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Breeding Nymphalis io L. and Aglais urticae L. with artificial light

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1. Introduction

As far as we know the copulation of diurnal butterflies has never been obtained on a large scale under completely artificial circumstances, with the exception of Pieridae. FISCHER (1) describes a method by which as much open air and sunlight as possible is to be used. The best results are obtained by *Parnassius* spp. and Pierids; slightly more difficult are Vanessids, Argynnids, Melitaeids and some Satyrids, in particular *Pararge* spp. According to FISCHER the results with Lycaenids and Hesperiids is uncertain, whereas the success with *Apatura* spp. and *Limenitis* is dubious. The species *Gonepteryx rhamni* L., *Nymphalis antiopa* L. and *N. polychloros* L. which have one generation only and all Vanessids which hibernate in the adult stage can be used after hibernation in April or May only.

Both *Nymphalis io* L. and *Aglais urticae* L. are species belonging to the latter group. As to FISHER only the hibernated adults could be induced to copulation in captivity. In our case, however, we worked with a summer generation by starting with caterpillars which we collected in June and July 1954.

Formerly our breeding trials with diurnal butterflies failed. The first attempt was made in the summer of 1943 at Heverlee near Leuven (Belgium). A number of *Nymphalis io* L. was kept in a metal gauze cage of 40 × 20 × 20". This cage was illuminated from above with an electric bulb of 40 W. We did not observe any mating, and anyhow no eggs were laid.

The second attempt was made with *Papilio memnon memnon* L. at Lawang (E. Java), during the dry monsoon in July-August of 1947. The cage stood before

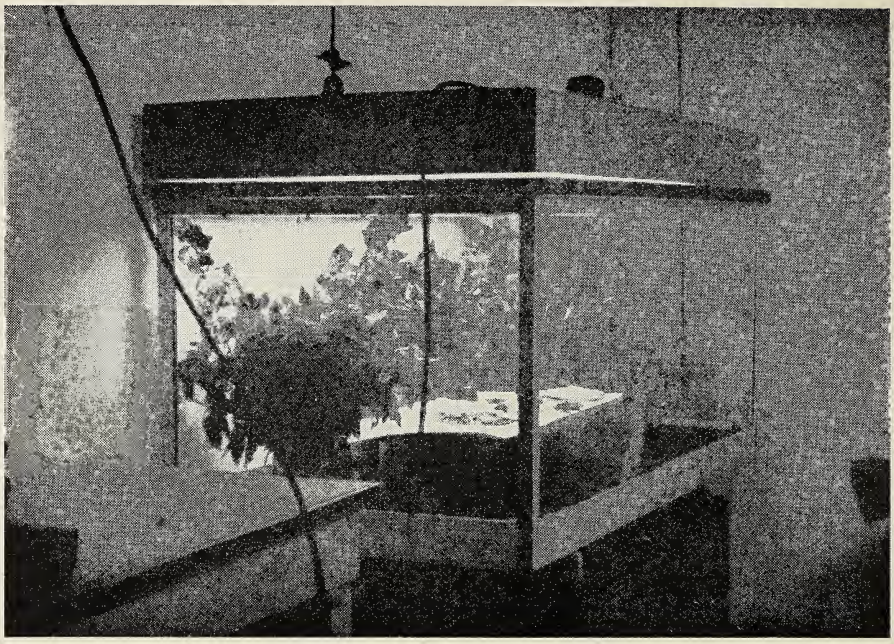

Fig. 1. Breeding light box with *Nymphalis io* L.

Fig. 2. Filterpaper covered platform with hatching pupae, and butterflies, some of which are feeding on the cottonwool with honey water.

a grated window, and no artificial light was used. The third attempt was made at Bussum (Netherlands) in 1950 with *Nymphalis io* L. in a cage of 10 ×16 × 10″ which was placed before the window and received direct sunlight daily during one hour. Both trials were not crowned with success.

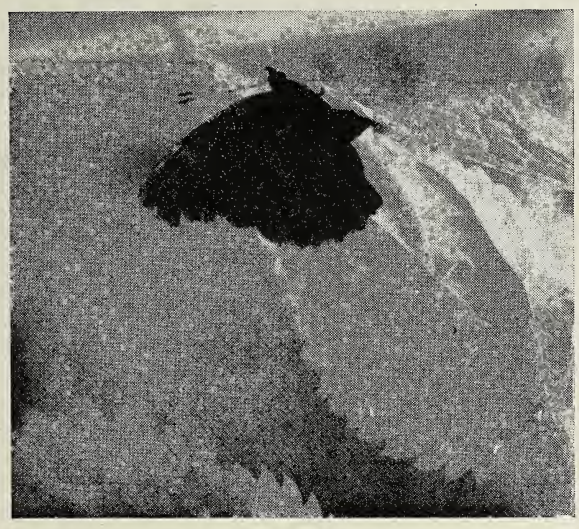

Fig. 3. Oviposition of *Nymphalis io* L. on nettle leaf.

2. *Nymphalis io* L. illuminated by fluorescent tubes.

In June 1954 we found numerous small caterpillers of *Nymphalis io* L. on great nettle (*Urtica dioica* L.) on the border of the IJssellake near Naarden. The caterpillars were transferred to breeding cages of about 22 × 22 × 26″.

The pupae were kept in a breeding room with constant temperature in a light-box with glass panels which was 74″ long, 26,5″ wide, and 22″ high (fig. 1). The box was covered with a glass plate above which a cap with 8 fluorescent tubes was suspended. The tubes used were of the type Philips TL 40 W/33 giving so called "white light". The bottom of the box was covered with wet sphagnum in order to keep the relative humidity between 90 and 100%. The temperature within the box was 24° C.

On a platform covered with filterpaper which was constructed above the sphagnum (fig. 2) 200 pupae were laid on July 9. The first butterflies appeared on 14th July; on July 17 all butterflies had hatched. Food was applied in the form of a 15% honey solution which was poured into a plug of cotton wool in a petridish.

During the first days the butterflies made no use of the food. It was not before the fourth day that they were seen on the cotton wool plug with honeywater. Direct mating was not observed, so we suppose that mating occurred chiefly during the night.

To enable oviposition cutted nettles in jars were placed in the box. On 20th July the first batch of eggs was found; during the next days more egg batches were deposited (fig. 3). The eggs ware transferred into petri dishes fitted with wet cotton-wool and also kept at 24° C. During the development the colour of

the eggs changed from green to greenish-brown with a black spot. No difference was observed whether the eggs were illuminated by fluorescent tubes or not.

The dates concerning the duration of the egg and larval stage are summarized in table 1. The rather simultaneous development is striking and lasts in every case 19 days. Pupation takes about 24 hours from the moment when the caterpillar is hanging down from the branch in the typical comma position. As it was not possible to count the number of deposited eggs we restricted ourselves to count the pupae. We assume the total number of caterpillars having been about 10.000.

Table 1. Development of *Nymphalis io* L. from eggs collected in the light box.

Date of laying	Date of hatching	Date of pupation	Duration of egg stage	Duration of larval stage	Number of pupae
20/7 '54	25/7 '54	8/8 '54	5	14	52
22/7	27/7	10/8	5	14	1592
24/7	28/7	12/8	4	15	950
25/7	29/7	13/8	4	15	565
26/7	30/7	14/8	4	15	2700
28/7	2/8	16/8	5	14	750
				Total :	6609

One hundred pupae which have been bred out of the eggs of July 24 were placed in the light box on August 23. After three days the first 3 butterflies appeared; on 27th August there were 45 and on the next day 95 butterflies.

As was the case with the first summer generation we did not observe any feeding during the first four days. Unlike the first generation mating was observed now and then. The first eggs were found on August 31 and during the next days a reasonable number of egg batches had been deposited. As we have now the fourth successive generation in the light box within 3 months we suppose that the above described breeding method is valid.

3. *Aglais urticae* L. illuminated by fluorescent tubes.

On 6th August 58 pupae of *A. urticae* were placed in the light box under circumstances as already described for *N. io* L. On 10th August the first butterflies appeared, and on 12th August all had hatched. Feeding was observed not before three days after the appearance of the first butterflies.

The first eggs were found on August 16, i.e. 4 days after hatching of the first butterfly. All larvae hatched within 2—3 days. So this method appears also suitable for breeding *A. urticae* L.

4. Discussion.

According to FISCHER (1) there is but little chance of obtaining mating of *Nymphalis io* L. and *Aglais urticae* L. in captivity, even when as much open air and sunlight as possible is given. Our former attempts with *N. io* L. and *Papilio memnon memnon* L. with and without electric light failed. Very good results were obtained in a light box illuminated by a number of fluorescent tubes (Philips TL 40W/33), so that this method is suitable for mass-rearing.

Moreover it is clear that not only the wintergeneration but also the summer generation can mate and oviposit in captivity.

Samenvatting

Het kweken van *Nymphalis io* L. en *Aglais urticae* L. met kunstmatige belichting.

Volgens FISCHER (1) is de kans slechts gering dat copulatie van *N. io* L. en *A. urticae* L. in gevangenschap gelukt, ook al geeft men zoveel buitenlucht en zonlicht als mogelijk is.

Vroegere pogingen met *N. io* L. en *Papilio memnon memnon* L. met en zonder electrisch licht zijn mislukt.

Poppen van de eerste zomergeneratie van *N. io* L. werden geplaatst in een lichtbak die verlicht was met 8 TL-buizen van 40 W/33 (z.g. „wit licht"). Tweehonderd poppen leverden ca. 10.000 eieren op. In 3 maanden hebben wij 4 achtereenvolgende generaties met evenveel succes gekweekt, zodat de methode zich uitstekend schijnt te lenen voor massa-kweek. Ook voor *A. urticae* L. bleek de methode te voldoen.

Literature

(1) FISCHER, E., 1926, Züchtung der Lepidopteren, in : ABDERHALDEN, Hdb. d. biolog. Arbeitsmeth., Abt. IX, T. 1, 2, pp. 277—356. Berlin-Wien.

Nieuwe vindplaats van Epirrhoë tristata L. Op 19 Augustus 1955 ving ik te Deventer op licht een zo goed als gaaf exemplaar van *Ep. tristata*. Ongetwijfeld is dit een nieuwe vindplaats voor deze Geometride in het Oosten van het land.

W. OORD, Potterstraat 16, Deventer.

Afdelingsvergaderingen. De afdeling Noord-Holland en Utrecht zal in dit winterseizoen nog vergaderen op 30 November, 25 Januari en 7 Maart, telkens om 8 uur 's avonds in hotel Krasnapolsky.

De afdeling Zuid-Holland zal nog vergaderen op 14 December en 8 Februari in hotel Terminus te Den Haag en op een nog nader vast te stellen datum in April te Leiden in het Rijks Museum van Natuurlijke Historie.

DE AFDELINGSSECRETARISSEN.

Döring, E., Zur Morphologie der Schmetterlingseier. 154 pagina's, 58 ongekleurde en 3 gekleurde platen met 2645 figuren. Akademie-Verlag, Berlin W 8, Mohrenstrasse 39. 1955. Prijs gebonden D.M. 33.

In dit boek worden de eieren van 622 vlindersoorten afgebeeld en beschreven. Het is daardoor het uitvoerigste werk, dat nog toe over vlindereieren gepubliceerd is. Van elk ei wordt een figuur van boven- en zijaanzicht gegeven en een sterker vergrote afbeelding van de micropyle en van een stukje van de zijwand. Alle afgebeelde eieren zijn door middel van tabellen te determineren. Soms hebben naverwante soorten eieren, die veel op elkaar lijken, maar het komt ook voor, dat bij soorten, die tot hetzelfde geslacht behoren, belangrijke verschillen aangetroffen worden.

De figuren zijn keurig getekend en laten duidelijk zien hoe sierlijk vaak de vlindereieren van vorm en structuur zijn. Een boek, dat stellig aanbevolen kan worden, ook al is het dan niet volledig. — LPK.