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The Morphology and the Sex Ratio of the Butterfly Species *Appias libythea* (Fabricius, 1775)

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Abstract

The morphology of the stripped Albtross butterfly, *Appias libythea* (Fabricius, 1775) and the sex ratio according to temperature tolerance were studied within the study period from June 2003 to May 2006. Sexual dimorphism was obvious between the sexes in this species. Temperature tolerance tests under varying temperature (25˚C, 30˚C, 35˚C and 40˚C) showed the suitable temperature for survival to be in 25˚C, 30˚C, 35˚C. The number of males predominated in the emerged butterflies in high temperature.

Key words : Sex ratio, temperature tolerance tests, morphology

Introduction

A butterfly begins its life as a tiny egg, which hatches into larva. The larva requires a host plant to serve as its food source. Each mated female of any butterfly species thus seeks a host plant to lay its fertilized eggs. The larva spends most of its time eating and the growth of larva is related to the consumed food. The old skin then could no longer accommodate the growing larva. Thus molting occurs at this stage. Molting normally takes place four times before transforming into the fifth larva. The fully-grown fifth larva sheds its old skin once it transforms into a pupa with a protective shell. Development from the worm-like larva into the elegant adult butterfly occurs inside the pupa. The adult butterfly when fully developed emerges from the pupa and begins its life cycle to produce another generation.

The brilliant colouring pattern in adult butterflies is due to the presence of scales on the wings that are often arranged in an overlapping pattern or like tiles. Coloration in scales is due to the chemicals from the host plants during the larval stage or due to feeding on excreta by adult butterfly. Ribs and veins are the main supporting structures for butterfly wings (O'Toole, 2002).

Preston-Mafham & Preston-Mafham (1988) said that a number of butterflies are sexually dimorphic and exhibit extreme differences in coloration between the sexes, with the males being the more brilliantly coloured of the two.

The present work is aimed to study the morphological characters of the stripped Albtross butterfly, *Appias libythea* and the sex ratio based on temperature tolerance.

Materials and Method

Study period

The study period lasted from June, 2003 to May, 2006.

Study site

The study was carried out in the laboratory of Zoology Department in the University of Yangon.

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Rearing process

The leaves spotted with butterfly eggs were taken to the laboratory and reared in plastic rearing boxes (6 cm x 4 cm) with slotted covers (Figure 1). The hatched larvae were fed with the leaves of the plant from where the leaves with the eggs have been taken. The leaves were first rinsed with water prior to feeding as water is also essential for the survival of the larvae. The growth of the larvae were recorded when the larvae molted as they increased in size. Feeding process was continued up to the fifth stage before they started to pupate; the period when they stop feeding. The pupa attached itself to the side or cover of the rearing box. The rearing box was then cleaned and left untouched until the emergence of the adult. The emerged adult was next identified according to Bingham (1905, 1907).

Figure 1. Rearing boxes

Temperature tolerance tests associated with sex ratio

Twenty-five eggs from the same batch of eggs were separated into five groups and each group was placed in separate rearing boxes to provide sufficient space for the larvae. The boxes were then simultaneously reared under varying temperatures (25˚C, 30˚C, 35˚C and 40˚C). The temperatures (25˚C, 30˚C and 35˚C) were conducted by keeping the tested boxes in the normal room temperature. The temperature of 40˚C was created under room temperature of 35˚C by insetting a 5-watt bulb in a box with the experimented larvae. The survival rates and the sex ratio were recorded from the emerged adults under the tested temperature (Figure 2).

Figure 2. Temperature tolerance test conducted by insetting a 5-watt bulb for maintenance of 40˚C

Results

Systematic position of the studied species

Phylum	_	Arthropoda
Class	_	Inseta
Subclass	_	Pterygota
Division	_	Endopterygota
Order	_	Lepidoptera
Suborder	_	Ditrysia
Division	_	Rhopalocera
Super family	_	Papilionidea
Family	_	Pieridae
Subfamily	_	Pierinae
Genus	_	*Appias* Hubner, 1819
Species	_	*A. libythea* (Fabricius, 1775)
Common name	_	Striped Albatross

Adult morphology of *A. libythea*

The head is black with fine pale white hairs. Antennae are dusky black, shorter than fore wing cell; mostly with 38-40 segments. The length of the antennae is 11 to 12 mm long and club shape. Eyes and labial pulps are brown. The long proboscis is a brown coiled tube.

The thorax is black with pale white hairs above, but bluish-white beneath. Legs are dark brown and well developed. A black streak extends along the underside of coxa and femur.

Dorsal part of the abdomen is black and the under and lateral sides are creamy white. The posterior end of the abdomen consists of a pair of valves, which are pointed at the apex. Insides of the valves, there is an anal brush of more or less black stiff hairs below in male (Figure 3 and 4).

Coloration and markings of the wings

Upperside: The forewing is triangular in shape with the apex acutely rounded and slightly protruded. The termen is almost straight with dusky-black scales on its margins. The pear shaped hind wing is broad. Both fore and hind wings are milky white. The costal and terminal margins narrowly lined with black edges. Apices of veins are triangular in shape with black markings.

Underside: The fore and hind wings are immaculate milky white. The base of the fore and half of costal thickly dusted with black scales. Costa and apex narrowly defined with black lines. The black streaks at apices of hind wing are similar to those of the upper side forewing.

The external morphology of both sexes is similar except in coloration. The male is white in color while the female is a mixture of white and black.

Temperature tolerance

The fertilized eggs of *A. libythea* reared under varying controlled temperatures showed that the tested fertilized eggs did not hatch in the temperature 40˚C. The temperature 25˚ C, 30˚ C and 35˚ C were recorded to be suitable temperature since all the stages in the life cycle underwent normal development in this temperature.

(A) upperside (B) underside (C) showing an anal brush

Figure 3. Male *Appias libythea*

(A) upperside (B) underside

Figure 4. Female *Appias libythea*

Sex ratio

Sex ratio is recorded to be male 1: female 1 in low temperature though survival rate is low. The number of males predominates in the emerged butterflies in high temperature. Sex ratio is recorded to be 3:2 and 2:1 under high temperature (Figure 5).

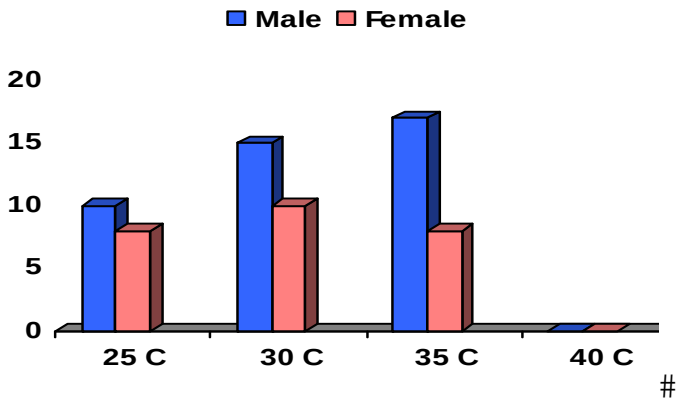

Figure 5. Sex ratio of *Appias libythea* under varying temperature

Discussion

The butterfly species, *Appias libythea* commonly known as Striped Albtross of the family Pieridae was studied from the aspect of morphology and sex ratio. The colour of the sex is distinctively distinguishable (white male, a mixture of white and black female). Sexual dimorphism is thus marked in this species. Kunte (2000) stated that the males of the species *A. libythea* look very similar to the males of Common Albatross, *A. albino* and could not be distinguished in the field unless they are caught and closely examined for their wing venation.

Temperature also confirmed this statement since survival rate of the larvae was recorded to be highest in the temperatures of 30˚ C and 35˚ C. The temperature usually ranges from 30˚ C to 35˚ C in the hot season based on the annual recorded data from Department of Meteorology, Kaba Aye, Yangon. The number of males dominates that of the females in large population size. Corbet & Pendlebury (1992) assumed that the sex ratio of butterflies would occur in approximately equal numbers. However, many species in their collection strongly suggest that it is the female, which appears to be the rare sex. This mentioned factor was found to be in agreement with the present finding since it was also recorded that the maintenance of temperature plays a critical role during the process of development.

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