

STENOBRACON DEESAE, CAM. (HYM. BRAC.)
A NATURAL ENEMY OF THE MOTH
BORERS OF SUGARCANE

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Introduction. In recent years Entomologists all over India have been devoting a good deal of attention to the study of the insect pests of sugarcane. The authors have been making detailed studies of the moth borers and their natural enemies. Of the several parasites collected the results of the studies of the three larval parasites, viz., *Elasynus zehntneri*, Ferr., *Stenobracon nicevillei*, Bingh and *Rhaconotus scirpophagae*, Wlko., have already been published by the authors 1, 2, 3. The present paper deals with *Stenobracon deesae*, Cam.

The parasite belongs to the sub-family Viperioninae. It was described by Cameron 4 from specimens collected by C. G. Nurse in 1902 at Deesa, Simla and Ferozepur. Dr. Ramakrishna Ayyar 5, 6 states that it is one of the chief parasites of the stem boring Pyralid caterpillars of cane, sorghum and pulses. It is reported as an important parasite of *Scirpophaga* by Husain 7 from Punjab. Narayanan 8 mentions it as a parasite of the sugarcane root borer, *Emmalocera depressella*, Swinh. It has also been recorded from Formosa, Java, Sumatra, China and the Philippines by Watanabe 9. The authors have collected this parasite from sugarcane and sorghum fields from *Diatraea sticticrasis*, Hmps., *D. venosata*, Walk. *Chilo Zonellus* Swinh and *Scirpophaga* sp. The Coimbatore collections contain a single specimen of *deesae* labelled "from paddy".

Description of the Parasite. The following is the description of the parasite by P. Cameron :—

"Long 12. terebra 15 mm. Habitat Deesa. Antennae black, narrowed towards the apex; the scape covered with blackish hair. Head smooth and shining; the face covered with long fuscous hair; the clypeal depression deep, smooth and shining. Mandibles with the apical half deep black. The ocelli are bounded behind by two deep, curved furrows; in front of them is a triangular depression. Thorax smooth and shining; there is an oblique furrow on the base of the mesopleurae at the base above. Wings yellowish-hyaline; there is a fuscous cloud between the base of the stigma and the transverse basal nervure and extending to the opposite side of the wing; a cloud at the apex of the stigma extending to shortly beyond the middle of the cubital celluleo; the apex of the wing to near the second transverse cubital nervure and on the lower side extended backwards to beyond the middle of the second cubital celluleo. The apex of the hinder wing and its lower side to the middle where it projects obliquely upwards along the cubital nervure, smoky. Legs luteous; the apices of the tarsi blackish. Abdomen luteous, more or less suffused with black; the basal three segments

irregularly longitudinally striated, the striae in places forming reticulations the three transverse furrows are deep and closely, stoutly, longitudinally striated there is no keel on the second segment; the smooth basal plate is small, indistinct and triangular.

The male is similar; the clouds in the wings are more suffused; the apex of the abdomen is black; the antennae are longer than the body.

Habits of the Wasp. The adult parasites, during May and June hover about in large numbers in sorghum and sugarcane fields. In the field the parasite flies from stem to stem prodding rapidly for a moment on each, to find out the presence of the borer inside. In grown up canes, all the borers except *Scirpophaga* sp. make their entrance into the stem by cutting a hole into the stem. During their larval life they also stray away from stem to stem on account of which there is always more than one hole on the stem. These holes are always filled with the frass, the freshness of which is a sufficient indication to the parasite of the presence of the borer inside. The larva of *Scirpophaga* sp., enters through the mid-rib, tunnel downwards into the stem and only just before pupation, constructs a small hole to the outside of the stem and closes it with a thin film of the outermost leaf sheath. It is only through this external opening that the parasite can thrust her ovipositor to parasitise the larva, whereas, the other borers are accessible throughout their larval life. In all cases of the attack of *Scirpophaga* sp., only one larva will be found inside the plant whereas in *Diatraea* sp., in some instances, more than one larva have been noted. On account of these two facilities, the parasite finds it easy to parasitise borers other than *Scirpophaga* sp., and this eventually explains how the parasite has been more often found to attack *Diatraea stictieraspis*, Hmps., and *D. venosata*, Walk., than *Scirpophaga* sp.

The adult parasite, when ready to emerge, crawls out of the cocoon by cutting a hole in it and comes out of the tunnel through the opening on the stem made by the host larva. Immediately after emergence the parasite is lethargic; mating takes place subsequently and the females are ready for egg-laying. The ovipositor measures 15 mm. long and if, during her thrusts, it encounters a larva, it paralyses the larva and lays an egg on or near the head of the host. Table I gives the egg-laying records of 12 females. In the laboratory, on an average, each female laid 21 eggs, the maximum being 84. Just like its closely allied species *Stenobracon nicevilleti*, Bingh., this wasp also possesses the habit of distributing its eggs but in so doing, it is not regular and definite. It lays one or more eggs on each and in one instance as many as 10 eggs were laid on a single host but in all cases only one adult emerged.

As a result of a series of trials it was found that (1) a host on which eggs have been laid once, is again parasitised by the same parasite or by other individuals of the same species, (2) the number of eggs laid on each host is indefinite, (3) if more than one host larva is supplied in stems, it distributes its eggs but not necessarily on all, (4) if one host alone is supplied to a number of parasites they attack the host simultaneously and lay eggs on it. (In one such attack 15 eggs were found laid). (5) if different species of

borers are given to a single parasite it shows no preference to any particular larva, (6) the parasite breeds parthenogenetically, the progeny in such cases being males, (7) when more than one egg is laid all the eggs hatch out but only one grub thrives.

Life History. The egg (fig. 1) is translucent, elongate and cylindrical with a highly drawn out pedicel which is $1\frac{1}{2}$ mm long. The whole egg measures $3\frac{1}{2}$ mm. The egg period ranges from 23-31 hours. If the pedicel portion of the egg is cut out, the egg does not hatch.

The newly hatched grub measures $1\frac{1}{2} \times \frac{1}{2}$ mm. The grub crawls about over the host and punctures its skin at some tender part of the cuticle and sucks into its stomach, the material from the host's body. As the grub ingests food from the host it becomes opaque attaining the color of the host. The grub reaches its maximum size of 15×4 mm. in 3-6 days by which time the host larva is completely eviscerated. At this stage, it spins a white cocoon of silk and pupates in it. Under Pusa conditions Narayanan has noted the larval period to take about 22-25 days.

The pupa, when fresh, is white but in about two days the thorax and later on, the head turn black. It measures 12×3 mm. The pupal period ranges from 5-8 days.

Duration of the Life Cycle. The total life cycle of the parasite ranges from 13-20 days, the average for 30 cases being 12 days. Table II gives the detailed life history records of the parasites.

Longevity of the Adult Wasps. The adults were fed with honey solution. The maximum longevity for a female was 57 days and of a male 54 days, the average being 30 days. Table III gives the longevity records of 12 males and 12 females. Narayanan in Pusa has noted the longevity of the female to be "more than a week, even ten days" and of the males to be 36 hours.

Seasonal and Regional Prevalence. Field observations on the incidence of the parasite in Coimbatore show that the attack of the parasite is noticed in larger numbers from May-July. In March, April, August and September there is only a slight attack. The wasp has been collected in the Madras Presidency from the following districts: - Coimbatore, Ceded Districts, South Arcot, Vizagapatam and Tinnevely.

***Stenobracon nicevillei*, Bingham.** This is a species very closely allied to *S. deesae*. It was collected in 1901 by L. de Niceville and described by Col. C. T. Bingham¹⁰. In general form the two species apparently seem to be similar but there are specific differences between the two. It is easier to distinguish the females of both these species than the males. The dorsal surface of the fifth and the base of the sixth abdominal segments are black in the females of *S. nicevillei* while this dark band is absent in *S. deesae* (fig. 6). The males of both these species bear a similar dark band on the sixth abdominal segment but a broad black band running across the vertex of the head in *S. nicevillei* distinguishes it from *S. deesae* (fig. 7).

Efficacy of *Stenobracon deesae* as a Parasite. Since, only one parasite emerges from each host, it is a drawback in its habit to lay, in some cases, more than one egg on each host. It is also considered a drawback for any parasite to have a number of hosts. Though *S. deesae*, has a number of hosts most of them happen to be pests of the same crop

With an ovipositor 15 mm. long, the parasite has the advantage of attacking the borers living in protected situations. At any stage of their larval life it is able to attack the borers. The duration of the total life cycle of the parasite, as compared with that of the host, gives it a favourable position for the control of the pest. It is also very easy to rear the parasites in large numbers in the laboratory as the host larvae are easily available from sorghum fields.

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TABLE I
Oviposition records of *Stenobracon deesae*, Cam.

	Fe- male No. 1	Fe- male No. 2	Fe- male No. 3	Fe- male No. 4	Fe- male No. 5	Fe- male No. 6	Fe- male No. 7	Fe- male No. 8	Fe- male No. 9	Fe- male No. 10	Fe- male No. 11	Fe- male No. 12
aged on	25 3 37	17 4 37	18 4 37	20 4 37	4 5 37	5 5 37	9 5 37	13 5 37	20 6 37	20 6 37	15 7 37	28 7 37
Date of Egg laying and the number of eggs laid.	30 3 37	24 4 37	19 4 37	21 5 37	6 5 37	9 5 37	23 5 37	13 6 37	4 7 37	24 6 37	20 7 37	31 7 37
	4	1	1	2	2	1	2	4	3	1	1	2
	1 4 37	26 4 37	20 4 37	23 5 37	13 5 37	10 5 37	25 5 37	15 6 37	4 8 37	28 6 37	21 7 37	1 8 37
	3	1	1	2	2	1	2	2	2	1	2	1
	2 4 37	28 4 37	21 4 37	26 5 37	14 5 37	12 5 37	26 5 37	16 6 37		4 7 37	22 7 37	2 8 37
	2	4	10	2	3	4	4	1		1	7	2
	3 4 37	29 4 37	22 4 37	27 5 37	15 5 37	14 5 37	27 5 37	17 6 37		6 7 37	23 7 37	5 8 37
	6	2	1	2	2	2	3	1		1	3	2
	4 4 37		24 4 37	30 5 37	21 5 37	15 5 37	30 5 37	1 6 37		7 7 37	26 7 37	6 8 37
	3		3	2	3	2	1	2		1	6	6
	6 4 37		25 4 37	1 6 37	27 5 37	19 5 37	31 5 37	22 6 37		8 7 37	27 7 37	9 8 37
	1		1	1	3	1	7	1		1	4	1
			27 4 37		30 5 37		9 6 37			10 7 37	30 7 37	11 8 37
			2		1		1			1	6	2
			28 4 37				11 6 37			11 7 37	31 7 37	12 8 37
			3				2			1	1	3
			29 4 37				12 6 37			14 7 37	1 8 37	4 8 37
			1				2			1	5	2
			30 4 37				13 6 37				2 8 37	15 8 37
			2				3				3	1
			1 5 37								3 8 37	16 8 37
			2								2	4
			6 5 37								4 8 37	
			3								2	
			12 5 37								5 8 37	
		2								7		
		13 5 37								6 8 37		
		2								1		
		14 5 37								7 8 37		
		2								4		
										8 8 37		
										1		
										10 8 37		
										2		
										11 8 37		
										7		
										12 8 37		
										1		
										14 8 37		
										5		
										16 8 37		
										14		
ried on	8 4 37	29 4 37	7 6 37	1 6 37	7 6 37	20 5 37	26 6 37	24 6 37	6 2 37	16 7 37	18 8 37	18 8 37
otal o. of eggs laid.	19	8	36	11	16	11	27	11	5	9	84	26

TABLE II.
Detailed Life-history records of *Stenobracon deesae*, Cam.

Ser. No.	Eggs laid on.	Name of the host supplied.	Larva hatched on.	Egg period in days.	Cocoon formed on.	Active larval life in days.	Pupated on.	Larval period in days.	Adults emerged on.	Pupal period in days.	Total life cycle in days.	Sex.
1	30 3 37	Chilo.	31 3 37	1	3 4 37	3	4 4 37	4	12 4 37	8	13	F
2	3 4 37	"	4 4 37	1	7 4 37	3	10 4 37	6	17 4 37	7	14	"
3	4 4 37	"	5 4 37	1	8 4 37	3	14 4 37	9	20 4 37	6	16	"
4	6 4 37	"	7 4 37	1	10 4 37	3	13 4 37	6	20 4 37	7	14	"
5	19 4 37	"	20 4 37	1	24 4 37	4	28 4 37	8	5 5 37	7	16	M
6	21 4 37	"	22 4 37	1	26 4 37	4	28 4 37	6	5 5 37	7	14	F
7	24 4 37	"	25 4 37	1	29 4 37	3	2 5 37	7	7 5 37	7	15	"
8	27 4 37	"	28 4 37	1	1 5 37	3	6 5 37	8	13 5 37	7	16	"
9	28 4 37	D. venosata.	29 4 37	1	2 5 37	3	7 5 37	8	13 5 37	6	15	"
10	29 4 37	"	30 4 37	1	3 5 37	3	9 5 37	9	16 5 37	7	17	"
11	30 4 37	"	1 5 37	1	5 5 37	4	8 5 37	7	15 5 37	7	15	"
12	6 5 37	Sesamia.	7 5 37	1	10 5 37	3	13 5 37	6	20 5 37	7	14	"
13	12 5 37	Scirpophaga.	13 5 37	1	17 5 37	4	21 5 37	8	27 5 37	6	15	M.
14	13 5 37	Chilo.	14 5 37	1	18 5 37	4	27 5 37	13	2 6 37	6	20	"
15	15 5 37	"	16 5 37	1	19 5 37	3	24 5 37	8	31 5 37	7	16	"
16	26 5 37	D. venosata.	27 5 37	1	31 5 37	4	3 6 37	7	10 6 37	7	15	"
17	27 5 37	Chilo.	28 5 37	1	31 5 37	3	2 6 37	5	9 6 37	7	13	"
18	31 5 37	"	1 6 37	1	4 6 37	3	8 6 37	7	14 6 37	6	14	"
19	9 6 37	Scirpophaga.	10 6 37	1	14 6 37	4	16 6 37	6	23 6 37	7	14	"
20	12 6 37	"	13 6 37	1	16 6 37	3	22 6 37	9	28 6 37	6	16	"
21	15 6 37	Chilo.	16 6 37	1	20 6 37	4	25 6 37	9	2 7 37	7	17	"
22	24 6 37	D. sticticrasis	25 6 37	1	29 6 37	4	5 7 37	10	12 7 37	7	18	F.
23	28 6 37	D. venosata.	29 6 37	1	5 7 37	6	8 7 37	9	15 7 37	7	17	M.
24	4 7 37	Scirpophaga.	5 7 37	1	11 7 37	6	14 7 37	9	21 7 37	7	17	F.
25	30 7 37	D. sticticrasis	31 7 37	1	4 8 37	4	9 8 37	9	16 8 37	7	16	M.
26	31 7 37	Chilo.	1 8 37	1	5 8 37	4	8 8 37	7	14 8 37	6	14	"
27	8 8 37	D. sticticrasis	9 8 37	1	13 8 37	4	19 8 37	10	25 8 37	6	17	"
28	9 8 37	"	10 8 37	1	15 8 37	5	20 8 37	10	28 8 37	8	19	"
29	12 8 37	Scirpophaga.	13 8 37	1	17 8 37	4	22 8 37	9	29 8 37	7	17	"
30	14 8 37	D. venosata.	15 8 37	1	19 8 37	4	22 8 37	7	29 8 37	7	15	"

TABLE III.
Length of Life of *Stenobracon deesae*, Cam.

Ser. No.	Emerged on			Died on			Sex of the adult	No. of days lived
1	25	3	37	8	4	37	F.	14
2	12	4	37	18	5	37	"	36
3	17	4	37	29	4	37	"	12
4	18	4	37	18	5	37	"	30
5	4	5	37	7	6	37	"	35
6	5	5	37	20	5	37	"	15
7	5	5	37	14	5	37	"	9
8	6	5	37	9	7	37	M.	34
9	13	5	37	28	6	37	F.	46
10	13	5	37	6	7	37	M.	54
11	13	5	37	28	6	37	F.	46
12	15	5	37	11	7	37	"	57
13	20	5	37	9	7	37	"	50
14	20	5	37	1	6	37	"	12
15	27	5	37	23	6	37	M.	27
16	10	6	37	2	7	37	"	22
17	9	6	37	22	7	37	"	42
18	11	6	37	11	7	37	"	30
19	11	6	37	2	7	37	"	21
20	12	6	37	11	7	37	"	29
21	14	6	37	2	8	37	"	49
22	23	6	37	27	7	37	"	34
23	16	8	37	15	9	37	"	30
24	24	8	37	27	9	37	"	30
Average longevity for females				...	...	...	...	30
Average longevity for males				...	...	...	...	32