

A review of the introductions of *Thersamonia dispar* Haw. (Lep., Lycaenidae) and the speciation problem

by

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Since 1909 there have been several attempts to establish new colonies of the Large Copper Butterfly, *Thersamonia dispar* Haw., in England, Ireland and the Netherlands. First there were attempts to introduce *T. dispar rutilus* Wern. into Wicken Fen, Cambridgeshire, by VERALL (DUFFEY 1968), in 1913 in Greenfields near Tipperary, Ireland, by E. B. PUREFOY (this colony existed until 1936) and in 1926 in the Norfolk Broads in the Bure Valley.

In 1915 *T. dispar* was discovered near Wolvega in the province of Friesland in the Netherlands. OBERTHÜR named this population *batavus* in 1923, though it was with difficulty distinguished from the extinct English nominate form.

In the autumn of 1926 J. H. E. WITTPEN sent young larvae of *T. dispar batavus* to PUREFOY at East Farleigh in England. These larvae produced 28 butterflies in 1927. On 10.V.1927 PUREFOY visited with WITTPEN and H. J. LABOUCHÈRE the *T. dispar batavus* locality at Wolvega and collected 14 larvae there in four days. PUREFOY sent 33 butterflies (20 ♂♂ and 13 ♀♀) to Woodwalton Fen. 8 females were caught for egg-laying. The remaining 5 females in the "Copper field" in the fen produced 300—400 eggs. In August of the same year WITTPEN sent 1000 eggs to PUREFOY, obtained from females caught at a locality near Wolvega, newly discovered by N. LOGGEN, very probably at 52°50'58"N—5°54'48"E (verbal communication by Mrs. WITTPEN). At that time this was a very favourable place for *T. dispar*. So already in 1928 there were a lot of butterflies in the fen and these produced many offspring.

In 1930 there was enough material to establish another colony at Wicken Fen (exterminated in 1942 by emergency reclamation during the war).

In 1942 Woodwalton Fen material was sent to Greenfields for a second attempt and the colony existed there until about 1955 (DUFFEY 1968). In 1949 there was another attempt in the Norfolk Broads, in the Yare Valley.

In 1953 the British Nature Conservancy leased Woodwalton Fen from the Society for the Promotion of Nature Reserves and Dr. E. DUFFEY became responsible for management. In April 1968 an account was published of his investigations and experiments concerning *T. dispar* and its habitat at Woodwalton Fen.

In the Netherlands there were also several attempts to establish new colonies of *T. dispar batavus*. The first was on 27.VIII.1928 when WITTPEN released 350 young larvae at the locality 52°17'50"N—5°05'52"E in the reserve Naardermeer near Amsterdam. On 11.VI.1929 he found only 3 full-grown larvae and he replenished the colony with 14 larvae, obtained from females from the locality near Wolvega already mentioned. WITTPEN received 100 pupae from the Woodwalton Fen stock by PUREFOY in 1932 for new attempts in the Netherlands. In the Naardermeer no butterflies were seen after the first attempt and on 21.VII.1932 WITTPEN released 25 ♂♂ and 13 ♀♀ there. This attempt was also unsuccessful. On 23.VII.1932 he released 34 ♂♂ and 26 ♀♀ at 53°05'10"N—

6°00'15"E near Boornbergum in a private reserve of the family HARINXMA THOF SLOOTEN in the middle of Friesland.

G. DIJKSTRA released some eggs on 29.VII.1939 and 35 pupae and larvae on 9.VI.1940 at the Raamsloot near Eernewoude, 53°08'N—5°56'E. The last specimen in that area was seen about 1955. The whole marsh area there is about 1000 ha, but in many places the *T. dispar* habitat became unsuitable owing to progression of the vegetation succession. The plans for these introduction experiments were discussed by WITTPEN with P. G. VAN TIENHOVEN, chairman of the Vereniging tot Behoud van Natuurmonumenten in Nederland (Society for the Conservation of Nature Reserves in the Netherlands) and J. B. CORPORAAL, secretary of the Nederlandse Entomologische Vereniging (Netherlands Entomological Society).

T. dispar batavus exists only in the marshes now, all together about 5000 ha, in the north-west of the province of Overijssel and the south-east of Friesland, where it is to be found in small groups throughout the area.

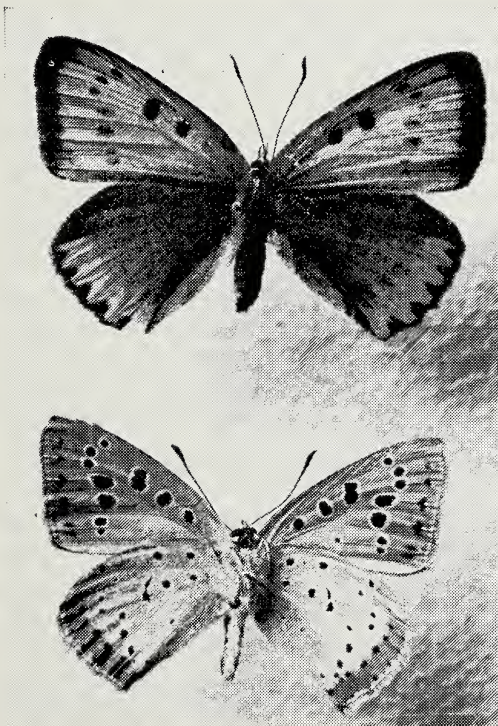
In Denmark *T. dispar rutilus* was found for the first time at Horreby Lyng on Falster, 54° 49'N — 12° 43'E in 1934. The last specimen was taken there about 1948. Horreby Lyng is a raised bog (now severely damaged by peatcutting and pineplanting) and a "Laggzone", a surrounding Caricetum area, which is the suitable habitat of *T. dispar* there. Because this habitat is not more than about 5 ha, and it was the only locality where most of the Danish *T. dispar* could be found, I believe that this colony was artificially introduced, probably in 1930—33.

All these introductions of *T. dispar* to new localities were unsuccessful, except the one at Woodwalton Fen, but there it is bred under half-artificial conditions (see DUFFEY). Because there were some difficulties with *T. dispar* in Woodwalton Fen, it became desirable to have a captive stock as an insurance against extinction and in 1960 H. G. SHORT at Esher, Surrey, started an experiment in breeding *T. dispar* from Woodwalton Fen in captivity. Separate stocks were maintained to prevent inbreeding. There are two critical periods in breeding *T. dispar*, the hibernating of the third instar larvae and the pairing of the butterflies. Both difficulties have been overcome and after some years it has been possible to send back many larvae and pupae to Woodwalton Fen for experimental purposes and to support the colony there. From the same source I also obtained quantities of eggs and young larvae. Material was also sent to Dr. H. HEAL who is now trying to establish a colony in a reserve in North-Ireland.

It is noticeable that the average butterfly of the present British population, especially the female, differs from *T. dispar batavus* from the Netherlands. The submedian spots on the forewing are often reduced as in forma *parva* Tutt 1906 and *subobsoleta* Tutt 1906 and sometimes as in forma *obsoleta* Tutt 1906. The red margin of the hindwing upperside is more often than usual enlarged as in forma *latefasciata* Lpk. 1954; there is a reduction of the dark colour, sometimes as extreme as in forma *suppressa* Tutt 1906. The underside of both sexes shows a slight reduction of all spots on the hindwing. The extreme specimens, in which forma *obsoleta*, *suppressa* and *latefasciata* are united, are very striking forms, unknown among *T. dispar* in Europe. In the following table details are compared of 150 females from the Woodwalton Fen stock with 200 *T. dispar batavus* in

Netherlands collections and with 33 *T. dispar dispar* in the collection of the British Museum (Natural History).

ratio cellspot: biggest submedian spot	Woodwalton Fen stock	<i>T.d. batavus</i>	<i>T.d. dispar</i>
	n	n	n
1 : 1.0	5	34	13
1 : 0.9	21	80	12
1 : 0.7	38	68	7
<i>parva</i> 1 : 0.5	40	18	1
<i>subobsoleta</i> 1 : 0.3	35	0	0
<i>obsoleta</i> 1 : 0.1	11	0	0
ratio red margin hindwing : total dark			
<i>latefasciata</i> 1 : 4	23	0	1
1 : 6	84	135	23
1 : 8	43	64	9
pattern of the hindwing			
<i>nigrescens</i>	25	56	2
<i>neurata</i>	89	92	22
<i>bilineata</i>	3	32	2
<i>unilineata</i>	6	20	7
<i>cuneata</i>	12	0	0
<i>suppressa</i>	15	0	0



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T. dispar from Woodwalton Fen. Top: ♀, showing reduction of submedian spots (f. *subobsoleta*) and enlargement of red submarginal band on hind wings (f. *latefasciata*). Bottom: ♂, under side, showing reduction of spots on hind wings.

Description of the forms by TUTT:

- f. *nigrescens* Tutt 1906 whole area from hind-marginal band to the base uniformly blackish-brown.
 f. *neurata* Tutt 1906 ditto, but with fine copper nervures.
 f. *bilineata* Tutt 1906 with the basal area somewhat paler and two rows of transverse spots showing (submedian- and subterminal-spots).
 f. *unilineata* Tutt 1906 ditto, with only inner row of spots (submedian-spots).
 f. *cuneata* Tutt 1906 ditto, but with the outer portion divided into marked wedge-shaped spots (subterminal-spots).
 f. *suppressa* Tutt 1906 hindwings almost unicolorous and unspotted.

This population is nowadays no longer representative of *T. dispar batavus*. The differences are clear enough to consider the population of *T. dispar* at Woodwalton Fen and all stocks derived from it, as a new subspecies.

I sued the WILCOXON test for the distinguishing character: ratio biggest submedian spot to cellspot, to support this opinion. This is the most remarkable character and, written in this way, easy to use for a statistical test. I found $u = 11.23$ comparing Woodwalton Fen material with *T. dispar batavus*. This means that the chance of the hypothesis that there is no difference is much smaller than 0.004%, so the difference is established.

Comparing *T. dispar batavus* with *T. dispar dispar* I found $u = 2.84$, which corresponds to a probability of 0.46% for the zero-hypothesis. It is mentioned in the literature, e.g., LEMPKE 1954, p. 335, that the submedian spots are biggest in *T. dispar*, though the difference is not very remarkable. This statistical test shows for this distinguishing character also a high degree of significance.

The cause of the change in the Woodwalton Fen Population within about 38 generations may be:

- a. genetic drift, because this population originated from a number of individuals which did not represent the total gene pool of the Netherlands population.
- b. the breeding of an important part of this population in captivity every year. The imagines might be selected on an ethological character because only those butterflies produce offspring which are willing to mate in captivity.

The present case demonstrates how quickly an isolated population may differ from the one where the ancestors came from. So it will be of little systematic value to use subspecific names for such small isolated populations.

In future we shall meet many examples of speciation like the one discussed here, because in Europe the distribution of many species will be soon restricted only to some nature reserves. Sometimes a reserve may be unfavourable during some time (due to human influence, e.g. drainage of the environment, use of fertilizers) and endangered species must be saved from extermination during the time of conservation measures to restore the nature reserve.

Samenvatting

In het artikel wordt getracht een zo volledig mogelijk overzicht te geven van alle uitzetpogingen met de grote vuurvliinder, *T. dispar*. Van 1909 tot 1949 zijn een aantal pogingen ondernomen in Engeland en Ierland. Thans komt alleen in het Woodwalton Fen nog een populatie voor, die zich daar slechts dankzij voort-

durend menselijk ingrijpen kan handhaven. Op het ogenblik wordt getracht in Noord-Ierland een nieuwe populatie te introduceren.

Ook in Nederland heeft men geprobeerd enkele moerasgebieden met grote vuurvlinanders te bevolken. De eerste pogingen waren in 1929 en 1932 in het Naardermeer en in 1932 te Boornbergum door de heer WITTPEN. De uitzettingen in het Naardermeer hadden geen enkel succes. De heer G. DIJKSTRA Hzn. zette een aantal eieren en volwassen rupsen en poppen uit in resp. 1939 en 1940 bij de Raamsloot te Eernewoude. De laatste grote vuurvlinde in Midden-Friesland werd gezien omstreeks 1955. Het is dus zeer waarschijnlijk dat de grote vuurvlinde daar niet inheems is geweest! Thans komt de soort in Nederland alleen voor in de moerasgebieden gelegen tussen Sloten en Zwartsluis.

Ik betwijfel ook, of de in Denemarken verzamelde grote vuurvlinde van een autochtone populatie stammen. Ik vermoed dat de grote vuurvlinde in het begin van de jaren 1930 op Falster is uitgezet.

De grote vuurvlindepopulatie in het Woodwalton Fen heeft sinds 1928 een merkbare uiterlijke verandering ondergaan. Bij het wijfje werd verkleining van de submediane vlekken op de voorvleugel gekonstateerd en de verdeling van de typen in achtervleugeltekening vertoonde een duidelijke afwijking ten opzichte van die van de Nederlandse grote vuurvlinde. De rode band is bij een aantal veel breder, de forma *bilineata* komt nog maar zeer weinig voor en bij een gering aantal is de donkere tekening bijna geheel verdwenen, waardoor de achtervleugels eenkleurig rood worden.

Het kenmerk „gereduceerde submediane vlekken” werd aan een statistische toets onderworpen en er werd een zeer hoge mate van significantie gevonden voor het verschil tussen de Engelse populatie en de Nederlandse. Hiermee is aangetoond, dat binnen 38 generaties een nieuw gestichte populatie zoveel van de oorspronkelijke kan verschillen dat deze als een nieuwe subspecies beschouwd zou kunnen worden, maar ik ben van mening dat de systematiek niet gediend is met het benoemen ervan.

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