

BIOLOGICAL STUDIES ON *AEOLESTHES SARTA* SOLSKY ATTACKING POPLARS IN PAKISTAN

by

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Abstract. *Aeolesthes sarta* Solsky is an important borer of poplars, chinar and several other species and widely distributed in Pakistan. Beetles measuring 35 mm (female) and 32 mm (male) emerge from 20th March to 15th April with peak emergence during 1st to 10th April. They mate in 8 hours to 2 days after emergence with a copulation period of 5 to 25 minutes. Longevity of males is 7 to 15 days while females live for 19 to 25 days. White elliptical eggs measuring 3.1 to 4.9 mm are laid in clusters 1 to 5 days after emergence usually at night in wounds and cracks on poplar stems. On an average a female lays 156 eggs with a maximum of 231 eggs at 22 to 24°C and a minimum of 22 eggs at 15°C under laboratory conditions. Yellowish white grubs, 5.4 mm long hatch after 10 to 22 days and start eating out galleries just beneath the bark. Older grubs make 2 to 7 cm broad and 19.3 cm long galleries deep into the stem. Fullgrown grubs 5.6 cm long transform to 3.6 cm long whitish yellow pupae after preparing pupal chambers. It completes one life cycle in two years. It spends one month in emergence, 22 days in egg laying and incubation, 17 to 18 months as grubs, 17 days as prepupae, 3 to 4 months as pupae and 1 to 2 months as premature beetles lying in pupal chambers.

Introduction. *Aeolesthes sarta* Solsky (Cerambycidae, Coleoptera) is one of the most destructive borer of poplar causing complete kill of poplar trees and making the wood unsuitable for industrial use.

Stebbing, (1914) reported this borer as the most serious pest of *Platanus orientalis*, *Populus alba*, *P. euphratica*, *Salix alba*, *S. babylonica* and *Ulmus* sp. causing heavy damage throughout Baluchistan. Beeson (1941) recorded it on *Acer cultratum*, *Aesculus indica*, *Corylus colurna*, *Juglans regia*, *Platanus orientalis*, *Populus alba*, *P. euphratica*, *Prunus racemosa*, *P. communis*, *Pyrus malus*, *Salix alba* and *Ulmus wallichiana* and considered it a serious pest of *Platanus orientalis*, Poplar and *Salix* in Quetta Valley. Janjua and Chaudhry (1962) recorded this borer on fruit orchards in Quetta valley and found it serious on *Platanus orientalis*. Chaudhry et al. (1966) and Chaudhry et al. (1969) reported it as a very widely distributed pest of poplars in Pakistan. Chaudhry and Ahmad (1972) recorded this borer as serious pest on *P. nigra* in different areas.

Material and Method. Realising the importance of the problem, research work on study of biology and ecology of different borers attacking poplar trees was started in March, 1973 under the PL-480 programme of U.S.D.A. Collection of infested logs of poplar was made from various localities. The logs were caged in laboratory as well as in the field for emergence of adults. The emerging adults were released in pairs for mating and study of

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Fig. 1. 1 *Aeolesthes sarta* females released on poplar billets kept in glass chimneys for oviposition. Counted eggs transferred to glass dishes for hatching.

Fig. 1. 2 Poplar billets having freshly hatched grubs released in artificially made slits in bark.

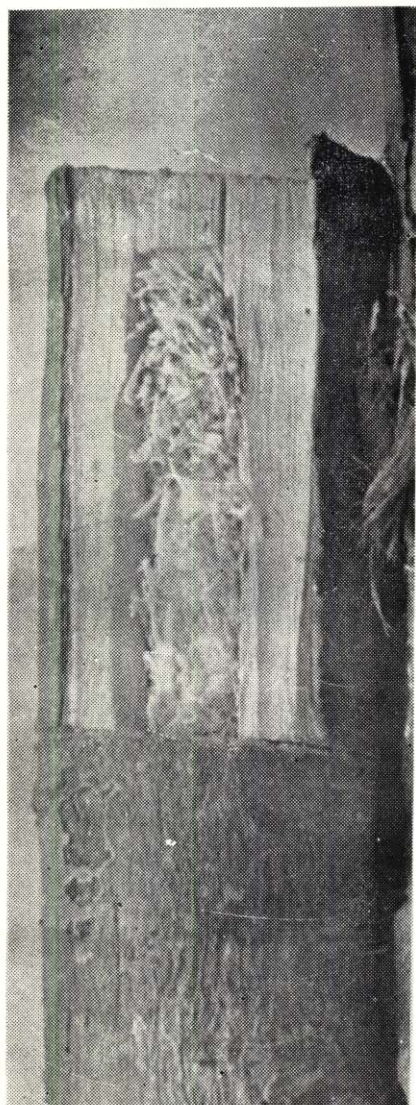


Fig. 2 Advanced stage grubs released in artificially made gallery according to grub size, bore into the billets leaving behind frass.

fecundity and longevity of females at different temperatures in the laboratory. Eggs laid by each female were counted and kept for hatching (Fig. 1-1). The grubs were reared on freshly cut billets of poplar by releasing them in artificially made slits (Fig 1-2) on the bark and later instars in artificially prepared galleries in the sapwood of poplar billets (Fig. 2). Grubs were transferred to fresh billets every month. To study distribution and extent of damage caused by this borer various poplar growing areas in Pakistan were surveyed by examining all trees planted at various places.

Results and discussion. Distribution and food plants: During the course of investigations *A. sarta* Solsky was collected from *P. alba*, *P. nigra*, *P. x-euramericana*, *P. ciliata* in Peshawar, Quetta, Parachinar, Swat, Dir and Rawalpindi. In Peshawar and Quetta areas it was found very serious on *P. nigra* and *Platanus orientalis*. It was also collected from *Malus pumila*, *Prunus amygdalis*, *Prunus armeniaca*, *Pyrus* spp. and

Salix spp. from Peshawar. This borer was absent in Azad Kashmir and Sind. The extent of damage on different host plants is given below:

Locality	Host	Number of trees observed	%tree infestation	%tree mortality
Peshawar	<i>P. nigra</i>	462	100	36
"	<i>P. x-euramericana</i>	216	79	—
"	<i>Malus pumila</i>	45	33	—
"	<i>Prunus amygdalis</i>	75	36	—
"	<i>Prunus armeniaca</i>	54	33	—
"	<i>Pyrus</i> spp.	25	20	—
"	<i>Platanus orientalis</i>	51	100	—
"	<i>Salix</i> sp.	160	75	—
Ziarat	<i>P. x-euramericana</i>	4	100	—
Kalat	<i>P. x-euramericana</i>	160	4.4	—
Mastung	<i>P. nigra</i>	12	100	—
"	<i>P. x-euramericana</i>	8	100	—
"	<i>P. alba</i>	50	100	34
Quetta	<i>P. nigra</i>	305	100	—
"	<i>P. alba</i>	25	100	—
Fortsandeman	<i>P. nigra</i>	114	100	22
Bannu	<i>P. nigra</i>	80	33	—
"	<i>P. x-euramericana</i>	65	4	—
Kohat	<i>P. nigra</i>	270	90	36
"	<i>P. x-euramericana</i>	182	35	—
Sialkot	<i>P. nigra</i>	62	15	—
"	<i>P. x-euramericana</i>	140	2	—
Abbottabad	<i>P. ciliata</i>	35	2	—
Kalam	<i>P. ciliata</i>	31	50	8
Rawalpindi	<i>P. nigra</i>	325	5	—
"	<i>P. x-euramericana</i>	287	2	—
Hassanabdal	<i>P. nigra</i>	64	20	—

The infestation varied from 2 to 100% at different places to various hosts. The minimum mortality of 8% was recorded on *P. ciliata* at Kalam and maximum of 36% on *P. nigra* at Peshawar and Kohat.

Biology: Adult beetle (Fig. 3-1) large elongate, cylindrical, steel grey in colour, elytra covered with thick coating of pubescence, shining white when newly emerged disappearing with age. Body length vary from 22 to 42.2 mm in males and 29.2 to 43 mm in females. Antennae more than double the body length in males and shorter than body in females. Elytra obliquely truncate at the apex, the outer angle being unarmed and the sutural angle dentate or shortly spined.

In laboratory, emergence of beetles has been observed from 20th March to end of April with mass emergence from 1st to 10th April. In order to come out of their pupal chambers beetles made round exit holes in stem of poplar trees. Sometimes on finding the weather unsuitable the beetles returned to their pupal chambers soon after their emergence. On coming out of their pupal chambers, beetles fed on tree bark superficially. When disturbed, the beetles produced heavy noise and became very restless. If more than one pair released in a cage, males fought vigorously and lost their antennae and legs and died.

The copulation of beetles commenced 8 hours to 2 days after emergence, and continued for 5 to 25 minutes. Male beetle was observed riding on the back of female. The male aedeagus measuring 5 mm long, thin, pointed, dark brown in colour, remained outside its body for 15 minutes after copulation. Usually a male fertilized one female, but in a few cases a male copulated with more than one females. The females lived for 19 to 25 days while males remained alive for 7 to 15 days.

White elliptical eggs (Fig. 3-2) measuring 3.1 to 4.9 mm in length, were laid 1—5 days after emergence. Eggs were normally laid at night in groups of 4-13 eggs in wound scars or small slits made by the beetles, sometimes over scraped bark of poplar stems. The oviposition commenced 1 to 5 days after emergence of beetles and continued for 7 to 22 days under different conditions:

Temperature average °C		Number of females	Eggs laid by females		% egg viability	Duration in days		
min	max		aver.	range		Preoviposition	Oviposition	Incubation
21	23	6	144	66—175	85.0	2—3	7—15	11—15
22	24	12	156	127—231	84.6	1—4	9—15	10—17
25	25	2	95	23—165	85.5	3—4	8—13	10—12
23	26	10	83	31—177	85.0	1—5	9—18	10—15
10	10	5	0	0	0	0	0	0
15	15	5	49.3	22—89	60.0	2—8	13—22	15—22
35	35	6	29	18—39	0	0	0	0
40	40	5	0	0	0	0	0	0
45	45	5	0	0	0	0	0	0
50	50	5	0	0	0	0	0	0

The maximum number of 231 eggs were laid at 22-24°C while minimum viable eggs were laid at 15°C. No egg laying took place at 10°C and above 35°C. The maximum hatching occurred during 12 to 13 days after oviposition. The eggs laid at 35°C did not hatch.

Newly hatched yellowish white grubs, with brown head and black mandibles, measuring 3-4 mm in length (Fig.3-3) penetrated into the bark by making thin galleries. One month old grubs measuring 6.1 mm in length ate out 8.9 mm long shallow galleries just beneath the bark. When released in fresh billets they bored deep into sapwood by making broad



Fig. 3 *Aeolesthes sarta*: 1. Male & female on Poplar branch; 2. Eggs in wound; 3. Freshly hatched grubs; 4. Galleries made by young grubs.



Fig. 4. 1 Heavily damaged Poplar stem showing feeding scars and exit holes.

Fig. 4. 2 Pupa of *Aeolesthes sarta*.

galleries. After 3 months the grubs attained a size of 2.4 cm and made 19.3 cm long and 2.7 cm wide irregular winding tunnels fully packed with frass and powder (Fig.3-4). These grubs continued feeding for hibernation during December to February. After 12 months when shifted to new billets during March they became active again and continued feeding till September. Full-grown grubs measuring 5.65 cm in length made pupal chamber deep down in the heart of stem. The chamber is straight but slightly curved and tightly closed from all sides. The larval period was 17 months and 11 days.

In case of severe infestation under natural conditions the grubs eat out patches under the bark and the sapwood resulting in fall of the bark from infested parts exposing sapwood of the stem having numerous galleries of the borer. If the damage extends all around the stem leaving no bark intact for passage of food material the tree dies completely. In case of light infestation small rotting areas on the bark often at the base of branches are visible to indicate the attack. In addition to growth losses resulting in reduced wood yield, the timber so produced is useless for industrial purposes due to numerous borer holes and galleries in it even if the trees are not killed completely (Fig. 4-1).

Pale, yellow pupa with legs tightly pressed to sternum, bears complete structural resemblance to its future beetle (Fig. 4-2.) The average pupal length is 3.6 cm. Transformation of beetle starts after a prepupal period of 17 days and completes in 3 months and 18 days.

The generation of this borer starts with egg laying in April. The grubs hatching in 10-17 days feed under bark and sapwood for about a year and a half with hibernation during December to February. After a pupal duration of about 4 months the beetles are formed but their emergence takes place 1-2 months later in March-April. One life cycle is completed in two years.

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