

THE LIFE HISTORY OF *ORNITHOPTERA ALEXANDRAE*  
ROTHSCHILD

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During the years 1967 and 1968 some data were obtained on the life history and behaviour of *Ornithoptera alexandrae* Rothschild, the largest known species of Rhopalocera; the study was completed in 1970. The geographic distribution of *O. alexandrae* is limited to a relatively small area in southeastern New Guinea. However, within its range there are many areas where the butterfly does not occur although the hostplant grows prolifically. The main habitat is a low and relatively flat region, but it has also been observed at altitudes up to 900 meters.

*O. alexandrae* is monophagous. Its hostplant is *Aristolochia schlechteri*, a vine having rather large, thick leaves and stringy stems covered with a layer of strongly ribbed cork. The flower is shaped like a starfish with three long arms and is dark purple-brown with a yellow heart. The fruit is green, shaped like a small cucumber, 20 to 30 cm long, strongly ribbed longitudinally and has a rough skin. It matures slowly and when fully rotten the seeds fall to the ground and are carried away by rainwater generally over short distances, resulting in a number of plants growing in a restricted area. In primary forest the vine reaches the top of tall trees of over 40 meters high. When larvae were transferred to *Aristolochia tagala*, a plant more generally distributed, it was accepted readily and the larvae developed normally, although at a much faster rate than larvae feeding on their natural host. Data recorded show a rapid growth as was the case with larvae of *Papilio aegaeus* when reared on parsley or carrot leaves (Umbelliferae) instead of their natural foodplants (Rutaceae) (Stride & Straatman, 1962). When three larvae, obtained from eggs collected in the field, were reared on *A. tagala* they went through six instars instead of the usual five. It is not known whether this is hereditary or environmental. The female butterfly does not oviposit on *A. tagala*.

*Oviposition.* Generally a single egg is laid on the under surface of an old leaf of the hostplant. In secondary forest where this plant is not very tall, the egg is laid from a few centimeters above the ground to about one meter above it. On several occasions a female was observed laying on other objects than the foodplant such as a grass stem growing at a distance of a few centimeters from one of the main stems of the *Aristolochia* vine. In primary forest, however, oviposition may take place at a considerable height above the ground.

*Egg.* Large, light yellow, flattened at the base. Diameter  $3\frac{1}{2}$  mm. Covered with a thick layer of a bright-orange sticky substance, which fixes it firmly to the surface on which it is laid. Incubation period varying from 11 to 13 days.

*First-instar Larva.* Ground colour dark wine red. All segments with long tubercles of same colour as body; tubercles fleshy for about one-fourth their length, remaining part stiff and black with numerous black spines. Two dorsal tubercles on the fourth abdominal segment light red as is dorsal saddle mark joining them on the same segment. Saddle mark divided mid-dorsally by a narrow black line. Head, prothoracic shield and legs black; prolegs dark, fleshy. Newly hatched larva seven to eight mm long. Osmaterium orange yellow.

*Second-instar Larva.* Ground colour reddish black. Tubercles proportionately longer, all fleshy and without spines, latero-dorsal ones the longest. Dorsal and latero-dorsal tubercles on thoracic segments two and three, and dorsal ones on abdominal segments one, seven, eight and nine red; two dorsal tubercles on abdominal segment four creamy-white with pink tips; remaining tubercles of ground colour. First thoracic segment with four tubercles, following three segments with eight; abdominal segments two to eight with six; ninth abdominal with four and the last segment with two tubercles.

*Third- to final-instar Larvae.* Ground colour unchanged. Tubercles without spines, of nearly equal length except for the ventro-lateral ones which are very short. In ultimate instar, body tubercles proportionately smaller than in early instars. All bright red except two dorsal ones on fourth abdominal segment which remain creamy white with pink tips. Conspicuous saddle mark extending and narrowing down to spiracles. Some larvae with an additional creamy spot on third abdominal segment. Measurements of a large, mature larva: length 118 mm, greatest width 30 mm; headcapsule length, 12 mm, width 11 mm; longest tubercle, 13 mm. Some larvae have six instars instead of the usual five, and these producing the largest butterflies.

*Adult.* The size of the butterfly varies considerably. The average length of the forewing in the male is 97 to 100 mm, in the female 118 to 126 mm. Many specimens are smaller, few are larger. One previously unrecorded feature is that some males have translucent, yellow discal spots on the hind wings, homologous to those of *priamus* and *victoriae*.

*Duration of stages.* The following data were recorded for the average duration of each stage:

on <i>Aristolochia schlechteri</i>		on <i>Aristolochia tagala</i>	
egg	12 days	egg	12 days
first instar	5 days	first instar	3 days
second instar	7 days	second instar	6 days
third instar	9 days	third instar	8 days
fourth instar	11 days	fourth instar	9 days
fifth instar	20 days	fifth instar	10 days
sixth instar	22 days	sixth instar	14 days
prepupa	3 days	prepupa	3 days
pupa	42 days	pupa	42 days
Total	131 days	Total	107 days

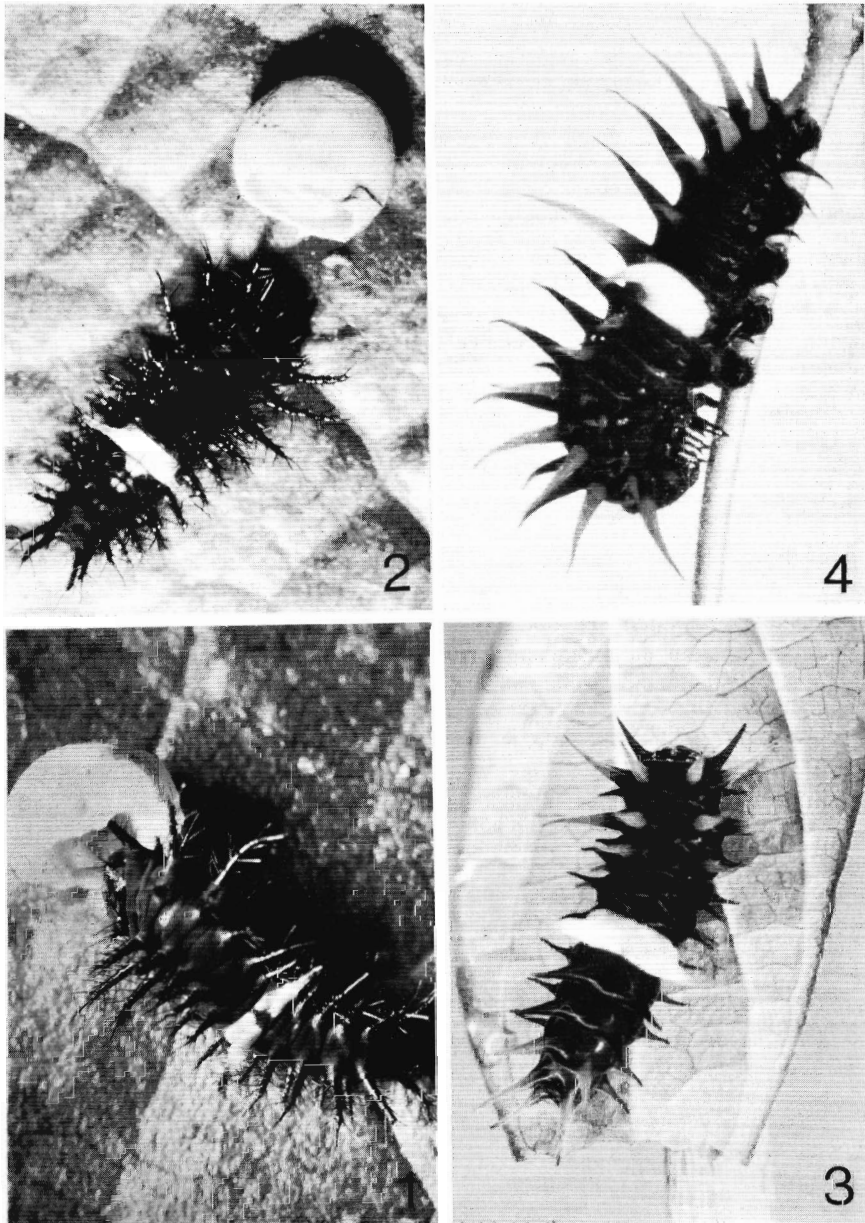
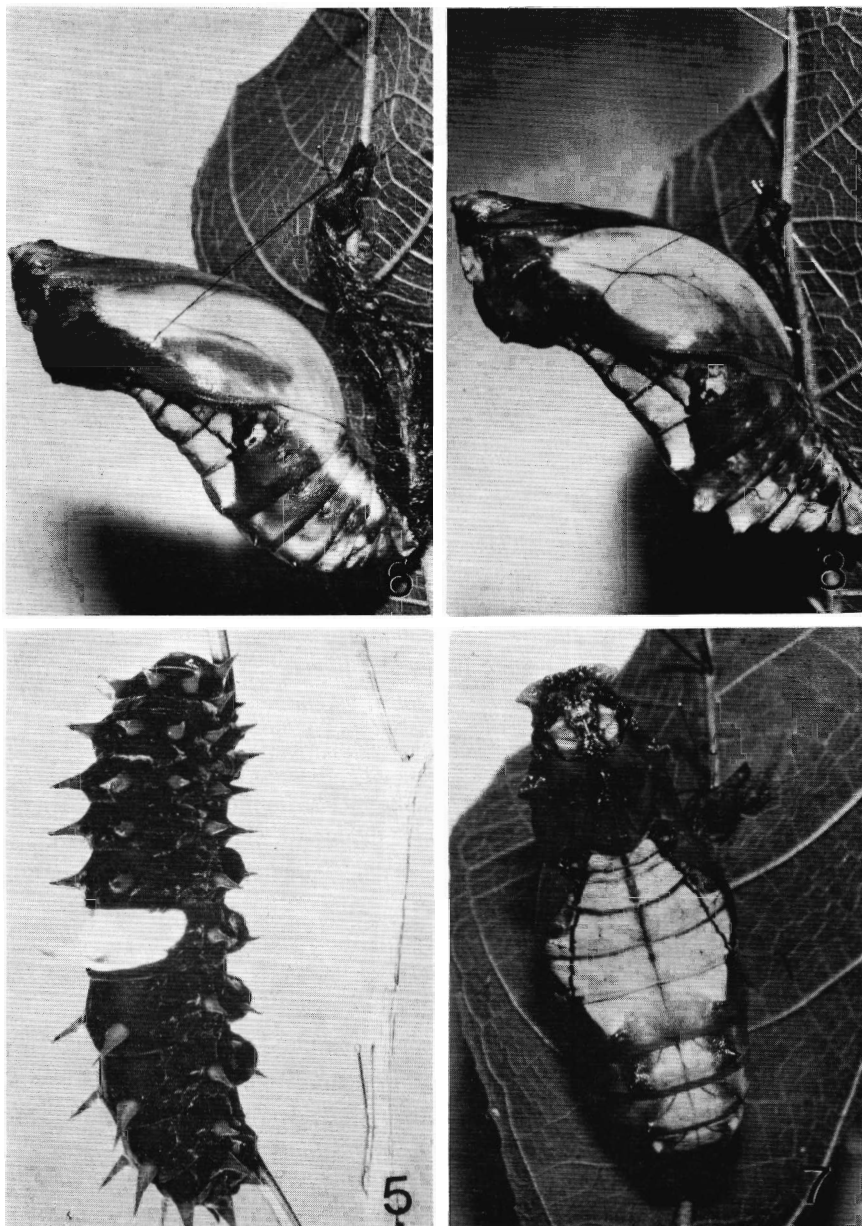


Fig. 1. *Ornithoptera alexandrae* Roths., first-instar larva.

Fig. 2. *O. goliath* Oberth., first-instar larva.

Figs. 3, 4. *O. alexandrae*. 3, Second-instar larva; 4, third-instar larva.



Figs. 5-7. *Ornithoptera alexandrae* Roths. 5, Sixth-instar larva; 6, pupa, lateral; 7, pupa, dorsal.

Fig. 8. *O. victoriae epiphanes* Schmid, pupa, lateral.

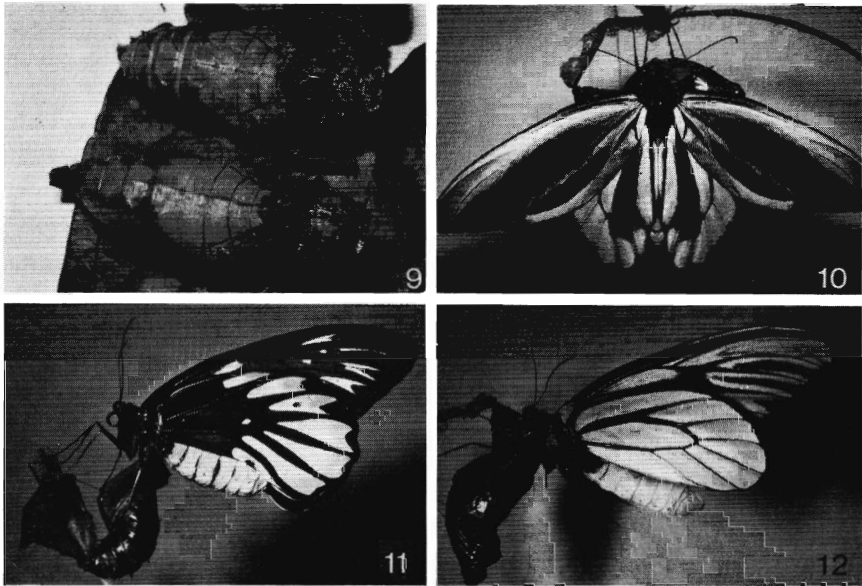


Fig. 9. Pupae of *Ornithoptera alexandrae* Roths. (below) and *O. priamus poseidon* Dbdy. (above).

Figs. 10–12. *O. alexandrae*, adults. 10, 12, Male; 11, female.

In the higher altitudes of its range the total figure may reach 180 days depending on the locality.

It was observed that larvae feeding on *Aristolochia schlechteri* spend much time in search of suitable leaves and stems. However, those feeding on the succulent and soft parts of *Aristolochia tagala* rarely move around and appear to have a longer average daily feeding time.

*Feeding habits.* Shortly after hatching the larva devours its eggshell, which provides sufficient food for the next 24 hours. It then commences feeding on tender shoots and young leaves. Later instars feed on older leaves and stems. Fifth and sixth instar larvae feed mainly on the stringy stems and shortly before pupation one or more stems of the host vine are severed, causing the upper parts to wither. If the plant is young, the lower part is eaten down to the ground.

*Pupation.* The larva may wander for 24 hours or longer to locate a suitable site for pupation, which sometimes occurs at a considerable distance from where it was feeding last. The longest recorded distance was nearly 10 meters. It generally pupates under a leaf of any kind of shrub or tree other than the hostplant, rarely on stems, at an average height of

one to two meters above the ground in secondary forest, but considerably higher in primary forest.

*Pupa.* Ground colour light brown. Wing cases yellow, a broad light-brown streak along lower margin. Abdominal segments brown ventrally and yellow dorsally, with a yellow latero-ventral streak. Dorsal saddle mark bright yellow, extending over segments one to five. Middorsally divided by a narrow dark brown line; a similar line running laterally below wing cases. Thorax dark brown, tegulae bright yellow. Abdominal segments five to eight with two very short, sharp, black processes each. Pupa very closely resembling that of *O. victoriae*. Duration of pupal stage from forty to forty five days.

*General observations.* Female butterflies appear to follow a determined flight pattern when ovipositing. This is suggested by the fact that larvae in different stages of development, together with one or more pupae or exuviae, may always be located on or near the same foodplant, while other plants growing in the vicinity remain free of specimens the year round. It is possible that females, in their search for suitable conditions for oviposition, are stimulated by plants which already do support or have previously supported early stages. Single larvae are only found on small plants.

Although it has not been possible to determine the longevity of the adults it is believed to be similar to that of *O. priamus*. Some males of *alexandrae* were clearly marked after they emerged from the pupa, and then released in a garden. A few of these specimens established themselves for the duration of their adult life in the same garden, where both hostplants and flowers were prolific. After 11 weeks, one male was found caught in a large spiderweb. Another died in the same way after nearly 12 weeks.

*Predators and diseases.* Several larvae have been found marked with numerous rustbrown dots, sitting motionless without feeding. They died after several weeks and may have been killed by a fungus disease.

On one occasion a larva covered with eggs of a Tachinid was collected, but continued feeding, pupated normally and produced the adult. Apparently the parasite eggs did not hatch or the resulting maggots did not survive. A native collector once had a pupa which produced a large number of small, black wasps, probably Chalcididae. Otherwise larvae of *O. alexandrae* are rarely attacked by parasites. Prepupae and soft, fresh pupae are sometimes killed by ants and wasps and mature larvae and pupae are attacked by tree rats and small marsupials. When not mating both sexes may be seen, generally flying high (average 20 to 30 meters above the ground) and in a single direction. In the forest, males are seldom seen as they remain in the shade of the high canopy and avoid open or exposed areas.

*Fecundity.* Two females were taken on the wing while ovipositing. Both specimens appeared in good condition, but it was impossible to make an accurate estimate of their age. They were kept alive and fed daily with a sucrose and honey solution. After 12 days in captivity both specimens were killed. One female had laid one egg; dissection of its abdomen produced another 16 mature eggs. On the basis that not more than 10 eggs had been laid before its capture, we can estimate a total capacity of 25 to 27 eggs. Dissection of the second female produced a total of 12 eggs of which two were immature.

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#### Literature Cited

- JORDAN, K. 1908. Indo-australian butterflies. *In* Seitz, A. Macrolepidoptera of the World. 9: 12-13.
- STRIDE, G. O. AND R. STRAATMAN. 1962. The host plant relationship of an Australian swallowtail, *Papilio aegeus*, and its significance in the evolution of host plant selection. *Proc. Linn. Soc. N. S. W.* 87: 69-78.

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#### A HOST PLANT FOR NORTHERN POPULATIONS OF *EUCHLOE OLYMPIA* (PIERIDAE)

Following my report in the Annual Summary for 1967 of *Euchloe olympia* (Edwards) being sighted in large numbers between Deep River and Stonecliff, some 75 miles farther north and possibly east of the Killaloe, Ontario records reported in the 1966 Annual Summary, I unsuccessfully attempted during the succeeding years to discover the host plant of this northern population.

It was not until May 23 of this year, that I was fortunate enough to observe two females of *Euchloe olympia*, at 1430 hours and a temperature of 76° F., ovipositing on *Arabis glabra* (L.) Bernh. This plant is regionally (although probably incorrectly) called Tower Mustard. Doubtless other Cruciferae are fed upon by *olympia* in this area but these are yet to be determined.

Identification of the host plant was very graciously made by Mrs. Mary Moore of the Petawawa Forestry Station, Canada Department of Fisheries and Forestry.

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