

# THE ENIGMA OF *CELERIO HYBR. PAULI* MORY

by

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With one colour-plate

## INTRODUCTION

In the summer of 1897, the well-known Swiss entomologist M. Paul observed on *Hippophae rhamnoides* in the vicinity of Sion, Wallis, Switzerland, a sphinx caterpillar resembling *Celerio euphorbiae*. Unfortunately, the detailed description of the caterpillar has been lost. Breeding of the caterpillar was successful, however, and on September 1st of the same year the moth emerged. It was put at the disposal of Prof. Standfuss for his collection (Fig. 1; at present kept in the Entomology Institute of the Eidgenössische Technische Hochschule at Zürich, Switzerland). Shortly thereafter, the medical student Mory published a photograph together with a detailed description of the moth. The author, on the basis of a comparative study, thought that it could be the product of a natural cross-breeding of *Celerio euphorbiae* ♂ with *Celerio hippophaes* ♀, since called *Celerio hybr. Pauli* Mory (1901). Several years later, Denso (1911) denied the probability suggested by Mory for two reasons. First, caterpillars from experimentally obtained crossbreeding of *Celerio euphorbiae* ♂ with *Celerio hippophaes* ♀, although clearly resembling those of *Celerio euphorbiae* could only be bred *ab ovo* on *Euphorbia cyparissias* or other *Euphorbia* species. Second, the resulting moths differed in various ways from Paul's specimen. Since it remained possible that the latter was a bastard resulting from a cross between *Celerio livornica* and *Celerio hippophaes*, Denso gave the experimentally obtained bastard of *Celerio euphorbiae* ♂ with *Celerio hippophaes* ♀ the name *Celerio hybr. euphaes* (see Denso, 1911).

Paul's finding remained enigmatic. With the present report we offer a possible solution of the problem of a *Celerio euphorbiae*-like caterpillar to be found on *Hippophae rhamnoides*, a solution which might serve as a model holding equally well for bastards of *Celerio livornica* crosses with *Celerio hippophaes*.

## EXPERIMENT

The materials used for the experiment which gave the desired result were the genuine species *Celerio euphorbiae* and *Celerio hippophaes*, found in the summer of 1973 in the Wallis region of Switzerland. Brought to Holland, the pupae hatched as early as the latter part of 1973, and cross-breeding of *Celerio hippophaes* ♂ with *Celerio euphorbiae* ♀ (*Celerio hybr. hippophorbiae*) under strictly aseptic conditions



was successful on *Euphorbia cyparissias* and/or *polychroma*. In 1974, the following cross-breeding with this hybrid succeeded:

1. *Celerio hybr. hippophorbiae* ♂ × *Celerio hippophaes* ♀, and
2. *Celerio hybr. hippophorbiae* ♂ × *Celerio euphorbiae* ♀.

Caterpillars of variety 1 were highly variable and accepted only *Hippophae rhamnoides*; some of them strongly resembled the caterpillars of *Celerio hippophaes*, but none those of *Celerio euphorbiae*. Variety 2, on the other hand, was very similar to *Celerio euphorbiae*, and accepted only leaves of *Euphorbia cyparissias* and/or *polychroma*. Most of the pupae of both varieties hatched in September of 1974. Probably supported by excellent climatological conditions, cross-breeding of *Celerio hybr. (hippophorbiae × euphorbiae)* ♂ with *Celerio hybr. (hippophorbiae × hippophaes)* ♀ was again successful three times. The three female moths together yielded about 150 fertile eggs. Approximately 25 per cent of the caterpillars accepted *Hippophae rhamnoides* leaves and developed extremely well; the rest did equally well on *Euphorbia polychroma*. Most of these caterpillars resembled another successfully obtained bastard, the result of cross-breeding of *Celerio hybr. (hippophorbiae × hippophaes)* ♂ with *(hippophorbiae × hippophaes)* ♀. However, a far from negligible number of not only the caterpillars raised on *Euphorbia polychroma* but also of those kept on *Hippophae rhamnoides*, were almost indistinguishable from *Celerio hybr. hippophorbiae*, i.e. resembled *Celerio euphorbiae* rather closely so that observers less familiar with the detailed pattern of this *Celerio* species would probably have concluded that these were *Celerio euphorbiae* caterpillars of the red (Fig. 3), or the yellow, or even of the black variety (Fig. 4).

## DISCUSSION

Cross-breeding is rather common in nature (Mory, 1897). Moreover, the two species in question, *Celerio euphorbiae* and *Celerio hippophaes*, live near each other in the foreland of the Rhône River in the Wallis region. In captivity, *Celerio hybr. euphaes* Denso is one of the most easily obtained bastards. *Ab ovo* caterpillars of this crossing, however, do not accept *Hippophae rhamnoides*. Hence, in nature this bastard is doomed to death. However, the reciprocal bastard, *Celerio hippophorbiae* which is obtained just as easily in captivity, grows very well on the fodder plant of the maternal family. Caterpillars of both of these primary bastards produce highly fertile moths. Secondary bastards are therefore easily obtained: whereas the variety *Celerio hybr. hippophorbiae* ♂ × *Celerio hippophaes* ♀ lays the eggs on and accepts *Hippophae rhamnoides*, the reciprocal bastard, *Celerio hybr. hippophorbiae* ♂ × *Celerio euphorbiae* ♀, does the same with the various *Euphorbia* species growing in the Wallis region. Of these two, the rather sophisticated recombination of *Celerio hybr. (hippophorbiae × euphorbiae)* ♂ with *(hippophorbiae × hippophaes)* ♀ in captivity has been shown to lay eggs on *Hippophae rhamnoides*, which is accepted by approximately one-fourth of the emerging caterpillars, even those strongly resembling *Celerio euphorbiae*. This tertiary bastard now might have been responsible for Paul's finding of an *euphorbiae*-like caterpillar on *Hippophae rhamnoides*. The fact that *ab ovo* caterpillars of the two primary bastards *Celerio hybr. euphaes* and *Celerio hybr. hippophorbiae* do not accept *Hippophae rhamnoides*,



whereas the cross *Celerio hybr. (hippophorbiae* × *euphorbiae*) ♂ with (*hippophorbiae* × *hippophaes*) ♀ does so, including *euphorbiae*-like specimens, must be explained by chromosomal crossing over.

Unfortunately, the adults of our tertiary bastards (Fig. 2) are all distinctly different from *Celerio hybr. Pauli* (Fig. 1). We must consequently agree with Denso's criticism and reconsider the possibility of a bastard with another *Celerio* species, most likely with *Celerio livornica*, particularly because of the white flames on the thorax. Such flames were not present on any of the specimens bred by us. If *ab ovo* caterpillars of the primary bastard of *Celerio livornica* and *Celerio hippophaes* too should prove unable to grow on *Hippophae rhamnoides* (which is certainly also the case for *Celerio hybr. vespertilioides* and *Celerio hybr. irene*), our observation would offer a model for further experiments with these two species of the genus *Celerio*, to elucidate the enigma of *Celerio hybr. Pauli* Mory. *Celerio livornica* is a frequent and well-known guest of the Wallis region, coming from the Mediterranean area, and its fodder plants are even more ubiquitous than those of *Celerio euphorbiae*.

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#### SUMMARY

A tertiary bastard was obtained by crossing *Celerio euphorbiae* with *Celerio hippophaes*, i.e. *Celerio hybr. (hippophorbiae* × *euphorbiae*) ♂ with (*hippophorbiae* × *euphorbiae*) ♀. An appreciable proportion of the *ab ovo* caterpillars of this bastard, many of which clearly resemble those of *Celerio hybr. hippophorbiae* (and hence of *Celerio euphorbiae*), accept *Hippophae rhamnoides*, which for *ab ovo* caterpillars of the primary bastard *Celerio hybr. euphaes* and *Celerio hybr. hippophorbiae* is never the case. Although the emerging moths are distinctly different from *Celerio hybr. Pauli*, our experiments might serve as a model for cross-breeding experiments between *Celerio hippophaes* and other *Celerio* species such as *Celerio livornica*, in order to explain the enigmatic observation made by Paul in 1897.

#### LITERATURE

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