

**THE BIOLOGY OF FLESH FLY, *BOETTCHERISCA PEREGRINA*
(ROBINEAU-DESVOIDY, 1830) (DIPTERA: SARCOPHAGIDAE)**

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Abstract: The biology of *Boettcherisca peregrina* (Robineau-Desvoidy, 1830) (Diptera: Sarcophagidae) was studied in the laboratory ($25 \pm 5^\circ\text{C}$, R.H. $70 \pm 10\%$ and 12 h light: 12 h dark cycle). There were four definite life stages, such as egg, larva, pupa and adult, in its life cycle. The mean duration of the life cycle was 13.19 ± 1.32 days. The egg was creamy white color, cylindrical, rounded at both ends. The egg shell was comparatively thick and hard. There were three larval instars. The larvae of *B. peregrina* were acephalous and apodus type. The transparent 12 segmented larva possessed a pair of mouth hook, bands of small backwardly directed black micro spines, a pair of prothoracic spiracle and a pair of posterior spiracle. The 1st larvae were relatively more transparent at the time of hatching. The second instar larvae were voracious feeder. The body size increased largely during the third instar. They were deep creamy to pale brownish in color. The pupae of *B. peregrina* were coarctate aedeagus type. The posterior end of the puparium was rounded and the anterior end was slightly pointed. The adults were metallic brown in color. The males were smaller in size than the females. The mean incubation period was 11.6 ± 2.70 hours, and the larval, post-feeding and pupal periods were 102.22 ± 7.85 hours, 75.4 ± 3.57 hours, and 5.81 ± 1.30 days, respectively. The longevity of the mated male and female adults (36.9 ± 2.46 days and 27.2 ± 2.25 days, respectively) were more than that of the unmated ones (23.6 ± 2.25 days and 18.3 ± 1.5 days, respectively). The protein fed adults lived longer than the protein unfed ones. The male always lived longer than the female.

Key words: Biology, life cycle, *Boettcherisca peregrina*, Sarcophagidae.

INTRODUCTION

Boettcherisca peregrina (Robineau-Desvoidy, 1930) (Diptera: Sarcophagidae), commonly known as flesh fly, has medical and veterinary importance as an ectoparasite causing myiasis in human and other mammals. Recently, the flies are used in medio-criminal entomology. They are large-sized flies with black and gray longitudinal stripes on the thorax, and a checkerboard-like pattern on abdomen, which often red-tipped. The eyes are brightly red. Females are larviparous. These flies are strong fliers.

In Bangladesh, *B. peregrina* has great significance for human hygiene and also in the economy of the livestock myiasis, fish and other animal food processing factories. The larvae of this species take nourishment from exposed

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fish and meat, and contaminate the food material by reducing the nutritional value of the food materials. *Lucilia cuprina* is the key pest of the fish drying industries of the coastal and off-shore islands in the Bay of Bengal. *Boettcherisca peregrina* is also a common pest on the same area. Together with the key pest they harm a lot of existing fish industries.

There are three important insect pests of sun-dried marine fish, viz. *B. peregrina*, *Chrysomya megacephala* and *L. cuprina*. At present, the feasibility study of the blowfly Sterile Insect Technique (SIT) is being continued at Sonadia and Nazirer Tek marine fish drying yard in order to suppress the major pest, *L. cuprina*. Preliminary results of the field level application of the blowfly SIT showed a gradual suppression of the wild population of *L. cuprina* in the targeted localities. The present study on the general biology of *B. peregrina* will be of great value towards the development of suitable control measures including SIT.

MATERIAL AND METHODS

The biology of the fly was studied in the blowfly laboratory of the Radiation Entomology and Acarology Division, Institute of Food and Radiation Biology (IFRB), Atomic Energy Research Establishment (AERE), Savar, Dhaka. An adult stock rearing of *B. peregrina* was maintained in the laboratory condition ($25 \pm 5^\circ\text{C}$, $70 \pm 10\%$, R.H. and 12 h light: 12 h dark cycle). Adult stock was kept in rectangular cages made up of wood and iron frame ($30 \times 20 \times 20$ cm) covered with nylon mosquito net. They were supplied with a solution of sugar and water soaked in cotton wools as their food.

Fresh bovine liver was supplied to the adult flies for proper reproductive development. Initially, small pieces of fresh cow liver were given which helped the growth of their reproductive system. Later on, tilapia fish (*Oreochromis niloticus*) were given as their food which was placed in a petridish inside the stock cage for the collection of eggs and larvae. Normally, the females were viviparous laying the 1st instar larvae. Occasionally, the females laid eggs in clusters. The eggs and 1st instar larvae were then put on a fish placed in a small bowl the fish being used as their food. The fishes containing the larvae were then placed in a larger plastic bowl with sawdust at the base. The large bowl was then covered with a piece of cloth primarily to prevent from external invasion by the same or other fly species.

Some larvae of *B. peregrina* were placed on a petridish to observe different characteristics of the larval instars after each ecdysis. Five replications were used. Prior to pupation the late 3rd instar larva stopped feeding and dropped onto the saw dust and remained in the saw dusts till the formation of pupae

and this stage is called the post feeding larval stage. The pupae were isolated from the saw dust by hand sieving. The clean pupae kept in a petridish and were placed in the adult cages for emergence into the adult flies of the next generation. Different changes of morphological features and color of various life stages were recorded under a light microscope and micro photograph was taken by using a Nikon microscope. The length and breadth of the larvae were measured by an ocular micrometer. The longevity of the adults was observed on two different food media (Sugar, Water and Liver or Sugar and Water) either in paired or unpaired conditions. For this, ten pairs of male and female were placed in each adult cage for rearing. The emerged males and females were utilized for laboratory culture and other experimental purposes.

RESULTS AND DISCUSSION

The life cycle of *B. peregrina* comprised of four definite stages, such as egg, larva, pupa and adult (Fig. 2).

Egg (Fig. 1): The egg of *B. peregrina* was creamy white in color, cylindrical, rounded at both ends; the anterior end was more tapered than posterior end. The shell or chorion of the egg was comparatively thick and hard. The creamy white egg considerably attained a deeper creamy coloration prior to hatching. Under light microscope, segmental dark bands and black pointed mouth hook of the developing larva could be seen through the transparency of the chorion. The moisture played an important role in the hatching of the larvae. The incubation period of the flesh fly was 11.6 ± 2.7 hours (Table 1). The average length and breadth of the egg of *B. peregrina* were 1.61 ± 0.13 mm and 0.44 ± 0.039 mm, respectively (Table 2).

The present results were in conformity with the findings of David *et al.* (2003) and Sukontason *et al.* (2007, 2005).

Larva (Fig. 1): The larva of *B. peregrina* was acephalous and apodous type which had three instars. Each instar was transformed into the following instar by shedding off their old skin (exuvium). The transparent 12 segmented larva possessed a pair of mouth hook, bands of small backwardly directed black micro spines, a pair of prothoracic spiracle and a pair of posterior spiracle. The tracheal and digestive systems of the larva were visible under the microscope through transparent body cuticle. They could move by means of the expansion and contraction of their segmented legless body.

First instar larva (Fig. 1): The 1st instar larva was relatively more transparent at the time of hatching. The mean length and breadth of the larva was 1.77 ± 0.024 mm and 0.50 ± 0.107 mm, respectively (Table 2). In most cases, the female flies laid first instar larva on or near the food sources.

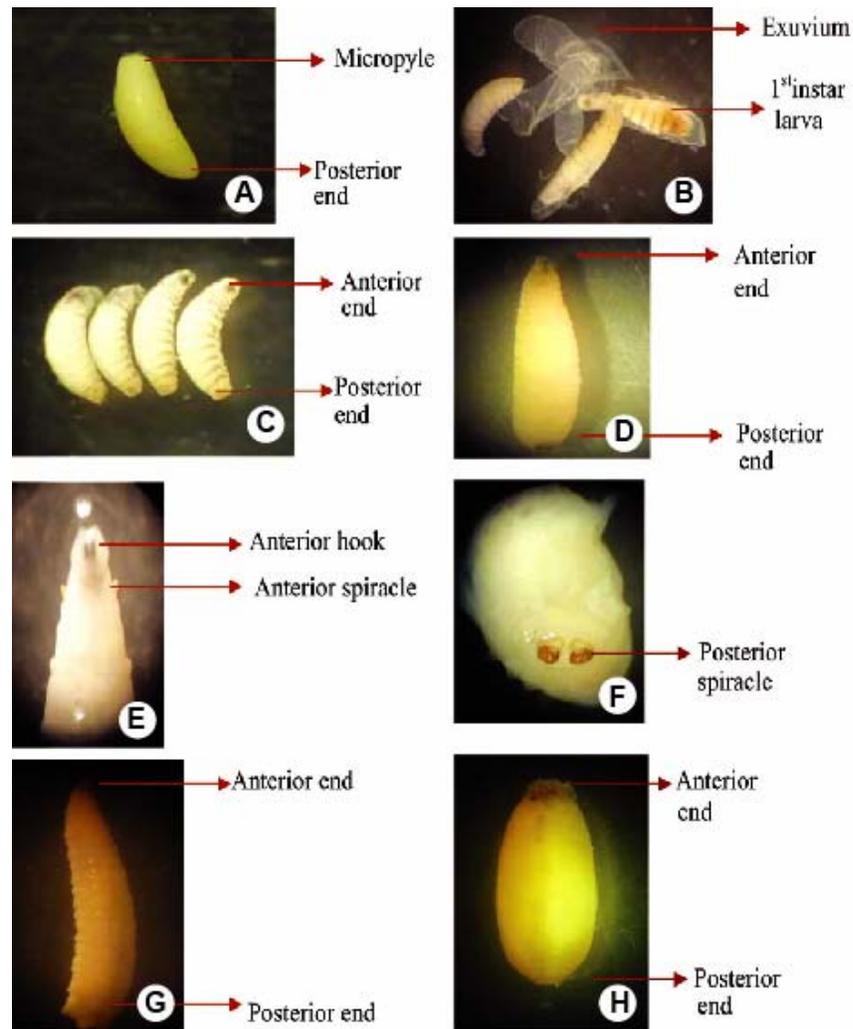


Fig. 1. Photograph showing A) egg; B) 1st instar larva hatching out; C) 1st instar larvae; D) 2nd instar larva; E) Anterior hook of 3rd instar larva; F) Posterior spiracle of 3rd instar larva; G) 3rd instar larva and H) early stage of pupa of *B. peregrina*. (Magnification=2X).

Second instar larva (Fig. 1): The second instar larvae were voracious feeder. The mean length and breadth of the 2nd instar larvae were 4.49 ± 0.22 mm and 0.97 ± 0.088 mm, respectively (Table 2).

Third instar larva (Fig. 1): The body size of the third instar larva increased largely, but the overall morphological features were the same as those of the second instar larva. It was deep creamy to pale brownish in color. The mean length and breadth of the 3rd instar larva was 21 ± 0.98 mm and 4.76 ± 0.36 mm, respectively (Table 2).

Table 1. The developmental period of various stages of *B. peregrina* reared in the Laboratory.

No. of obs. (n)	Incubation period (hours) (Mean ± SD)	Larval duration (hours)			Total larval duration (hours) (Mean ± SD)	Post-feeding larval duration (hours) (Mean ± SD)	Pupal duration (hours) (Mean ± SD)	Total duration (Mean ± SD)
		1 st instar (Mean ± SD)	2 nd instar (Mean ± SD)	3 rd instar (Mean ± SD)				
5	11.6 ± 2.70	18.2 ± 2.94	25.4 ± 3.91	47 ± 2.64	102.2 ± 7.9	75.4 ± 3.57	5.8 ± 1.30	13.91 ± 1.32

Table 2. The length and breadth (in mm) of different developmental stages of *B. peregrina* reared in the Laboratory.

No. of obs. (n)	Parameters	Egg (Mean ± SD)	Larval instar			Post feeding larval stage (Mean ± SD)	Pupa		Adult
			1 st instar (Mean ± SD)	2 nd instar (Mean ± SD)	3 rd instar (Mean ± SD)		Male (Mean ± SD)	Female (Mean ± SD)	
10	Length	1.61 ± 0.13	1.77 ± 0.02	4.49 ± 0.22	21 ± 0.98	24.36 ± 0.82	11.40 ± 0.84	12.47 ± 0.4	13.86 ± 0.25
	Breadth	0.44 ± 0.04	0.50 ± 0.10	0.97 ± 0.089	4.76 ± 0.4	5.38 ± 0.6	4.54 ± 0.44	3.22 ± 0.30	3.80 ± 0.25

Larval period: The total larval period, i.e. from first larval hatching to post feeding pre-pupal stage, was of 102.2 ± 7.85 hours (Table 1).

These findings on the larval morphology of *B. peregrina* were also observed by other contemporary scientists as Queiroz and Carvalho (1987), Queiroz *et al.* (1997) and Parkar (1916).

Post-feeding larval stage: At the end of the third instar larval stage, the larva stopped feeding and dropped into the saw dust, and passed on to an inactive stage. During this period, the larva became thicker and shorter, and the cuticle gradually contracted, hardened and darkened to form puparium. The average duration of this stage was 75.4 ± 3.57 hours (Table 1). The average length and breadth of the post-feeding larva were 24.36 ± 0.816 mm and 5.38 ± 0.559 mm, respectively (Table 2).

Pupa and pupal period (Fig. 2): The pupae of *B. peregrina* were coarctate aedeagus type. The posterior end of the puparium was rounded and the anterior end was slightly pointed. Some of the non-functional features were observed on the puparium like bands of spines, black sclerotized mouth-hook, anterior spiracles, posterior spiracles, etc. The color of the pupa was creamy white at the initial stage and later turned into red brown to blackish brown color after a few hours or a day when sclerotization was completed. The average pupal period of the flesh fly was 5.8 ± 1.30 days (Table 1). The average length and breadth of the pupa were 11.40 ± 0.84 mm and 4.54 ± 0.44 mm, respectively (Table 2). The results of the study had similarity with the findings of Janjua (1948).

Adult (Fig. 2): The ptilinum of the mature adult broke the puparium during emergence. The newly emerged flies were at first very soft, grayish black in color with ptilinum and unexpanded wings. Within a few hours, the ptilinum was inverted; the cuticle hardened and the wings were expanded to dry. They were turned to metallic brown in color. The males usually emerged earlier than the females. The males were smaller in size than the adult females.

The mean length and breadth of the males were 3.11 ± 0.0089 mm and 0.805 ± 0.07 mm, respectively and those of the females were 3.46 ± 0.0625 mm and 0.95 ± 0.0645 mm, respectively at the thoracic region (Table 2).

Duration of life cycle: The total duration of the life cycle (from egg to adult) of *B. peregrina* was 13.19 ± 1.32 days (Table 1).

Adult longevity: The mean longevity of the paired male and female reared on liver, sugar and water were 36.9 ± 2.46 days and 27.2 ± 2.25 days, respectively and that of the unpaired male and female feeding on the same food, were 23.6 ± 2.25 days and 18.3 ± 1.5 days, respectively (Table 3). The mean longevity of the paired male and female feeding on sugar and water were 29.2 ± 1.17 days and

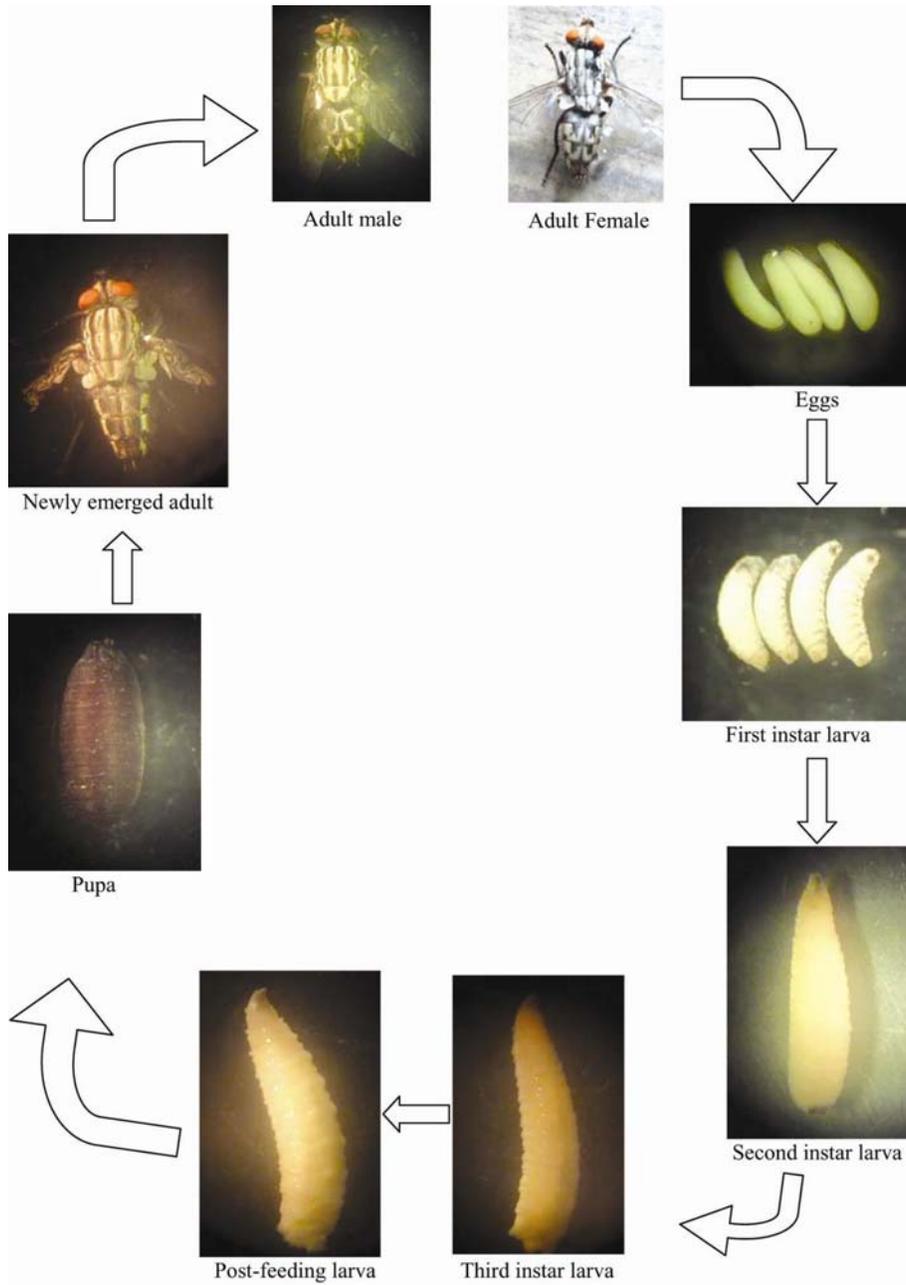


Fig. 2. The life-cycle of *B. peregrina* (Magnification=2x).

25.5 ± 1.67 days, respectively and unpaired male and female feeding on the same food, were 16.8 ± 1.03 days and 14.4 ± 1.26 days, respectively (Table 3). The variations in dietary proteins, and paired and unpaired conditions influenced the adult longevity of *B. peregrina*. The longevity of the males was

always greater than the females in both paired and unpaired conditions irrespective of variations in food sources. Gabre *et al.* (2005) reported that in case of *C. megacephala*, the adult longevity of both males and females feeding on liver was always more prolonged than those reared on the food without liver. Protein rich food, such as fresh bovine liver is essential for the reproductive development of *B. peregrina*.

Table 3. Longevity of the male and female of *B. peregrina* on different food regime.

No. of obs. (n)	Food	Longevity in days			
		Paired		Unpaired	
		Male (Mean \pm SD)	Female (Mean \pm SD)	Male (Mean \pm SD)	Female (Mean \pm SD)
10	Liver, sugar and water	36.9 \pm 2.46	27.2 \pm 2.25	23.60 \pm 2.25	18.03 \pm 1.5
	Sugar and water	29.2 \pm 1.17	25.5 \pm 1.67	16.8 \pm 1.03	14.4 \pm 1.26

The present study of *B. peregrina* infesting fresh fish will be very useful for the development of flesh fly SIT through the radio-sterility of male flies, and release of the sterile male in target area to mate with the wild female, and resulting in the hinderance of the natural production of offsprings which will cause gradual suppression of the target pest population.

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