	*Antrocephalus cariniceps* (CAM.)	P	Narendran (1985)
"	*Antrocephalus hakonensis* (ASHM.)	P	Narendran (1985,1989)
"	*Antrocephalus sp.? maculipennis* (CAM.)	P	NRA
"	*Antrocephalus phaeospilus* WATERSTON	P	Narendran (1985)
"	*Brachymeria atteviae* (JOSEPH, NARENDRAN&JOY	P	Narendran (1989)
"	(*B. hime atteviae* JOSEPH et al.)	P	JOSEPH *et al.* (1973)
"	*Brachymeria* cuploeae (WESTWOOD)	P	Cock & Perera (1987)
"	*Brachymeria excarinata* GAHAN	P	Joy *et al.* (1974)
"	*Brachymeria lasus* (WALKER)	P	"
"	*Brachymeria magaspila* CAMERON	P	Pillai & Nair (1986)
"	*Brachymeria nephantidis* GAHAN	P	Joseph *et al.* (1973) Satpathy & Rao (1972)
"	*Brachymeria nosatoi* HABU	P	Joy & Joseph (1972, 1973)
"	*Brachymeria podagrica* (FAB.)	P	Narendran (1985,1989)
"	*Psilochalsis carinigena* (CAMERON) (*Invreia opisinae* NARENDRAN)	P	Narendran (1985. 1989)
"	*Stomatoceras sulcatiscutellum* GIRAULT	P	Narendran (1985, 1989)
Hymenoptera: Eulophidae	*Trichospilus diatraeae* CHERIAN AND MARGABANDU	P	NRA
"	Trichospilus *pupivorus* FERR	P	Ananthanarayanan (1934) Jayaratnam (1941) Pillai & Nair (1982 b)
"	*Tetrastichus israeli* M.& K.	P	Ali & Subramaniam (1972)
Hymenoptera : Ichneumonidae	*Brachycoryphus nursei* (CAM.)	PP	Nirula *et al.* (1955)
"	*Ecthromorpha agrestoria* SWED	L-P	Pillai & Nair (1987 c)
"	*Eriborus trochanteratus* (MORLEY)	P	Kapadia (1983)
"	*Xanthopimpla punctata* F.	L	Dharmaraju (1962) Pillai & Nair (1986 a)
"	*Xanthopimpla nana nana* SCHULZ.	P	Ayyar & Margabandu (1934) Pillai & Nair (1989, 1990 b)
"	*Xanthopimpla* sp.	P	Pillai & Nair (1990 b)
"	*Thrathala* sp.	P	Pillai & Nair (1987 b)
Hymenoptera : Braconidae	*Apanteles taragamae* WILKINSON	P	Cock & Perera (1987)
"	*Bracon hebetor* SAY (*Bracon brevicornis* WESM.)	L	Rao, *et al.* (1948)
"	*Bracon serinopae* (CHERIAN)	L	Sathiamma *et al.* (1987)
"	*Meteoridea hutsoni* (NIXON)	L	Cherian (1929) Cock & Perera (1987)
Hymenoptera : Elasmidae	*Elasmus nephantidis* ROHWER	L-P	Sudheenira Kumar *et al.* (1979)
Hymenoptera :	*Goniozus (Parasierola) nephantidis*	PP	Rao & Cherian, (1927) Pillai & Nair (1982 c)
		L	Rao & Cherian (1928)

Bathylidae	(MUES.)		
Hymenoptera : Eurytomidae	*Eurytoma* sp.	L	Jayaratnam (1941)
"	*Eurytoma albotibialis* ASHM	P	Dharmaraju (1962) Pillai & Nair (1987)
Hymenoptera : Eupelmidae	*Anastatoidea brachartonae* GAHAN	P	Joy & Joseph (1976) Cock & Perera (1987)
Diptera: Phoridae	*Magaselia* sp.	P	Rema Devi *et al.* (1980)
"	*Megaselia* sp. nr. *scaleris* LOW	P	Narayanan *et al.* (1967)
Diptera : Tachinidae	*Thelairodrino gracilis* MESNIL	L-P	Rao (1961) Pillai & Nair (1982 d)
"	*Palexorista* sp.	L	Pillai & Nair (1986 b)
"	*Stomatomyia bezziana* BARANOFF	L	Dharmaraju (1962) Rao & Rao (1964)
Hymenoptera : Trichogrammatidae	*Trichogramma chilonis* ISHII *T.australicum* GIRAULT	E	Narendran (1985) Mallikarjuna Rao & Azam (1985)
Acarina pytmotidae	*Pyemotes ventricosus* NEWPORT	L	Rao *et al.* (1948)
	PREDATORS		
NEUROPTERA: CHRYSOPIDAE	*Ankylopteryx octopunctata* FAB.	E.L.	NRA
"	*Ankylopteryx octopunctata Candida* (FAB)	E,L	Sathiamma *et al.* (1985)
Heteroptera : Anthocoridae	*Cardiastethus* sp. (*Triphleps* sp.)	E,L	Mohamed *et al.* (1982) Rao *et al.* (1948)
"	*Cardiastethus* sp.? *pygmaeus pauliniae* CARAYON	E,L	NRA
Heteroptera : Anthocoridae	Cardiastethus sp. nr. nazarenus REUTER	E,L	Kapadia (1987)
"	*Cardiastethus exiguus* (= C. *pygmaeus Pauliniae*	E,L	Naseer & Abdurahiman (1990)
"	*Cardiastethus affinis*	E,L	"
"	*Buchananiella sodalis*	E,L	"
"	*Physopleurella* sp.	E,L	NRA
Heteroptera : Lygaeidae	*Geocoris* sp.	L	NRA
Heteroptera: Reduviidae	*Sphedanolestes aurescens* DIST.	E,L	Rao *et al.* (1948)
Coleoptera: Melyridae	*Idgia dimelaena* (WALKER)	P	Pillai & Nair (1986 b)
Coleoptera : Carabidae	*Creagris labrosa* NIETNER	L	Pillai & Nair (1986 b)
"	*Calleida splendidula* (F.)	L	Rao *et al.* (1948) Pillai & Nair (1990 a)
Coleoptera : Coccinellidae	*Menochilus sexmaculatus* F.	E	Pillai & Nair (1986 b)
"	*Micraspis* sp.	E	"
"	*Propylea fallax* KHNZORIAN	E	"
"	*Jauravia pubescens* F.	E	"
Psocoptera peripsocidae	*Ectopsocus* sp.	E	Mohamed *et al.* (1982)

crease of the population of its host providing more or less a steady rate of parasitism. *B. nosatoi* and *B. nephantidis* can be multiplied in the laboratory using simple methods (PILLAI & NAIR, 1982 a). *B. atteviae* JOSEPH *et al.*, parasitised 7.12% pupae at Salem, Tamil Nadu (PILLAI & NAIR, 1989), but in other states it is not so far observed as an important species of parasitoid.

X. punctata has been observed as an outstanding parasitoid of *O. arenosella* at Ayiramthengu, Kollam District, Kerala State (43.6% average parasitism) and at Salem, Tamil Nadu (26.5%) dominating all other pupal parasitoids (PILLAI & NAIR, 1980). Parasitism by *X. nana nana* also reached upto 31.6% (PILLAI & NAIR, 1990). But, their association with *O. arenosella* is only for six months from July to December-January. Both the species select breeding sites close to the seashore, streams, back waters or paddy fields, where pest incidence is also high. *X. punctata* and *X nana nana* usually breed in separate breeding sites usually without mixing up or intruding into each other's territory of breeding.

O. arenosella multiplies profusely during summer months, while *Trichospilus pupivorus* undergoes aestivation (PILLAI & NAIR, 1982 b). It cannot also withstand drought conditions and summer temperature. In areas of dry weather conditions, this species may not be present at all in the field (eg. Salem). *Brachymeria* sp. and *Xanthopimpla* sp. suppress its population in the field. Large scale releases of *T. pupivorus* have not produced any significant change in pest population.

The record of *Tetrastichus israeli* M. & K. (ALI & SUBRAMANIAM, 1972) appears to be quite exceptional as it is never recovered from the pupae of *O. arenosella*, in spite of massive releases continuously for several years now in many parts of Kerala. It is clear that *T. israeli* will not breed in the coconut ecosystem (PILLAI & NAIR, 1991). *Eurytoma albotibialis* ASHM. (PILLAI & NAIR, 1987 a) and *Anastatoidea brachartonea* GAHAN (COCK & PERERA, 1987) are hyperparasitoids, rather than primary parasitoids. NARENDRAN (1989) considers *Stomatoceras sulcatiscutellum* GIRAULT as a synonym of *Antrocephalus haknonensis* (ASHM.). *Brachymeria podagrica* (FABRICIUS) first recorded as a larval parasitoid (NARENDRAN, 1985) was subsequently reported as a secondary parasitoid (NARE- NDRAN, 1989).

B. PREDATORS

The efficiency of the predators is neither fully assessed nor they are widely used in the programme of biological suppression of *O. arenosella.* The carabid predator, *Parena nigrolineata* (CHAUDOIR) was found in large numbers at Moonuchavadi, near Salem and at Coimbatore, Tamil Nadu. PILLAI & BHAT (1987) & PILLAI & NAIR (1990) developed rearing techniques of *P. nigrolineata* and *Calleida splendidula* F.), respectively. But, adults and grubs of both the species are not voracious feeders.

C. NEW RECORDS

The authors are recording six natural enemies of *O. arenosella.* They are *Antrocephalus* sp.? *maculipennis* CAM. and *Trichospilus diatraeae* CHERIAN & MARGABANDU and the predators, *Ankylopteryx octopunctata* FAB., *Geocoris* sp., *Cardiastethus* sp.? *Pygmaeus pauliniae* CARAYON and *Physopleurella* sp. *T. diatraeae* was also reared from the pupae of *Anadevidis peponis* (F). infesting snake guard and *Phalacra vidhisaria* (WALKER) (Pep: Drepanidae) on coconut.

In this paper, we are listing sixty natural enemies-fourty parasitoids and 20 predators of *O. arenosella* other than the spiders reported by SATHIAMMA *et al.*, (1987). The authors do not consider the list to be complete. *O. arenosella* would, in fact, be supporting a very large complex of natural enemies all over India. A systematic survey through out the *Opisina*-infested tracts in the country would certainly reveal many more parasitoids and predators.

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