FURTHER NOTES ON SCENTS IN BUTTERFLIES.

BY

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Reprinted from "The Entomologist's Monthly Magazine," 2nd Series, Vol. xxv.

During the two years that have elapsed since the appearance of my list* of the butterflies which have been observed to possess a scent, I have had further opportunities of investigating the subject.

Butterfly scents have been divided by Fritz Müller and Dixey into two categories:—

(1) Attractive scents: in the very large majority of cases confined to the male sex. These are almost always agreeable to the average human perception.

(2) Repulsive or protective scents: usually common to both sexes, and often strongest in the female. These are, for the most part, disagreeable to man, or even disgusting.

As perhaps might have been expected, further investigation, while extending the basis of facts upon which these generalizations have been made, has revealed more and more exceptions.

The exceptional occurrence of female butterflies with attractive scents needs further explanation. Moreover, my own experience with scents believed to be repulsive convinces me that if such scents are really protective they must be far more repulsive to the enemies of butterflies than they are to man. All lovers of dogs must have noticed that many odours which give pleasure to us excite disgust in them, and *vice versâ*.

In the following notes an asterisk indicates that the species is one that I have not previously dealt with.

* "Butterfly Hunting in Many Lands." 1912. pp. 490–516. Full references to the authorities are there given. The species are dealt with here in the same order to facilitate comparison.

NYMPHALIDÆ.

Ithomiinæ.

* *Ceratinia fenestella*, Hew. (Trinidad, 1913). Out of three examined, a ♀ had an odour resembling musty tobacco. Fritz Müller detected a rather faint scent in *C. eupompe*, Hb.

* *Mechanitis lycidice*, Bates, and *M. veritabilis*, Btl. (Trinidad and Venezuela, 1913). Ten specimens of each of these closely allied species were examined. In one only, a ♂ of the first named, was a slight scent suspected in connection with the fringes. So far as it goes this confirms Fritz Müller's record of a very faint scent in the ♂ of *Mechanitis lysimnia*, F.

* *Eutresis hypereia*, Dbl. and H. (Venezuela, 1913). A ♀, the only specimen met with, gave out both during life and after death, a strong odour like that of cockroaches.

Danainæ.

Danaida archippus, F. (Dominica and Venezuela, 1913). 4 ♂♂ and 2 ♀♀ examined. Previous results confirmed, but in one ♀ the scent is described as "not strong, scarcely disagreeable."

Danaida eresimus, Cr. (Venezuela, 1913). Of 2 ♂♂ examined, one had a sweet scent, somewhat aromatic in character, the other a "not unpleasant" scent. In 1907 I was somewhat in doubt as to the ♂ possessing a scent.

* *Lycorea atergatis*, Dbl. (Trinidad and Venezuela, 1913). Six specimens were examined, 3 ♂♂, 3 ♀♀. All the ♂♂ had the tufts everted, but in only one of them could any scent be detected, it was slight and resembled that of a cockroach. One of the ♀♀ had a similar slight odour, in another the scent was compared to that of a cigar box. Fritz Müller found an extremely strong, rather disagreeable odour, in "*Lycorea* sp."

Satyrinæ.

Pararge megæra, L. (Spain, 1913). In 4 ♂♂ out of 9, I succeeded in detecting a more or less distinct scent of chocolate, without the vanilla element.

* *Pararge mæra*, L. (Spain, 1913). I took but one specimen, ♀, which had a scent of pure chocolate, strong during life, less strong after death.

Nymphalinæ.

Didonis biblis, F. (Trinidad and Venezuela, 1913.) 4 specimens

examined, 3 of them ♂♂. No scent was detected in any of them, so that in this species I have again failed to confirm Fritz Müller.

* *Byblia ilithyia*, Drury. (Sudan, 1912). A ♂ and 4 ♀♀ were examined: the former had a sweet aromatic scent, which struck me as like scented tobacco; of the latter, one had a similar scent, but less strong; another a scent compared to chocolate; a third to that of *Teracolus protomedia*, of which, later. This scent in the female tallies with earlier observations on *B. goetzius*, Herbst.

Hypolimnas misippus, L. (Sudan, 1912). In 2 ♂♂ I found no scent, but in 2 ♀♀ out of 4, I detected a slight treacly odour. Compare Dr. Dixey's observations (*op. cit.*, p. 502).

Victorina stelenes, L. (Trinidad, 1913). 2 ♂♂ were taken, one appeared to have a slight flowery scent; I was not very certain about this at the time, but find that it agrees with my earlier experience with this fine insect.

Agraulis vanillæ, L. (West Indies, 1913). Out of 4 ♂♂ examined, one had the stable-like odour noted in 1907.

Colænis julia, F. (West Indies, Trinidad, and Venezuela, 1913). 4 ♂♂ and 4 ♀♀ were examined; in the 4 ♂♂, and doubtfully in one of the ♀♀, a scent was noted, in only one instance strong, said to be "peculiar," "sweet," "like treacle," or "like ginger-bread nuts." These results are in concordance with my experience of the sub-species *cillene*, Cr., in Jamaica

[I follow here the arrangement adopted in "Butterfly Hunting in Many Lands," but I am now disposed to consider *Agraulis* and *Colænis* as Heliconines.]

HELICONINÆ.

Eueides aliphera, Godt. (Trinidad and Venezuela, 1913). 4 ♂♂ and 3 ♀♀ examined. In one ♂ no scent was observed; the other three had both during life and after death an odour compared to rancid lamp-oil, or to acetylene, varying from very slight to strong. 2 ♀♀ had a similar scent to the ♂, but the third is noted as having "a sweet, pleasant scent." These results, speaking generally, confirm those previously obtained.

Heliconius hydarus, Hew. (Trinidad and Venezuela, 1913). Previous results were confirmed, but 2 ♂♂ and 1 ♀ *H. euryades*, Riff., gave negative results.

* *Heliconius ethilla*, Godt. (Trinidad, 1913). The only specimen at my disposal, a ♀, had a strong tobacco-like odour.

LYCÆNIDÆ.

**Thestor ballus*, F. (Spain, 1913). 8 ♂ ♂ were examined: all had a scent, not very strong, compared sometimes to chocolate, sometimes to "chocolate sweets" (*i.e.*, with a vanilla element). 4 ♀ ♀ appeared to be scentless.

PAPILIONIDÆ.

Pierinæ.

Catopsilia florella, F. (Sudan, 1912). The strong luscious scent of the ♂ was confirmed,

Rhabdodryas trite, L. (Dominica, 1913). The only specimen taken, ♂, yielded a "sweet pleasant scent; not so strong or luscious as *C. eubule*," confirming Fritz Müller.

Phœbis agarithe, Bsd. (St. Lucia, 1913). A pair had a "strong fetid butyric odour"; ? emitted by the ♀.

Callidryas eubule, L. (West Indies, Trinidad and Venezuela, 1913). The strong luscious scent of the ♂, compared by me to *Freesia* but by a friend to carnation, was amply confirmed, as was also the butyric odour of the ♀.

Gonepteryx rhamni, L., and *G. cleopatra*, L. (Spain, 1913). These butterflies were found flying together at Ronda, Andalusia, in March.

9 ♂ *cleopatra* were examined: in all a scent was found; in one it was described as "very slight," in another as "decided, but not very strong," in four as "strong"; in 8 out of the 9 it was unhesitatingly compared to that of *Freesia*.

8 ♂ *rhamni* were examined: in 5 I was unable to detect any trace of scent, either during life or after death, but in the other 3 the living insects had a very faint scent, which I could not clearly describe, but in each case noted that it was not that of *Freesia*.

These results are in complete accordance with those obtained in Algeria in March, 1905.

It would, however, appear that I paid little or no attention to the female *Gonepteryx* in Algeria, although I sent home four specimens, of which three may be referred to *cleopatra*, the fourth probably to *rhamni*.

But at Ronda I examined 9 ♀ ♀, all seemingly referable to *cleopatra*, and was not a little surprised to find a scent in all of them:

this scent was more distinct than that of the male *rhamni*, but much less strong than that of the male *cleopatra*. To me it was agreeable, sweet, and suggested *Freesia*.

Are we to regard *rhamni* and *cleopatra* as distinct species of which the females closely resemble one another ? Or are we to look upon them as but one species with a (locally) dimorphic male ?

Dr. Dixey gave to the Entomological Society some years ago an admirable summary of the facts, which was fully reported at the time.†

An obvious question arises: can the scent be directly connected, or indirectly correlated with the orange scales ? Mr. Enock's record of ants attacking *G. rhamni* and confining their depredations to the orange spots is very suggestive, especially in the light of somewhat similar observations as to *Danainæ*.

**Aphrissa statira*, Cr. A ♂ had, when alive, a slight sweet scent.

Colias edusa, auct. (Spain, 1913). 6 ♂♂ were examined; in three I was unable to detect any odour, in two a very slight chocolate-like scent was suspected, in one I satisfied myself that a slight but distinct scent was present, which I was disposed to compare to that of clove-pink. I was, however, unable to localise the scent in the "patches."‡

Terias nise, Cr. (W. Indies, Trinidad, and Venezuela, 1913.) 19 ♂♂ were examined of which 5 had a sweet scent, compared in several instances to the peculiar smell of *Convolvulus arvensis*. 7 ♀♀ gave negative results. These observations confirm my experience in 1907, though the positive results are proportionately fewer.

Teracolus protomedia, Klug (Sudan, 1912)). In 6 ♂♂ out of 24 I detected a slight scent, not easy to describe; the words "dusty," "stuffy," "musky," "peculiar," "like wood," and "very faint *Freesia*" appear in my note book. Previous results were thus confirmed.

**T. eupompe*, Klug (Sudan, 1912). In two ♂♂ out of a large number examined a slight scent was observed, in one noted as "sweet," in the other as "stuffy."

T. halimede, Klug (Sudan, 1913). A ♂, one of many, had a distinct musky odour.

**T. pleione*, Klug (Sudan, 1913). A ♂, one of many, had a distinct musky odour.

† Proc. Ent. Soc. Lond. 1905. pp. xxxvi—xli.
‡ See Dixey, Proc. Ent. Soc. Lond., Oct. 5th, 1904, p. lvii,

T. evippe, L. (Sudan, 1913). A ♂, out of 12 examined, yielded a scent like *Freesia*.

T. evarne, Klug (Sudan, 1912). Out of a large number of ♂ ♂ five were found to have a scent: it was distinct and sweet in character, in one compared to *Freesia*, but in another described as "somewhat medicinal."

Having captured large numbers of many species of *Teracolus*, I am forced to the conclusion that the scent of the males is either very slight, or very transient, or for some other reason more difficult to detect than scents in some other genera.

Calopieris eulimene, Klug (Sudan, 1912). 3 ♂ ♂ out of 21 appeared to have a faint sweet scent, once suggesting gorse.

Leuceronia buquetii, Bsd. (Sudan, 1912). Out of 4 ♂ ♂, I suspected a faint sweet scent in one, and noted a "slight, scarcely agreeable" scent in another.

Euchloë bellidice, Hübn. (Spain, 1913). Out of 19 ♂ ♂ examined a scent was detected in 15; this was variously estimated as "very slight," "slight," "distinct," or "decided"; in most cases it was described as "sweet," once compared to that of *Freesia*, once said to be "somewhat aromatic," another time "scarcely pleasant." Only 3 ♀ ♀ were examined; one had an unpleasant odour, the other two were scentless. [This is *A. belia*, Cr.].

This species flies with the next, but is commoner and more generally distributed, and a larger insect.

Euchloë tagis, Hübn. (Spain, 1913). Of this local species I examined 13 ♂ ♂, 5 ♀ ♀, and one of which the sex is uncertain. In none of them was any odour detected.

The two preceding species are closely allied, so that exceptional specimens of the former are said to resemble the latter. It is interesting to find that they differ in the matter of scent production.

Euchloë belemia, Esp. (Spain, 1913). 15 ♂ ♂ were examined: two had a "pleasant scent," which was "slight" in one, "very slight" in the other. In six others a scent was suspected, in one of which it appeared to be "very sweet." 11 ♀ ♀ gave negative results. This butterfly flies swiftly.

Daptonoura lycimnia, Cr. (Trinidad and Venezuela, 1913). Of 11 ♂ ♂, one appeared to be scentless, the other 10 all had a decided sweet luscious scent, compared to that of *Freesia*. My experience in 1907 was thus fully confirmed, but my results are not in complete

accordance with those of Fritz Müller, who found the scent of the ♂, though very delicious, rather faint and often hardly distinguishable. Two ♀ ♀ were examined but no scent found. (Compare *op. cit.*, p. 511).

Belenois gidica, Godt. (Sudan, 1912). Of 13 ♂ ♂ all appeared to be scentless, but in 1 ♀ out of 5 a faint scent was detected.

Belenois mesentina, Cr. (Sudan, 1912). I found the ♂ to have a slight scent, variously suggesting the adjectives "musky," "aromatic," "flowery." Previous results were thus confirmed.

Pieris (Perrhybris) calydonia, Bsd. (Venezuela, 1913). 11 specimens, all ♂, were examined; in 4 of these there was a distinct scent, described as "flowery" or "like *Freesia*"; in two a somewhat unpleasant scent, suggesting pomade, was found. On the whole previous results were confirmed.

**Pieris (Perrhybris) sevata*, Feld. (Venezuela, 1913). 2 ♂ ♂ had a slight but distinct flowery scent; 2 ♀ ♀ were scentless.

**Pieris (Perrhybris) phileta*, F. (W. Indies and Venezuela, 1913). Out of 10 ♂ ♂ examined, only four yielded a scent, twice doubtfully described as "peculiar," once as "heavy, somewhat unpleasant," once as "strongly fetid." Of two ♀ ♀ one had a "slight fetid odour." In 1907 I failed to detect any odour in this species.

**Synchloë glauconome*, Klug (Sudan, 1912). 3 ♂ ♂ out of 8 yielded a distinct sweet scent like that of *Freesia*.

**Synchloë daplidice*, L. (Spain, 1913). Of 32 ♂ ♂ examined, 24 had a scent. This was in no case strong, but variously estimated as "very slight," "slight," "distinct," or "decided"; it was variously described as "aromatic," "like sweet-briar," or "scarcely pleasant," but more often as "sweet," and in a majority of specimens was compared to that of *Freesia*. Of one of the 24 ♂ ♂ the note says that observation in the field showed "a slight sweet scent," but that at home the butterfly was found alive in its envelope, and emitted "a strong scent, somewhat like that of *P. rapæ*." One observation gave a doubtful, seven gave negative results. In 8 out of 10 ♀ ♀ examined, no scent was detected; in one "a very slight but very sweet scent" was noted; of another it is recorded "a very slight *Freesia* scent: no doubt about it."

Papilioninæ.

**Thais rumina*, L. (Spain, 1913). In 10 out of 11 ♂ ♂, and in all the 7 ♀ ♀ examined, a scent was easily detected, though sometimes it

was but slight; it appeared to be alike in both sexes. From time to time I have attempted to describe this scent by such words as "somewhat unpleasant," "disagreeable," "? like rue," "peculiar," "musty," or "somewhat like musty straw, but less disagreeable."

When examining the specimens at Oxford in July, 1913, five months after capture, and again in October, eight months after capture, the scent was still very distinct, even in the presence of naphthalin. Mr. Bagnall thought it "musky," Mr. Hamm "musty," Dr. Carpenter thought it "like smell of pepper, but mild pepper," while Dr. Dixey suggested "the smell of the pepper-tree." The last comparison struck me as apt.

T. rumina has a striking pattern, similar on both upper and undersides, it is slow in its movements and bold in its behaviour; further it is hard to kill; when it is added that both sexes have a peculiar scent, it will be seen that it has all the characteristics of a protected species.

**Papilio cymochles*, Dbl. (Trinidad, 1913). A ♂ had a somewhat unpleasant odour, described as "stuffy"; a ♀ a scent described as "like that of an old pipe."

**Papilio machaon*, L. (Spain, 1913). Two ♂ ♂ had a strong disagreeable odour of musty straw.

**Papilio podalirius*, L. (Spain, 1913). A ♀ had a decided odour like straw, but not disagreeable.

Yet once more I appeal to field naturalists to join in the investigations of these interesting perfumes, which hitherto have attracted the attention of so few.

Highlands, Putney Heath:
October 24th, 1913.