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# Pigeon-Pea Pod Borers and Their Natural Enemies in Barbados, West Indies

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In Barbados, three pests, *Heliothis virescens* (F.), *Fundella cistipennis* (Dyar) and *Callosobruchus chinensis* (L.) inflict serious damage to pigeon-pea pods. Over the years it was estimated that some 60% pods were destroyed annually.

Although a number of indigenous natural enemies were recorded attacking eggs, larvae and pupae of these pests, their populations were usually too low for adequate control.

Between 1968 and 1983, a number of parasite species were introduced from India, Pakistan, Uruguay, U.S.A. and the

Eastern Caribbean islands; 17 for the control of *H. virescens*, seven for *F. cistipennis* and two for *C. chinensis*. Of these, two species, *Bracon hebetor* (Say), from India and *Bracon* sp. prob. *hebetor* (Say) (close to *Bracon brevicornis* [Wesmeal]), from St. Vincent, became established against *Heliothis* and *Fundella*. The levels of parasitism by the latter species ranged from 2.1 - 70%, avg. 16.4%, between April and December 1983.

The pigeon-pea (*Cajanus cajan*) is a cultivated annual or perennial shrub grown in many tropical and sub-tropical countries for its green or dry seeds. In the Caribbean in general and in Barbados in particular, it is planted on the borders of sugarcane fields. In recent years, because of the greater demand for this commodity, pure stands are also grown.

In Barbados, the most important pests are the pod-borers, a noctuid, *Heliothis virescens* (F.), a pyralid, *Fundella cistipennis* (Dyar) and a bruchid, *Callosobruchus chinensis* (L.).

Between 1968 and 1976, several parasites and predators were introduced by the Ministry of Agriculture, Food and Consumer Affairs, from India, Pakistan, Uruguay and the United States of America, through the Commonwealth Institute of Biological Control (CIBC), West Indian Station, Trinidad (see Appendix 1-3). Some of these became established, but their populations remained low.

Since 1977, a search was carried out by the Caribbean Agricultural Research and Development Institute (CARDI) for natural enemies of pigeon-pea pod borers, *H. virescens* and *F. cistipennis*; the bruchid, *C. chinensis* and certain other important pests throughout the region.

From a number of egg, larval and pupal parasites recorded in the Eastern Caribbean islands, a *Bracon* sp. (solitary) attacking *F. cistipennis*, and a *Bracon* sp. prob. *hebetor* (Say) (close to *Bracon brevicornis* [Wesmeal]) a gregarious ecto-larval parasite attacking *H. virescens* and *F. cistipennis* in St. Vincent; a *Bracon* sp. (gregarious ecto-larval parasite) on *F. cistipennis* and *Ancylostoma stercorea* (Zell.) in Antigua, St. Kitts, Nevis, Montserrat and St. Lucia; and *Apanteles etiellae* (Viereck) (solitary) attacking *F. cistipennis* and *A. stercorea* in St. Kitts, Nevis and Montserrat, were of greater importance for the control of these pests, in the countries where these were absent. Of these, *Bracon* sp. prob. *hebetor* and *Bracon* sp. (gregarious) were mass bred in the laboratory on *Trachylepidia fructicassella* (Rag.) larvae. These two species were released in pigeon-pea plots throughout the island, and recoveries were made in the field. It appears that at present the former species is the most effective, attacking up to 44% *Heliothis* and up to 70% *Fundella* larvae in the field. Observations on the permanent establishment of these two parasites and their effect on the pod-borer populations are continuing. *Bracon* sp. prob. *hebetor* has also been introduced into Antigua, St. Kitts, Dominica and St. Lucia.

*Trichospilus diatraeae* (Cherian and Margabandhu), a pupal parasite of various pests in India, was introduced into Barbados against *Fundella* and *Heliothis* spp. The parasite seems to prefer pests pupating on the leaves of their host plants, and attacked *Pseudoplusia includens* (Walker) on tomato, *Diaphania* (= *Margaronia*) *hyalinata* (L.) on cucurbits and *Palpita hyalinata* (L.) on French Willow. *Heliothis* spp., which pupate in the soil, and *Fundella* in pigeon-pea pods, thus escaped parasitism.

## Pod-Borers and Their Natural Enemies

*Heliothis virescens* (F.) (Lepidoptera : Noctuidae) is a serious pest of pigeon-pea in Barbados and other Eastern Caribbean islands.

The larvae bore into the pods and destroy the developing seeds. In addition to *H. virescens*, *Fundella cistipennis* (Dyar) also attacks the pods. The average pod damage recorded between 1969 - 76 ranged from 27.8 - 90.5%, average 61%.

*H. virescens* is always more abundant than *F. cistipennis*, although the latter becomes more prevalent during January to March.

The egg of *H. virescens* is creamy-white, dome shaped, with a small conical micropile at its apex. The sides are grooved with long and short ridges. They are laid singly on buds, flowers and young pods. Initially the newly hatched larva feeds on the leaf surface, flowers, buds and pods, and later bores into the pod. A single larva can damage most of the seeds in a pod. The full-grown larva leaves the pod and pupates in the soil.

The life-cycle was studied in the laboratory at 26.3°C ± 0.2°C and 88% relative humidity. The incubation period lasts three days. Generally there are five or six larval instars and in a few instances, seven. During these studies, 57.1% larvae moulted six times; 38.1%, seven times and 4.8% eight times. The time taken by various instars is given in Table 1.

The pest has been recorded on a wide range of cultivated and wild plants, including cotton (*Gossypium barbadense*), tomato (*Lycopersicon esculentum*) and sweet potato (*Ipomoea batatas*).

During these studies, the natural enemies were recorded in Barbados as listed in Table 2.

Because of inadequate control by indigenous natural enemies, some seventeen species of parasites and one predator were obtained from India, Pakistan, Uruguay, Arizona (U.S.A.), St. Vincent and Antigua, W.I. (see Appendix 1).

TABLE 1. Life-cycle of *Heliothis virescens*, studied in Barbados, W.I.

STAGE	DURATION IN DAYS		STAGE	DURATION IN DAYS	
	Range	Average		Range	Average
Incubation period	3	7	5th instar	2 - 12	6
1st instar	3 - 6	2.7	6th "	5 - 10	8.2
2nd "	1 - 4	2.5	7th "	12	
3rd "	1 - 7	5.1	Pre-pupal period	1 - 4	3
4th "	1 - 8	3.3	Pupal period	13 - 19	15.6
Total larval period	17 - 30	21.8	Larval and pupal period	32 - 49	39.9
Complete life-cycle (i.e. egg laying to adult emergence)	35 - 52	42.9			

TABLE 2. Natural enemies of *Heliothis virescens*, in Barbados, W.I.

FAMILY	SPECIES	STAGE ATTACKED
Trichogrammatidae	<i>Trichogramma fasciaticum</i> Perk.	Egg-parasite
Braconidae	<i>Bracon</i> sp.	Larval parasite
Bethylidae	<i>Parasiterola</i> (= <i>Parasiterola</i> ) sp. prob. <i>nigrifemur</i> (Ashmead)	" "
Tachinidae	<i>Aechlyus macropus</i> (Townsend)	Larval-pupal para.
"	<i>Archita pill coctis</i> Wulp	" "
Coccinellidae	<i>Cycloneda sanguinea</i> (L.)	Preys upon eggs and young larvae
"	<i>Nephus</i> sp.	- do -
Chrysopidae	<i>Chrysopa</i> sp.	- do -
"	<i>Chrysopa lurida</i> Bks.	- do -
"	<i>Chrysopa limbatata</i> Nav.	- do -
Vespidae	<i>Polistes barbadosis</i> Richards	Preys upon larvae

TABLE 3. Time (hrs.) for the development of the parasite, *Bracon* sp. prob. *hebetor* (Say) (= *Bracon brevicornis* [Wesmeall]) on *H. virescens* larvae under laboratory conditions.

DEVELOPMENT STAGE	MEAN (hrs.)	STANDARD ERROR	RANGE
Incubation period	43	0.4	35.24 - 47.12
Larval period (three larval instars)	48	0.9	42.00 - 54.00
Pre-pupal period	47	0.6	41.00 - 50.00
Pupal period	128	3.0	116.00 - 150.00
Total development period	266	5.0	267.00 ± 5

Most of the parasites obtained from overseas were released directly in the field, while a few species *viz.* *Apanteles marginiventris* (Cresson), *Bracon hebetor* (Say), *Bracon* sp. prob. *hebetor* (Say) (= *Bracon brevicornis* [Wesmeall]), *Campoletis chloridae* (Uchida), *Campoletis flavicincta* (Ashmead) and *Eucelatoria bryani* (Sabrosky) were bred in the laboratory, and some of these were released over a long period of time.

1. *Apanteles marginiventris* (Cresson) was obtained from the Indian and Pakistan Stations of CIBC during 1970 and 1975.

It is a solitary larval parasite, attacking first and second instar larvae of *Heliothis* and *Spodoptera* species. The female inserts a single egg into the larval body, and the parasite develops internally. The full-grown grub emerges from the larval body and spins a white silken cocoon for pupation.

Between 1970 and 1980, it was recovered from the larvae of *Spodoptera eridania* (Cramer) on *Beta vulgaris* and *Solanum melongena*.

2. *Bracon hebetor* (Say), a gregarious, ecto-larval parasite was introduced from the Indian Station of CIBC during 1970 and 1975, for trials against *Heliothis* spp. and *F. cistipennis*.

A small culture was built, and some 3,000 adults were released in pigeon-pea plots. The parasite was first recovered in 1973, when 3.0 - 17.5%, average 7.5% larvae of *H. virescens* were parasitised. The average percentage parasitism was 2.4 in 1974, 6.3 in 1975 and 9.2 in 1976.

3. *Bracon* sp. prob. *hebetor* (Say) (very close to *Bracon brevicornis* [Wesmeall]). In St. Vincent during February 1983, the parasite attacked medium to full-grown larvae of *H. virescens* and *Ancylostomia stercorea* (Zell.), in pigeon-pea pods. Some of the field collected material was brought to Barbados, a culture established and its biology studied.

The parasite mates soon after emergence. The male with its wings extended laterally, pursues and mounts the female, quickly bends the abdominal tip and inserts its aedeagus. During this effort it occasionally vibrates its wings, while the female remains quiet. The male may require a number of attempts before it mates successfully. Mating lasts from one to two minutes. Both male and female mate several times.

Soon after mating, the female actively searches for host larvae. On encountering a caterpillar, the parasite suddenly ceases movement and thrusts her abdomen with the ovipositor extended forward between her legs. Maintaining this position, she gradually moves nearer to the caterpillar, and with a gentle sting paralyses it instantly. Thereafter, she may feed on the body wound at intermittent intervals for several hours, before laying eggs on it. The eggs are laid loosely on any part of the body.

The biology of the parasite was studied in the laboratory. The details are given in Table 3.

Between 21 March and 12 April, 1983, 4,500 adult parasites were liberated at Fairy Valley, Christ Church. From April to December 1983, a further 25,870 adults were released in other parts of the island, and work is continuing.

The parasite was first recovered from Fairy Valley on 19 April, 1983, when 35.2% of the larvae of *H. virescens* were parasitised. The overall parasitism ranged from 3.9% to 44.4%.

The initial recoveries show that the parasite may build up higher populations during wet weather when the pest population will also increase, and the green pods, a preferred site for attacking the host will also be in greater numbers.

4. *Campoletis flavicincta* (Ashmead), a native of Uruguay, was obtained through the Commonwealth Institute of Biological Control, West Indian Station, Trinidad, during August 1981, for trials against *Heliothis* and *Spodoptera* species. The parasite was cultured on *Spodoptera* larvae, because of their convenient mass production in the laboratory.

The parasites mate soon after emergence. The male actively pursues the female, moving its antennae and wings vigorously and grasping her with its forelegs, bends the abdomen anteriorly and inserts the aedeagus. Mating lasts for 1.50 to 3.35 minutes. Both sexes mate several times. Mated females show reluctance to mate again, but male(s) pursue them to remate. Sometimes, over-mating kills the female.

Usually the female requires a two to three days preoviposition period after mating, but if the hosts are available earlier, she will parasitise them. Progeny from these will be exclusively male.

The parasite prefers two to four day old larvae, but under forced conditions, it also attacks five to six day old caterpillars.

During 1981, seven generations were produced in the laboratory. In all, 8,181 *Spodoptera* larvae (*i.e.* *S. eridania*, *S. frugiperda*, *S. latifascia* and *S. sunia*) were exposed to the parasite females. Of these, 2,830 (34.6%) were successfully parasitised. From 2,830 parasite cocoons, 1,656 (58.5%) produced adults, of which 1,332 (80.4%) were males and 324 (19.6%) were females. All species of *Spodoptera* were successfully parasitised.

The female actively approaches the caterpillar, vibrating its wings and antennae vigorously, and with a quick jab inserts a single egg into the larval body. If the host larva initially escapes attack, the female pursues it until it is successful.

Parasitised larvae continue to feed for a few days, before gradually losing their appetite; growth is arrested and the larvae become sluggish.

The parasite's life-cycle was studied on *S. latifascia*, *S. eridania* and *S. frugiperda*. The development period on these hosts is given in Table 4.

TABLE 4. Life-cycle of *Campoletis flavicincta* (Ashmead), in three *Spodoptera* spp.

Development stages of <i>C. flavicincta</i>	Host		
	<i>S. latifascia</i>	<i>S. eridania</i>	<i>S. frugiperda</i>
Egg-larval period (days)	11.6 ± 0.31	10.6 ± 0.12	9.3 ± 0.32
Pupal period (days)	6.1 ± 0.25	6.0 ± 0.07	6.0 ± 0.19
Total development period (days)	17.7 ± 0.24	16.6 ± 0.13	15.3 ± 0.27

These studies show that on *S. frugiperda* development took place in the shortest period, but because of its cannibalistic habit, was not a suitable host for mass rearing in the laboratory. Instead, *S. eridania*, which can be bred very easily in the laboratory, was used.

Between November 1981 and May 1982, 1,137 adults (260 females and 877 males) were released in pigeon-pea, maize, sorghum and alfalfa fields. No recoveries were made from pigeon-pea fields.

- Campoletis chloridae* (Uchida), a native of India and Pakistan, was obtained during 1968, 1971, 1975 and 1982, through CIBC, Trinidad. Its general behaviour is similar to that of *C. flavicincta*. When reared on the larvae of *S. eridania*, the egg-larval period occupied 9 to 11 days (average 10.6 days) and the pupal period lasted for 5 to 7 days (average 6 days). The total development took 14 to 18 days (average 16.6 days).

Between October 1982 and March 1983, 976 laboratory bred adults (207 females and 769 males) were libtated in pigeon-pea and other crop fields. In April 1983, two empty cocoons were recovered from a pigeon-pea pod.

- Eucelatoria bryani* (Sabrosky)—This parasite was obtained from Arizona (U.S.A.), through CIBC, Trinidad, in 1972, and was multiplied in the laboratory.

The flies mate readily. Mated females require a 7 to 8 day gestation period. Mature flies were then dissected under a binocular microscope, and the parasite maggots placed on the host caterpillar with the aid of a camel hair brush. These then penetrate into the host body. After 4 to 7 days feeding, four or more full-grown parasite larvae emerge from a single host and form puparia. The pupal period lasts for 7 to 10 days.

Out of 2,330 parasitised larvae of *H. virescens*, 3,408 puparia were obtained, and 2,225 adults (1,358 males and 867 females) were released in pigeon-pea plots. No recoveries were made.

*Fundella cistipennis* (Dyar) (Lepidoptera : Pyralidae) is another pod-borer of pigeon-peas. It also attacks the pods of beans (*Phaseolus* spp.), cowpea (*Vigna unguiculata*), seaside bean (*Cannavalia maritima*) and stinking bush (*Cassia occidentalis*). The larvae also bore into the stems of *V. unguiculata* and *C. occidentalis*.

The eggs are ovate, shallowly domed dorsally, flattened against the substratum ventrally and chorion ornamented with a network of elongated polygons. Whitish in colour when freshly laid, they later assume a pinkish colour. They are laid singly on the buds, flowers and young pods.

The larva is creamy-white, often tinged with pink, with a dark brown head capsule. The newly hatched larva feeds outside the pod for a few hours before boring into the pod, where it attacks the developing seeds. Pupation usually occurs inside the pod within a tough silken cocoon slightly projecting outside the pod. The exposed portion of its cocoon is concealed by debris. The total life-cycle lasts for 35 to 44 days.

The natural enemies recorded in Barbados are listed in Table 5.

TABLE 5. Natural enemies of *Fundella cistipennis* (Dyar), in Barbados.

FAMILY	SPECIES	STAGE ATTACKED
Trichogrammatidae	<i>T. fasciatum</i>	Egg-parasite
Braconidae	<i>Bracon</i> sp.	Ecto-larval para.
Bethylidae	<i>Parasiterola</i> (= <i>Perisiterola</i> ) sp. <i>nigrifemur</i> (Ashmead)	" " "
Tachinidae	<i>Stomatomyia ipae</i> Walker	Larval parasite
Coccinellidae	<i>C. sanguinea</i>	Preys upon eggs and young larvae
Chrysopidae	<i>Chrysopa</i> sp.	- do -
"	<i>C. lanata</i>	- do -
"	<i>C. limicata</i>	- do -

The populations of these natural enemies were usually too low to provide adequate control.

Between 1968 and 1983 nine parasite species (six from CIBC, Trinidad, and one each from India, St. Vincent and Antigua) were obtained and released in pigeon-pea plots (see Appendix 2.)

From those nine species, only two parasites, *vis.* *B. hebetor* from India and *Bracon* sp. prob. *hebetor* (= *B. brevicornis*) from St. Vincent were recovered in the field.

The average levels of parasitism by *B. hebetor* were 8% in 1973, 1.3% in 1974 and 8% in 1975 and 1976; the highest level of parasitism recorded at one locality was 46.6%.

*Bracon* sp. prob. *hebetor*, was first released in March 1983. Between April and December 1983, the range of parasitism recorded was 2.1% to 70% (average 16.9%).

Seed beetle — *Callosobruchus chinensis* (Linnaeus) (Coleoptera : Bruchidae) has been recorded in the Greater and Lesser Antilles.

The bruchid is a serious pest, attacking seeds in the field as well as in storage. The larvae develop inside the dry peas and beans.

During these studies, out of 10,350 dry pods examined, 7,280 were infested by four species of Coleoptera and two of Lepidoptera. The most abundant of these was the bruchid.

The adult is about 3mm long, greyish-black with white markings and two raised ivory spots at the middle of the hind margin of the prothorax.

The eggs are laid on the pods in the field or on the seeds in storage, and hatch in 4 to 6 days. On hatching, the larvae bore into the seeds. More than one larva can survive in a single seed and they mature in about three weeks. Pupation occurs within the

seeds. The pupal stage lasts for 7 to 10 days, and the adults may remain in the seed for three days or longer.

The main natural enemies recorded in Barbados were: *Dinarmus vagabundus* (Timberlake) and *Zatropis* sp. nr. *bruchivorus* (Ashmead) (Pteromalidae).

During 1975 and 1976, two parasites, *D. vagabundus* and *Dinarmus basalis* (Rondani) were received from the Indian Station of CIBC. Of these, 2,211 adults of the former and 1,300 of the latter were released in the field. Although a few recoveries were made, it is not known if the parasite(s) were indigenous or introduced.

### Minor Seed Pests

A few insects of minor economic value, found damaging the seeds were: *Brachyacma palpigera* (Wlsm.) (Gelechiidae), *Cathartus quadricollis* (Guer.) (Silvanidae), *Pityophthorus xylotrupes* (Eichhoff) (Scolytidae), *Trogoderma anthrenoides* (Sharp) (Dermestidae), *Loberus* sp. (Languriidae) and *Stilbus* sp. (Phalacridae).

### DISCUSSION

In Barbados, three pests, *Heliothis virescens* (F.), *Fundella cistipennis* (Dyar) and *Callosobruchus chinensis* (L.) inflict serious damage to pigeon-pea pods. Over the years it was estimated they destroy some 60% of the pods annually.

Although a number of indigenous natural enemies were recorded attacking eggs, larvae and pupae of these pests, their populations were usually too low for adequate control.

Between 1968 and 1983, a number of parasite species were introduced from India, Pakistan, Uruguay, U.S.A. and the Eastern Caribbean islands; 17 for the control of *H. virescens*, nine for *F. cistipennis* and two for *C. chinensis*. Of these, two, species, *Bracon hebetor* (Say) from India and *Bracon* sp. prob. *hebetor* (Say) (close to *Bracon brevicornis* [Wesmeal]) from St. Vincent, became established against *Heliothis* and *Fundella*. The levels of parasitism by the latter species was 3.9% to 44.4% (average 35.2%) on *H. virescens* and 2.1% - 70% (average 16.9%) on *F. cistipennis*, between April and December 1983.

APPENDIX 1. Exotic natural enemies introduced against *Heliothis virescens* (F.), between 1968-83, into Barbados, W.I.

Natural enemy	Country/origin	Year introduced	No. Released	Status
<b>Trichogrammatidae:</b>				
<i>Trichogramma achaeae</i> and <i>Nagarkatti</i>	India	1972	40,000	N.R.
** <i>Trichogramma chilostraeae</i> and <i>Nagarkatti</i>	India	1972-73	24,000	R.
<i>Trichogrammatoides armigera</i> and <i>Nagarkatti</i>	India	1972, 1974 and 1975	14,000	N.R.
<b>Ichneumonidae:</b>				
** <i>Camponotus chloridiae</i> Uchida	India and Pakistan	1968, 1971-72, 1975 & 1982	2,280	R.
** <i>Camponotus flavicincta</i> (Ashmead)	Uruguay (through CIBC, Trinidad)	1981-82	1,330 (338 females and 992 males)	R.
<i>Eriborus</i> sp.	India	1975	Figure not available	N.R.
<b>Braconidae:</b>				
*** <i>Apanteles marginiventris</i> (Cresson)	India and Pakistan	1970 and 1975	5,700	R.
** <i>Bracon hebetor</i> (Say)	India	1970 and 1975	2,700	R.
*** <i>Bracon</i> sp. prob. <i>hebetor</i> (Say) (close to <i>Bracon brevicornis</i> (Wesmeal))	St. Vincent	1983	12,000 (lab. bred)	R.
<b>Eulophidae:</b>				
*** <i>Trichoapilus diatraeae</i> and Margabandhu	India	1972	25,000 (lab. bred)	R.
<b>Tachinidae:</b>				
<i>Drino imberbis</i> Wiedemann	India	1968-70 and 1975	1,580	N.R.
<i>Eucarcasia illota</i> Curran	India	1968-69	1,100	N.R.
<i>Eucalatoria</i> sp.	India	1970	F.N.A.	N.R.
<i>Eucalatoria bryani</i> Sabrosky	Arizona (USA, via CIBC, T'dad)	1972-73	2,225 (867 females)	N.R.
<i>Exorista fallax</i> Neigen	India	1968	60	N.R.
<i>Goniophthalmus</i> sp.	India	1968	15	N.R.
<b>Reduviidae:</b>				
<i>Rhinocoris marginatus</i> Fab.	India	1970-71	50	N.R.

KEY:  
 R. = Recovered. N.R. = Not recovered  
 \*\* = Recoveries not consistent. \*\*\* = Established permanently

APPENDIX 2. Exotic natural enemies introduced against *Fundella cistipennis* (Dyar), between 1968-84, into Barbados, W.I.

Natural enemy	Country/origin	Year introduced	No. released	Status
<b>Braconidae:</b>				
<i>Bracon</i> sp.	Antigua	1984	2,160	N.R.
<i>Bracon cajani</i> Mues.	Trinidad	1968-70 and 1974	10,000	N.R.
<i>Bracon thurberiphagne</i> (Mues.)	Trinidad	1968-70 and 1974	10,200	N.R.
** <i>Bracon hebetor</i> (Say)	India	1970 and 1975	2,700	R.
*** <i>Bracon</i> sp. prob. <i>hebetor</i> (Say) (very close to <i>Bracon brevicornis</i> (Wesmeal))	St. Vincent	1983	12,000	R.
<i>Apanteles erilliae</i> Viereck	Trinidad and St. Kitts	1968-69 and 1975	244	N.R.
<i>Phanerotoma bennetti</i> Mues.	Trinidad	1969-70	117	N.R.
<b>Ichneumonidae:</b>				
<i>Eiphosoma annulatum</i> (Cresson)	Trinidad	1968-70	394	Already present in B'dos
<b>Bethylidae:</b>				
<i>Parasiterola</i> (= <i>Perisierola</i> ) sp.	Trinidad	1968	79	-du-
APPENDIX 3: Exotic natural enemies introduced against <i>Callosobruchus chinensis</i> L., during 1975-76, into Barbados, W.I.				
Natural enemy	Country/origin	Year introduced	No. released	Status
<b>Pteromalidae:</b>				
<i>Dinarmus basalis</i> (Rondani)	India	1975-76	2,200	N.R.
<i>Dinarmus vagabundus</i> (Timb.)	India	1975-76	1,300	Already present.

KEY:  
 R. = Recovered N. R. = Not recovered  
 \*\* = Recoveries not consistent \*\*\* = Established permanently